

Embedded in every technology is a bias or powerful idea, sometimes two or three powerful ideas. Technology leads us to favor and value certain perspectives and accomplishments and to undervalue others. What we might not realize is every technology has a philosophy, which is a given expression in how the technology makes people use their minds, in what it makes us do with our bodies, in how it codifies the world, in which of our senses it amplifies, in which of our emotional and intellectual tendencies it disregards.

Neil Postman (1998, p. 3)

**Not Only With, but also Within Technology:
The Reshaping of New Brunswick Teacher Pedagogy During
the Coronavirus Pandemic**

by

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Abstract

The New Brunswick (NB) Department of Education continues to make large-scale investments in digital technology as tools to safely educate during the COVID-19 pandemic. This intensified turn to technology has generated a wide range of commentary, raising excitement and concern from various voices. Despite a vast narrative since March 2020 around much of the world surrounding the movement to digital spaces in education, there is very little discussion in NB about how these digital tools are creating new learning environments that are reshaping ways of thinking and knowing. As a school district technology coordinator responsible for supporting the use of technology in 69 schools, I offer a unique perspective into the ways these new tools and environments are changing NB education. To better understand the implications of these new digital tools on teaching and learning in NB schools, I draw upon my own experiences, those of NB teachers, and the work of media ecologists. This articles-based doctoral work seeks to deepen the discussion around the impact of this heightened shift to digital media in K-12 education in NB. Education in NB is an interconnected system of partners working together to ensure the success of students. The decisions made by the Department of Education, school districts, and schools affect the ability of the system to achieve its goals, and so I write for these audiences in this work.

Dedication

To Dean Ann Sherman, who saw something special in me and insisted I embark on this journey as an explorer and trailblazer. Even though you're gone now, Ann, I could hear you encouraging me to remain steadfast throughout all the peaks and valleys of this work. Without you, I would not have set foot on this expedition. This work is dedicated to you.

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Introduction: A Changing Educational Landscape

Introduction

When the COVID-19 pandemic caused New Brunswick (NB) schools to close on March 16th, 2020, students were suddenly left with no access to formal education. Like many education organizations, the NB Department of Education and Early Childhood Development (EECD) and its affiliated school districts turned intensely toward new technological tools and software as a means to help safely educate. In this moment, NB high school teachers were forced to confront what was likely the most jolting and sudden shift of their career: transitioning the means by which they educated - from classroom to computer screen, from co-presence to distance, from hands on to hands off. While *what* they were teaching may not have shifted drastically, *how* they taught did.

Working as a school district technology coordinator while also being enrolled as a PhD student since 2017, I have been studying technology in education for over four years. For my doctoral thesis, I wanted to investigate how educational technologies influenced NB teacher practice, and in what ways new technological tools shaped learning environments and the way students learned. I felt particularly well positioned to investigate this inquiry as I was immersed in the challenges and opportunities that technologies were presenting for teachers on a daily basis. In my day job, I was overseeing purchases, professional learning, and other forms of support intended to help teachers improve their pedagogical approach using technology across various disciplines. However, given the varying degree to which teachers were using different types of technology in their practice, I questioned, for my PhD work, how I would design my study. Then, COVID-19 caused the world's biggest educational technology experiment in

history (Barnum & Bryan, 2020; Bennett, 2020; Hattie, n.d.; Shultz, 2020; Zimmerman, 2020).

What Happened in New Brunswick Education?

March-May 2020

On Friday, March 16, 2020, NB joined provincial governments across Canada by closing schools due to the increased public health threat of the COVID-19 virus. Students and teachers left school not knowing when they would return to the institution that supported learning, social life, and for some, essential services such as food programs and counselling.

At this time, teachers were specifically asked to refrain from any formal teaching endeavours. Teachers were directed by the EECD to periodically check in on the wellbeing of their students and to offer their assurances through email, phone calls, and video chats. Specific focus of the provincial government became health, safety, and essential services for students, including access to the internet and networked devices (GNB, April 2, 2020). The EECD and its affiliated anglophone school districts released a Technology Support for COVID-19 Continuity of Learning Plan. Within the document, the EECD maintained that “Technology is an important part of a 21st Century education and the [EECD] acknowledges it is an essential tool for both teaching and learning; that providing greater access to computers and computer related resources will support the Continuity of Learning Plan provided for the COVID-19 period” (Anglophone West School District, 2020).

Almost immediately upon the school closures across Canada, online subscription-based education companies began offering free services. The internet bustled with

webinars, instructional videos, live learning activities, social media groups, and free resources for parents and students (Osmond-Johnson, Campbell & Pollock, 2020). After three weeks of school closures, Minister of Education, Dominic Cardy announced “a plan to continue to deliver education to students” which included teachers sharing educational resources for students in the anglophone sector and the development of a newly established New Brunswick Family Resources website (GNB, n.d.). For many students who had access to internet service and devices, days spent in the classroom were shifted to days spent on digital devices.

With the continued threat of the COVID-19 virus, on April 2, 2020, Minister Cardy made the announcement that many feared: school buildings would remain closed for the rest of the 2019-2020 school year, only resuming in September 2020 if conditions were safe (The Canadian Press, 2020). However, in the interim, teachers would now be actively engaging with students while they finished their last few months. Educators were challenged to find ways to work with families, some still without access to technology, to determine how they might support full-time at-home learning. Some subjects, such as Literacy, Numeracy, and Science continued to be taught, while others, like Arts, History, and Vocational Studies were temporarily sidelined (People for Education, n.d.). Curriculum outcomes were condensed, stand and deliver teaching techniques were discouraged, provincial testing and formative assessments were cancelled, and post-secondary institutions would exercise flexibility and make accommodations so that students’ eligibility for admissions, scholarships, bursaries would not be affected (Poitras, April 2, 2020).

June-August 2020

On June 12, with the anticipation of the pandemic continuing throughout the coming school year, NB's Return to School plan for September 2020 was announced. Along with new operational plan initiatives and smaller class sizes, one of the most significant changes to NB schooling outlined in the document would occur at the high school level. High schools with large enrollment would switch to a new blended learning model, which envisioned students attending school in person on one day and learning remotely the next day. Teachers would be "responsible for their entire class, whether they [were] physically present or engaged in blended learning activities" (GNB, June 12, 2020, p. 2). As a follow-up to this new approach to learning, the EECD released the following news release on June 22, 2020: "High school students will now be expected to bring their own electronic devices for learning beginning in September as part of a shift toward a more personalized, collaborative and tech-based learning model" (GNB, July 22, 2020, n.p.). In a press conference, Minister Cardy assured educators "The learning environment is going to be different during the 2020-21 school year and as we continue to live through the COVID-19 pandemic," and that "this model will help support blended learning and the continuity of learning of high school students in the immediate future, while also addressing long-standing issues" (GNB, July 22, 2020, n.p.). The shift away from schools as institutions led the education sector to take immediate actions to close the learning gap for students by offering them subsidies on digital devices as learning tools (Van Horne, 2020).

In order to prepare for this pedagogical shift, students' summer vacation came one week earlier to afford all K-12 teachers time to attend a week of required professional learning related to online instruction and the use of digital tools. Particular attention was

paid to Microsoft Teams (Teams), as it was the platform chosen by the EECD for online instruction as it met the requirements for privacy and online security for students. While the EECD selected the program, my role was to help NB teachers learn the digital tools within Teams for teaching, and ultimately to work with teachers to determine what effective teaching looks like in these virtual spaces.

September 2020

NB was successful in its efforts to curb the spread of the virus throughout the summer of 2020. As a result, schools reopened in September 2020, albeit with strict health and safety measures in place. NB high school students started to attend school on a rotational basis at a minimum of every second day, and when not in school, students would learn remotely (GNB, June 12, 2020). Teachers were required to establish learning outcomes, materials, and relevant resources for students at home or provide direct teaching online (GNB, June 12, 2020) while teaching those in the physical classroom. To accommodate the blended learning model, a laptop or tablet was deemed a required tool for NB high school students, an initiative the EECD said would “help avoid interruptions in learning that may result from COVID-19 and allow for more personalized learning opportunities to help better prepare students for post-secondary education and the workplace” (EECD, September 11, 2020). All NB high schools began the 2020-2021 school year with a new *Bring Your Own Device* program in place (Urquhart, Aug 27, 2020), an initiative that would eventually extend to all K-12 schools in NB.

January 2021

Two days before students returned to high school for semester two, the EECD announced the expectation that high school teachers were responsible for “managing the

class as a single group, half of which is online and the other half at the school,” that “a minimum of 10 minutes per class [be] dedicated to a live virtual meeting with students at home for every class, every day”, and that “all students should be learning full time every day” (Haggert, 2021). The president of the New Brunswick Teachers' Association, Rick Cuming, responded by saying, “this blended learning model is a strain on families, a strain on students, and teachers” (Cuming, Feb 9, 2021) and that teachers weren't ready for the change, even though they knew it was coming (Cave, Feb 3, 2021). The Superintendent of Anglophone West School District encouraged teachers stating that if they “take some time to learn the tricks of the trade when it comes to this blended learning method and [be] open to learning about ways it can happen, then I think everyone will benefit” (Cave, Feb 3, 2021).

March 2021

After several months into the 2020-21 school year, several high schools in the Anglophone West School District remained in blended learning models. Teachers were responsible for teaching two groups of students - those who were physically present in the classroom and those who were learning remotely. When outbreaks occurred in communities, classes, and sometimes schools, moved to 100% virtual environments for days or weeks at a time depending on the situation.

Most of my role over the 2020-21 school year focused on working with my new team of Digital Learning Leads to support teachers with this new blended model of teaching in the high school setting. Our team offered a range of professional learning and technical support in addition to purchasing a range of licensing software and hardware for teachers and students. Yet, despite our efforts, parents, students, and teachers said the

new blended method of teaching high school in the province was overwhelming (CBC News, October 8, 2020). While these investments may have been perceived as a stopgap solution at a time of crisis, I believe they fundamentally changed the NB education system to a point of no return.

I became interested in knowing how this new exacerbated use of technology during COVID-19 might impact teacher pedagogy. I wondered how all the training in digital tool use and platforms was changing teacher practice. What opportunities and limitations would teachers encounter, what benefits and challenges would they experience, and to what extent might this intensified turn toward technology influence and reshape teacher pedagogy? I wondered what new pedagogical habits might be formed during the post pandemic, and what ones might be broken? Would the innovative trials taking place in response to the pandemic shed light on new values that could influence contemporary policies and practices moving forward into a unique educational era?

What is this Work and Why is it Important in New Brunswick?

I believe we are at what Kenneth Boulding (1963) calls a “break boundary” in NB education, a transformative point at which “a system suddenly changes into another or passes some point of no return” (as cited in McLuhan, 1964, p. 58). As the province continues to invest in technology to continue education during a time of crisis, there is a critical connection to be made between how students and teachers interact with technological tools in classrooms and how media alter the learning environment. I believe that it is important to recognize that the introduction of new technology in the classroom is changing the way we think, learn, and act (McLuhan, 1964; Postman, 1970; Strate, 2006). As scholars Friesen and Hug (2009) assert: “if the acquisition, refinement and

circulation of knowledge all occur as mediated processes, it only makes sense that an awareness of the current and potential role of media in forming knowledge should follow” (p. 78).

For decades, teacher practitioners have shared their experiences and insights about the uses of technology in their classrooms. During the same period, scholars in the field of media ecology have theorized about what it means to introduce digital devices into educational environments. Despite their shared concerns, they have been more or less left out of each other’s conversations (Gushue, 1969; Kuskis, 2012), with the result that media ecologists can assert very little about the practical implications of their ideas while teachers have, for the most part, not encountered media ecology concepts.

Through this work and my unique positioning, I aim to bridge the practical and theoretical divide between media ecologists and teacher practitioners, and to bring to light the need for a critical approach to technology in the classroom so we might better understand the effects of media on how teaching and learning occur, and possibly even on our understanding of what teaching and learning mean.

It is my hope that this doctoral study contributes to the critical discourse surrounding the integration of technologies within the context of K-12 teaching and learning, “a discourse often silenced by the glare of the ‘new’” (Caplan, Myrick, Smitten & Kelly, 2013, p. 1172). Furthermore, I hope to provoke avenues of thought that consider educational technologies from an authentic and critical perspective so that informed decisions about pedagogy in NB education, and elsewhere, can be made.

Through a series of one-on-one interviews, I sought to engage a group of NB high school teachers in reflecting on the challenges and opportunities that presented

themselves when working with students through mediated processes. In the case of NB educators, this was specifically Teams, the technology that teachers were accessing at the provincial level. Through this work, I aim to bridge the gap between those working in the education sector (teachers, department of education employees, school district staff) and academics working in media ecology. I aim to provide a practical application of media ecology concepts, with the goal of promoting more informed decisions about the use of technology for teaching and learning as a whole.

What I hope media ecologists will gain from this study is a deeper understanding of how their work is realized in the classroom setting. What I hope educational stakeholders can take away from this study is an awareness of the biases that exist within technologies and how they can effectively respond to these at all levels of education from policy and purchasing to classroom etiquette and approach. While this work was important prior to the COVID-19 pandemic, it has become increasingly relevant given the intensive investment in technology. While face to face classes have now resumed, the policies, programs, and habits that formed in the technologically inducted blended learning environments during the COVID-19 era may be harder to shake. As a province we must be conscious of what we want to support on a go-forward basis. The following research questions are explored in this articles-based dissertation:

- What potential impositions and pedagogical constraints do new digital tools place on NB teaching practices?
- How might the intensified turn toward technology be reshaping ways of thinking, feeling, acting, and knowing among teachers and students?

- How do the rules, patterns, structures, and biases of these new digital environments differ from those of the traditional classroom, and in what ways will they influence NB teacher pedagogy during the pandemic and beyond?
- What educational values might get taken up as a result of this prevailing shift in pedagogy?
- To what extent are those in NB education system investing time and consideration toward the notion that the tools we use to make sense of the world actually help shape our understanding of it?
- To what extent can media ecology help NB education stakeholders better understand the effects of these new media on how teaching and learning occur, and possibly even on their understanding of what teaching and learning mean?
- How can those in the NB education system assess and evaluate the costs and benefits of new technologies, anticipate the consequences or effects of their adoption, and provide considerations to those devising policy regarding their appropriate use?

Who Am I and Why Me?

When I graduated with my Bachelor of Education, I envisioned myself as an innovative and creative teacher who would leverage technology to enhance teaching and learning. My university assignments and papers had been mostly focused on integrating technology into pedagogy, and I was excited to put my theories into practice. I was eager to use technology with my students in engaging, contemporary, and creative ways.

My work at incorporating technology into my pedagogical approach won me both the New Brunswick Minister's and Canadian Prime Minister's Awards for Teaching Excellence. I became known as an innovative teacher who used technology to engage students by motivating them to learn and by introducing them to 21st century learning skills in a global environment (GNB, 2011; NBTA, 2013). Given this enthusiasm, I became a Technology Lead where my job was to support teachers and students in their educational endeavors using technology. In this role, I moved beyond my own interest in and use of technology to those of my colleagues and their students. I experienced the range of interests and competencies of teachers in their use of technology as a teaching tool; I gained insights into how students perceived technology and how they engaged with media as learners; and I expanded my knowledge of the breadth of technology available in education.

Doctoral Student/Researcher

After two years as a Technology Lead, I was seconded by a collective partnership between government, university, and private sectors to research and develop a digital literacy framework for the province of NB (GNB, March 12, 2018). It was during this time that I also began my PhD in Educational Technology. My doctoral program opened my eyes to critical research. My view of technology as a progressive and transformative tool was challenged. I began to look critically at technology use in education. As a PhD student, I became interested in knowing more about the influence of technology on teaching and learning. I reflected on my own teaching experience and wondered how technology had influenced my teaching practice. I thought of all the opportunities my students and I were given through the tools of the classroom, but I also looked back at

these times with my students with a critical eye, seeking to understand in what ways technology may have guided and limited our learning.

During the first year of my PhD, I stumbled onto a field of inquiry called media ecology and the notion that, as humans, “we shape our tools and thereafter they shape us” (Culkin, 1967, p. 52). My outlook on technology began to change. I realized technology was not only the gadgets, tools, and machines I had come to appreciate, but also an environment or system involving “organization, procedures, symbols, new words, equations, and, most of all, a mindset” (Franklin, 1999, p. 3). Given this realization, I became interested in, not only *what* was being done with educational technology but also *how* and *why* it was being done.

My experiences as a doctoral student and my investigations in media ecology led me to wonder to what extent NB teachers invest time and consideration toward the notion that the tools we use to teach actually shape understanding? Postman (1998) says that all media become mythic, as if they are part of the natural order of things. As technologies become part of our everyday way of doing things, they fade to the background, and so their effects do as well. This may be true in practice of many NB educators. I wonder to what extent NB teachers consider the ways technologies like the clock, books, desks, the interactive white board, tablets, as well as lesson plans, bell schedules, subjects, and curricula guide their practice and shape student understanding? Postman used to ask his students if they knew when the alphabet was invented. His students were astonished, as if he was asking them when clouds or trees were invented. They had not thought of the alphabet as a technology or a human invention, yet the technology of writing has shaped the thoughts of the entire Western world and formed the foundation of our education

system. Like Postman's students, most of us are blind to writing's influence on the development of our thought patterns, our social institutions, and our identities. McLuhan (1964) used the analogy of a fish not knowing the water in which it swims to characterize humans' ignorance to the psychic and social effects of their technologies. In the case of media environments in educational settings, Postman (1970) said we do not recognize the influence and effects of our technologies because we assume that what we are "dealing with is not an environment but merely a machine" (p. 161).

I gained a ferocious appetite for media ecology and began reading scholars such as McLuhan (1964), who argued that the content of any medium was far less important than what it makes us do, how it shapes our habits, behaviours, and even our ways of knowing. I was inspired by Cathy Adams' (2008) dissertation work investigating educational software, and how regardless of the content it frames, imposes a pedagogical sway over the way teachers visualize, organize, and present knowledge. I began to reflect on how the teaching tools of my practice influenced my teaching and my students' learning. Indeed, we used networked devices to connect with others around the world, we wrote and produced movies and music to showcase our learning, and we advocated for things we believed in. But looking back now, I began to wonder how our use of hardware and software in the classroom had hardened and softened us to certain ways of knowing. I wanted to explore this idea in NB education. I became interested in the ways educational technologies influenced teacher pedagogy in NB. I knew this was the topic I wanted to explore in my doctoral work. I wondered how I could study this phenomenon. I thought back to the literature I had read outlining how other media ecologists studied the influence of technology on teaching and learning in the classroom. McLuhan (1960)

tested the effects of various media in the classroom on student learning and created a “syllabus for teaching the nature and effects of media in secondary schools” (p. 1); Strate (2014) examined the implications of employing computer technology in educational settings and advocated that “media education is an ethical obligation and ought to be taught in the schools” (p. 102); and Cassidy (2004) examined the history of electronic media in education and argued whenever new technologies are used in schools, they reflect the prevailing pedagogy and curricula of their time. Perhaps most inspiring to me was Adams’ (2008) dissertation *PowerPoint and the Pedagogy of Digital Media Technology* whereby she worked with teachers to examine the software’s powerful sway over teacher pedagogy. She determined that the software tool imposed pedagogical constraints over teachers by structurally framing knowledge and how teachers “visualize and subsequently present their knowledge” (p. 135). These media ecology scholars explored these phenomena, but as my supervisors kept asking me, what would my original contribution be?

School District Technology Coordinator

My secondment came to an end after submitting the New Brunswick Digital Literacy Framework. In September 2019, I returned to the public school system as a school district Technology and Skilled Trades Coordinator. I began supporting the integration of technology for the purposes of teaching and learning across all curricular areas from kindergarten to grade 12. In this role, I coordinated professional learning, supported innovative learning projects, procured software and hardware tools, and worked with teachers, administrators, and school district staff in their efforts to use technology effectively. My goal was to support teachers in making the best pedagogical

use of the tools available to them. My doctoral work thus far has led me to believe that this consideration also involves supporting teachers to learn how to be critical of technology - to look at technology not only as progress and innovation, as I once did, but to also examine the ways technology limits and guides their practice. Then, with only six months under my belt in my new role, a global pandemic hit.

Who is My Audience and Why have I Chosen Them?

Despite a vast narrative surrounding the movement to digital spaces in education, I have found that there is very little discussion in NB about how these new habitual uses of digital tools may also be “imposing pedagogically questionable constraints on teaching practices, and unintentionally biasing how knowledge across disciplines is being represented, presented, and subsequently held by teachers and students” (Adams, 2008, p. 10). As a researcher studying educational technology, I now had the opportunity to examine a new educational environment in NB.

I want to address the varying layers of audiences in this dissertation - teachers, those in leadership roles within the education system, and media ecologists. Education in NB is an interconnected system, or what Oettinger (1969) calls a suprasystem. The suprasystem is made up of subsystems and their corresponding elements that work towards achieving a unified purpose or goal. Betts (1992) explains that suprasystems often work as a hierarchy, whereby the highest level of the hierarchy encompasses all of the processes at each system level below it, and it becomes increasingly complex as the number of elements and the relationship among them increases. If we think of the provincial government as the suprasystem, the subsystems in the hierarchy are the Department of Education, its school districts, and the schools within those districts. Some

of the internal elements within a school system include principals, teachers, and students, but other systems play a role within this system, such as counselling services, information technology companies, and caterers. The concept of a system therefore relates to the structure, rules, operation, or functions of the suprasystem as a whole, as it is made up of united and integrated elements and systems. All schools in NB are subsystems working within the system of the school district. Schools report to school districts, and school districts are responsible for carrying out the requirements outlined by the Department of Education. School districts receive their direction and funding from departments, and departments receive their funding from the provincial government suprasystem. While the suprasystem works under a hierarchical structure, it is important to note that the suprasystem and its subsystems cannot achieve their purpose without the elements, and the elements by themselves cannot replicate the system's functions (Betts, 1992). Therefore, the decisions made by the suprasystem and the systems within the suprasystem affect the ability of subsystems and elements to achieve the common goal. It is for this reason that I have chosen to speak to those within the NB Department of Education and Early Childhood Development, school districts, and schools.

School District Staff and Education Department Employees

If the NB education system and the elements within each system are working toward achieving a unified purpose or goal, what is that goal? Determining appropriate educational technologies that serve a utilitarian purpose for education systems can only be done if we articulate the purpose of education. The mission of the EECD is “to have each student develop the attributes needed to be a lifelong learner, to achieve personal fulfillment and to contribute to a productive, just and democratic society” (EECD, n.d.).

Education departments and school districts have considerable influence over educational decisions, and the technologies that function both *in* the education system and *as* the education system create environments which impose certain ways of thinking, feeling, and behaving on human beings (Postman, 1970). They assign roles and rules to humans that govern what they can and cannot do within them (Nystrom, 1973). The EECD and its school districts would do well to know the environments that are being created by the systems and technologies being put in place and aim to create and sustain the optimal conditions in which students can reach their goals during and after the pandemic.

Today, technology has shaped the environment of NB education. SMART Boards can be found in almost every classroom, every teacher is assigned a laptop, high school students require a device to learn, and the province-wide adoption of the Microsoft 365 suite of tools has become essential for teaching and learning. Indeed, in the NB education system, technology has become what Franklin refers to as our *practice* - our technique, method, or means of educating. School subjects, curricula, and bell schedules are also what Ellul (1964) refers to when he speaks of technique, something he describes as “the absolutely most efficient means” and “the one best way” (as cited in Rose, 2006). In education, our technology or technique is the *way* we educate. Franklin believes that our use of technology as practice is directly related to culture and identity, for culture is a socially accepted set of practices and values, which becomes a form of self-identification (1999). Franklin (1999) points out that there are consequences from using technology as practice; a cultural norm is set which determines a particular way of doing something and eventually influences identity by imposing a measure of control and accountability over the system and its users. The thought of or ability to perform a task in a different manner

using a different tool is limited by the identity developed through the establishment of cultural norms. When technology is used exclusively as practice, it inherently defines the content. When entire school districts adopt technologies as their practice, they risk sending the message that the technology becomes their technique, and ultimately defines the way they educate.

Teachers

The immediate and unprecedented closure of NB's school buildings on March 16, 2020 due to the COVID-19 pandemic forced teachers to face what was likely the most challenging time of their career. Many teachers have been forced to incorporate new digital technologies and platforms as essential tools to safely educate students during the pandemic. In particular, the physical classroom environment many high school teachers and students have become accustomed to suddenly transformed into a semi-virtual learning environment. Indeed, as Reimers, Schleicher, Saavedra and Tuominen (2020) put it, "For educators, the COVID-19 Pandemic is a quintessential adaptive and transformative challenge, one for which there is no preconfigured playbook that can guide appropriate responses" (p. 2).

There is a crucial link to be made between how students and teachers engage with technological tools in classrooms and how media influence and change the learning environment. Media ecology research suggests that the introduction of new technology in the classroom is changing the way we think, learn, act, and feel (Postman, 1970; McLuhan, 1964); but most teachers have yet to encounter media ecology concepts (Gushue, 1969; Kuskis, 2012). In my experience, outside of high school media studies classes, discourse around media ecology in NB K-12 education has not been widely

shared. While teachers of all levels in NB are having to learn to incorporate new digital tools as part of their practice, educators may not realize that these tools are creating new learning environments with structures, rules, and biases that influence the way they teach and the manner in which students learn. I believe media ecology is a field of study that can support teachers' understanding of the influence of technology on their practice and in what ways the digital environment affects learning.

Media ecologists are drawn to conversations about education and technology (Acland, 2014), understanding that the introduction of new media into the information environment will have implications for how teaching and learning occur (Kuskis, 2012). Media ecologists view education's role in a rapidly changing media environment as vital. McLuhan (1964) argues that education is a form of "civil defence against media fallout" (p. 305), meaning that educators must teach students to critically examine the influence of media on their lives by learning to recognize and interpret their rules, structures, and biases. Newer voices in the field are echoing those traditional ones: Hayles (2007) suggests that hyper attention is increasing as books become displaced with the internet; Stiegler (2010) states that increased reliance on software programs is corroding our memories; and Adams (2008) asserts that the use of digital presentation tools is changing the way teachers teach and students learn. The work of these scholars suggests that not only should teachers be concerned with how to effectively use these tools to teach in online environments, but they should also realize that these new environments are reshaping their pedagogy.

In a keynote address at a technology conference leading up to the first full school year during the pandemic (2020-2021), I encouraged teachers to ask themselves the

following questions: What does a technology allow me to do, but also, by using it, what might it undo? How does my lesson using a digital slideshow presentation tool differ from the same lesson as a discussion, worksheet, or video call? What influence does technology have on the way my students learn? In other words, in what ways does technology contribute to the molding of my practice? I aimed to share the message of many media ecologists, that technologies become mediators of experience when humans interact with them, and different media affect us in different ways. As teachers face an increasing influx of digital technologies, and as they wrestle with how to shift the content of their courses to online environments, it is important that they can critically examine the influence and effects of these technologies on teaching and learning. Adams (2018) argues that an ethical, caring, and responsible education system can only thrive if teachers become “media ecologists of the digital” (p. 46).

The first two articles of this thesis are written primarily for K-12 teachers. Article one, *An Introduction to Media Ecology for Educators*, serves as an introduction to the field of media ecology for K-12 teachers. It weaves some of its key scholars’ concepts into a web directly pertaining to educational technologies and sheds light onto how ideas might translate into a media ecology pedagogy for an audience new to these concepts. It probes two big questions: *What is Media Ecology and why is it important to study media?* Learning about media ecology can help teachers and students better understand the effects of media on how teaching and learning occur and help them make better decisions around the use of educational technologies.

Article two, *Five Pathways Toward a Media Ecology Pedagogy for K-12 Educators*, attempts to apply some of the theoretical concepts of media ecology explored

in article one to practical uses in the classroom so that teachers and students are able to examine, assess, and understand the role media plays in shaping knowledge and understanding. These pedagogical tools offer teachers ideas and pathways to explore with their students with the goal of understanding media to better use, design, and create technologies that might make their world a better place.

Media Ecologists

Scholars in the field of media ecology have theorized about what it means to introduce digital devices into educational environments, but they can assert very little about the practical implications of their ideas (Kuskis, 2012). In article 3, *The Four Laws of Microsoft Teams*, my intended audiences are teachers, education leaders, and media ecologists, presumably because they are interested in exploring the effects of Teams as a learning management system in a K-12 context.

It is my hope that the shared experiences of NB teachers offer insight into how these new media being used in the classroom alter the learning environment, pose pedagogical constraints and affordances, and especially during this technologically inundated time in education, offer media ecologists insight into the effects of these new media (specifically Teams) on teacher pedagogy. The actions of school districts and the EECD, and the new environment being created in NB education may serve as interesting environments for media ecologists to study. Furthermore, my awareness of media ecology concepts while working as a school district technology coordinator affected the way I approached my role. My own unique interactions with technology, the conversations I had with teachers and colleagues, the choices I made, and ultimately how I supported schools may appeal to media ecology scholars researching educational

technologies. These interactions with teachers, school district personnel, and department colleagues might also provide media ecologists with a view into our provincial response to COVID-19, the roles media assign to us, and how they insist on our playing them (Postman, 1970). I also hope that my shared experiences and proposed practical applications of media ecology concepts in NB classrooms offer new considerations for media ecologists. Examining the new media being used in NB education and showcasing the experiences of NB teachers using these new media can offer insight into how these new media are reshaping education and ways of knowing.

The Network of Audiences

I write for all these audiences in article four, *The Coronavirus as Break Boundary: Navigating New Landscapes in New Brunswick Education*. I am part of the conversations taking place between the department, districts, and teachers. Being a member of the Media Ecology Association, an ongoing contributor of the annual Media Ecology Convention, and a subscriber to the Explorations in Media Ecology journal, I am also part of the discourse in media ecology. With a foot in both of these camps, I am able to speak to these groups and share my unique perspective on the transition to the digital in the public education system. I offer insight into the provincial and district practical initiatives aimed to help teachers and students learn during the pandemic. I aim to bring together my practical experience as a district technology coordinator and my research as a doctoral student studying educational technology. In doing so, I aim to help bridge the gap between the theoretical assertions of educational technology scholars and the practical experiences of NB teachers facing a shift to digital devices as an essential tool during a global pandemic. Through this articles-based dissertation, I write to each of

these audiences and pose correspondingly aligned considerations. My central positioning in NB education and my connection to these various education stakeholders offers me the opportunity to share in our collective work.

Conclusion

The EECD and its affiliated school districts have made large-scale investments in digital technologies and intensely turned to these tools to safely educate during the pandemic. I believe this heightened shift toward educational technologies has brought us to a critical juncture in NB education. The new learning environments created by these digital tools are a suitable petri dish in which to study a changing culture in NB education, and I consider media ecology an effective tool through which to study them.

Through teacher interviews, explorations of media ecology theories, and reflections from my own experiences as a technology coordinator, I investigate to what end the classroom environment and the landscape of education in NB is changing with this taking-up of digital tools, and what potential impacts this shift will have on teaching and learning and the reorganizing of social, emotional, psychological, and sensorial responses from key education stakeholders.

Given my central positioning of doctoral student and district technology coordinator, I offer a unique insight into this work and an opportunity to help bridge the practical and theoretical divide between media ecologists and teacher practitioners, and to bring to light the need for a critical approach to technology in the classroom so we might better understand the effects of these media on how teaching and learning occur, and possibly even on our understanding of what teaching and learning mean.

I hope this work provides insight into how this critical juncture is creating a new environment in NB K-12 education. In the forthcoming articles, I propose new considerations for educational reformers during this unique period in NB's history. I attempt to interpret and represent my own experiences and those shared by the research participants. Rather than take a for or against approach to educational technology use, I bring to light important considerations and potential implications of this heightened shift to blended learning and the use of digital tools as new modes of teaching and learning.

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Article 1: An Introduction to Media Ecology for Educators

Abstract

This article introduces the field of media ecology to educators. It weaves some of its key scholars' concepts into a web directly pertaining to educational technology and it sheds light onto how ideas might translate into a media ecology pedagogy for a teacher audience new to these concepts. It probes two big questions: What is media ecology and why is it important for teachers and students to study media? Derived from the work of Neil Postman and other media ecologists, I propose six traits of educational technologies teachers and students can use to guide inquiry into the effects of media on teaching and learning. The six traits are tactically employed to investigate many of the educational technologies being used in today's public schools, and how these tools create unique learning environments that impact teacher pedagogy and student learning. My perspective and experiences as a school district technology coordinator, teacher, and doctoral student studying media ecology offer teachers and media ecologists insight into the implications of the heightened use of digital technologies in today's K-12 classrooms, especially during the time of the COVID-19 pandemic when many schools are turning to technology as a means to safely educate. The article concludes with a set of suggestions teachers can consider for beginning an honest appraisal of educational technologies, and how they might make mindful decisions that lead to a healthy balance of media use in the classroom and beyond.

Keywords: media ecology, education, pedagogy, technology, COVID-19

Introduction

This article introduces teachers to the field of media ecology and the idea that educational technologies are environments that reshape teacher pedagogy, student learning, and ways of thinking, acting, and knowing (McLuhan, 1964; Postman, 1970; Strate, 2006). It probes two big questions: What is media ecology and why is it important for teachers and students to study media? Within this article, I showcase the work of some media ecology scholars, calling particular attention to the work of Neil Postman, a teacher, curriculum developer, and founder of New York University's doctoral program in media ecology in 1971. I translate Postman's (1995; 1998) patterns of technological change into a discourse relevant to educators and I apply them to the current and increasingly technological environment of schools, especially at a time when schools turn intensely toward digital tools as a means to safely educate students during the COVID-19 pandemic. I offer six traits of educational technologies teachers and students can use to guide inquiry and generate meaningful discussion around the effects of technologies on teaching and learning, and more broadly, how media shape and influence the way humans interact and make sense of the world.

Researchers such as Albrecht and Tabone (2020), Kuskis (2012), and Rose (2007) identify a divide in discourse between teacher practitioners and media ecology scholars. My unique positioning as a former classroom teacher, current school district technology coordinator, and doctoral student studying media ecology allows me the opportunity to bridge the practical and theoretical divide between media ecologists and teachers in a language common to both groups. I bring to light the need for a discerning eye toward the increasing use of educational technologies in the classroom, and I suggest a media ecology approach to help inform our considerations and assessment of educational media

moving forward. I also provide suggestions teachers can consider for beginning an honest appraisal of educational technologies, and how they and their students might make mindful decisions that lead to a healthy balance of media use in the classroom and beyond.

What is Media Ecology?

Media ecology is the study of media environments (Postman, 1970). The word media refers to “any and all technological extensions of the body and mind” (McLuhan, 1964, p. xi), which increase the power and speed of existing human faculties or behaviours (McLuhan, 1964). Ecology refers to the interactions that take place when a technology is introduced into an environment. If we think of a classroom as an ecosystem, and a technology as a species, the introduction of that technology into a classroom changes the relationships and interactions of the people within that ecosystem.

Books, desks, pencils, computers, projectors, and software are examples of technologies that change the environment of the classroom, and they help mould teacher practice and student learning. To illustrate an ecological approach, I compare the Asian carp to the SMART Board. The Asian carp, a freshwater fish native to Eastern Russia and China, was introduced to the United States in the 1970s to help solve algae blooms in rivers and lakes (Phelps et al., 2017) and to control weed and parasite growth in aquatic farms, canal systems, and as a form of sewage treatment (Mississippi National Park Service, n.d.). These large fish species are known for their big appetites and fast reproductive qualities, and with no natural predators, their population quickly escalated, resulting in the loss of food, eggs, and habitat of other species, threatening the survival of

native fish (Li et al., 2021). The sediment and organisms they stir up from lakes and riverbeds has reshaped the waters from clear to murky, subsequently changing the types of species that can inhabit the same ecosystem (Li et al., 2021). Furthermore, their incredible jumping ability threatens the safety of boaters, water skiers, and people fishing. While efforts to control the issues of algae blooms, weeds, and parasites improved with the introduction of the Asian carp, the United States government has invested hundreds of millions of dollars on research and prevention of the Asian carps' ecological impacts (Li et al., 2021; Phelps et al., 2017).

Educational technologies have similar ecological effects in classrooms and education systems. SMART Technologies claims its interactive white board is a “way of delivering education [that] makes learning easier, more personal and more accessible, all while reducing costs” (smarttech.com, n.d.). The first school-wide implementation of SMART Boards in my school district came in the fall of 2007, a collaborative project between the University of New Brunswick, the Department of Education, Park Street School, School District #18, and SMART Technologies. The project's aims were "to investigate the school-wide implementation of SMART Board technology in elementary classrooms [and] to document and investigate implementation processes of the initiative, as well as its associated outcomes related to instructional knowledge and practices, student engagement in learning, and staff support and collaboration" (Health and Education Research Group, n.d., p. ii). Since then, SMART Boards have become part of the *natural ecology* of every teacher's and student's learning environments in my school district: these large interactive displays are positioned front and centre of almost every classroom; through the provincial tendering process, no other interactive whiteboard

brands are permitted in the system; and blackboards have become nearly extinct, either lying beneath SMART Boards or used as magnetic display surfaces. SMART Boards have also changed how education takes place in New Brunswick: students take their turns manipulating objects on the display while their peers often watch and wait for their turn; the education department continues to invest tens of thousands of dollars on licensing every few years; the school districts and schools must now invest similar amounts on replacing dying boards and other hardware tools; and teacher training in SMART tool use continues to be a consistent focus of professional development.

Neil Postman, one of media ecology's most prominent scholars, first used the metaphor of ecology to emphasize "the interaction between media and human beings" (Postman, 2000, p. 10). Postman used the petri dish, a medium wherein a culture is grown from a substance, to describe the fundamental principles of media ecology. He continues the analogy by asking us to replace the word 'substance' with the word 'technology' and specifies the following:

A medium is a technology within which a culture grows; that is to say, it gives form to a culture's politics, social organization, and habitual ways of thinking. We put the word 'media' in the front of the word 'ecology' to suggest that we are not simply interested in media, but in the ways in which the interaction between media and human beings give a culture its character and, one might say, help a culture to maintain symbolic balance. (p. 11)

The Difference Between a Technology and a Medium

Developing a better grasp of media ecology concepts begins with an understanding of the difference between a medium and a technology. Marshall McLuhan

first broadened the definition of technology, which he called media, to include any human invention or innovation. In this sense, technologies are not only what the Oxford dictionary defines as: “machinery and equipment developed from the application of scientific knowledge”. Rather, technologies become media when they shape our “techniques, modes of information and codes of communication (and) play a leading role in human affairs” (Strate, 1999, p. 1). Neil Postman (1985) helps distinguish between a technology and a medium in his book *Amusing Ourselves to Death* when he writes:

A technology is to a medium as the brain is to the mind. Like the brain, a technology is a physical apparatus. Like the mind, a medium is a use to which a physical apparatus is put. A technology, in other words, is merely a machine. A medium is the social and intellectual environment a machine creates. (p. 84)

The manner in which some educational technologies become media is fairly explicit: hardware such as computers and tablets, and software such as video conference calls and learning management systems act as mediators because they mediate human communication. (However, it is worth noting that their effects may not be as explicitly recognized.) Other educational media (and their effects) are perhaps more implicit: grades, subjects, curricula, bell schedules, as well as schools and the education system are also educational media, as they form and structure the way we teach and learn, and what we value. What would schooling look like without these things?

The Medium is the Message

Marshall McLuhan is perhaps best known for his famous aphorism “the medium is the message” (1964, p. 19). McLuhan believed that the technologies we use not only become the way we do things, but they also influence the attitudes, beliefs, and values of

our society (Strate, 2006). He explains, “The ‘message’ of any medium or technology is the change of scale or pace or pattern that it introduces into human affairs” (1964, p. 20). The crucial idea that McLuhan is communicating about media here is that the information they carry is not nearly as important as what they are doing to us—how they guide the things we do, how they influence the way we think, how they orientate our bodies, and even how they structure our brains. In this way, media act as environments in which certain structures exist and where interactions take place.

Think for a moment about the effect that occurs in nature when a new species is introduced into an environment: you do not have the former environment plus a new species; everything in that environment is affected because of this new thing, and therefore you have an entirely new interacting environment. In the same way, when a new technology is introduced into a society the change is not as much additive as it is ecological; it does not add something to the environment, it creates a new environment altogether.

Bridging the Gap Between Teachers and Media Ecologists

For decades, teacher practitioners have shared their experiences and insights about the uses of technology in their classrooms and scholars in the field of media ecology have theorized about what it means to introduce digital devices into educational environments. Despite their shared concerns, they have been more or less left out of each other’s conversations (Gushue, 1969; Kuskis, 2012; Rose, 2007).

Kuskis (2012) argues that public school teachers rarely take up considerable examination of media ecology concepts in education. My experience as an educator and technology coordinator corroborates this argument. Outside of high school media studies

classes, discourse around media ecology in our provincial K-12 education system has not been widely shared. There seem to be five reasons for this. The first reason is that the term media is often associated with communications theories (Strate, 2006) and not education studies. Marshall McLuhan, known as the catalyst of the field, has not appeared in many educational theory textbooks and research journals (Gushue, 1969; Kuskis, 2012), which is unfortunate because “his ideas on education and learning represent a considerable body of commentary and criticism on the educational systems and practices of his day, as well as throughout history” (Kuskis, 2012, p. 314). The second reason is that media ecologists like McLuhan and Postman still seem to be “subverting traditional assumptions in education” (Postman & Weingartner, 1969, p. 16) and “the conservatism of the educational establishment in North America [is] resistan[t] to change and unwilling to consider criticisms from commentators outside the academic discipline of education” (Kuskis, 2012, p. 316). The third reason may be due to technology often being regarded as innovative and progressive (Franklin, 1999; Postman, 1992) and media ecologists engage in critical conversations regarding the downsides of technology that people do not want to hear (Timberg, 2014). The fourth reason for the lack of awareness of media ecology theories by K-12 educators is perhaps due to the long list of antecedents that collectively make up its intellectual canon (Fulford, 1967; Gushue, 1969) and the breadth of work required to study, understand, and implement it (Strate, 2006). The final reason is the long-standing focus on media content, which owes much to the media education movement started by Houk (1974), Buckingham (1993), and others.

It is my hope that my combined roles as educator, leader, and academic offer a unique insight into this work and an opportunity to help bridge the practical and theoretical divide between media ecologists and teacher practitioners by establishing terms of reference with which both groups are familiar.

Why is Media Ecology Important to Teachers?

There is a critical connection to be made between how students and teachers interact with technological tools in classrooms and how media alter the learning environment. Media ecology research suggests that the introduction of new technologies in the classroom is changing the way we think, learn, act, and feel (Postman, 1970; McLuhan, 1964). While teachers of all levels are having to learn to incorporate new digital tools as part of their practice, educators may not realize that these tools are creating new learning environments with structures, rules, and biases that influence the way they teach and how students learn. Media ecology is a field of study that can support teachers' understanding of the influence of technologies on their practice and, in particular, the ways the digital environment affects teaching and learning.

Media ecologists are drawn to conversations about education and technology (Acland, 2014), understanding that the introduction of new media into the information environment will have profound implications for how we teach and learn (Kuskis, 2012). For example, Hayles (2007) explores how the nature of learners' attention changes as books become displaced with the internet; Stiegler (2010) states that increased reliance on software programs is corroding our memories; and Adams (2008) asserts that the use of digital presentation tools is changing the way teachers teach and students learn. More recent work in the field continues to take place. For example, Turkle (2015) demonstrates

how youths' hyper-dependency on smartphones and social media sites fosters new active online communities but decreases the attention they give to each other in face-to-face conversations and reduces their capacity for empathy. Moreover, Rose (2021) reflects on our current "culture of convenience" - society's goal to make life easier and more comfortable through its new technological innovations, which can consequently lead to less meaningful or fulfilling experiences, such as students choosing comfortable virtual learning environments over superior face-to-face learning experiences (p. 335). Most recently, Albrecht (2021) beseeches teachers not to integrate electronic communications tools across the curriculum, and instead ensure opportunities for interpersonal, interactive, and face-to-face learning experiences through the arts and play to counterbalance the overwhelming presence of digital media in the lives of children. The work of these scholars suggests that not only should teachers be concerned with how to effectively use these tools in classroom environments, but they should also consider how these new environments are reshaping the way people communicate with, and subsequently understand each other.

While scholars in the field of media ecology have theorized about what it means to introduce digital devices into educational environments, they can assert very little about the practical implications of their ideas (Albrecht & Tabone, 2020; Kuskis, 2012). Albrecht and Tabone (2020) argue that "media ecology confined only to academic discourse does not fully serve its purpose or its promise" (p. x) and that those in education "are left with the enormous problem of translating [media ecologists'] ideas from the printed page into classroom praxis" (p. 93). Sharing my observations and teachers' experiences of technology use in schools can offer media ecology scholars

insight into how media pose pedagogical constraints and affordances and alter the learning environment of the classroom. Additionally, teachers' awareness of media ecology concepts offers them the opportunity to put into practice what media ecologists have been theorizing about for years.

Media ecologists view education's role in a rapidly changing media environment as vital. McLuhan (1992) argues that education is a form of "civil defence against media fallout" (p. 246), meaning that educators can help learners become critical users of media who recognize and interpret their rules, structures, and biases, lest they lose control of their media habits. As teachers face an increasing influx of digital technologies during the pandemic, and as they wrestle with how to shift the content of their courses to online environments, it is important that they critically examine the influence and effects of these technologies on their pedagogy. Media ecology offers a perspective as well as principles to guide this examination. Adams (2018) argues that an ethical, caring, and responsible education system can only thrive if teachers become "media ecologists of the digital", a process that involves the ability to "select and employ [technologies] judiciously and with care in order to amplify their life-enhancing potentials while minimizing their poisonous side effects" (p. 46).

Postman's Principles for Technology Use in Education

As a way to introduce teachers to media ecology concepts, I call upon the work of Neil Postman, a former elementary school teacher, university professor, and media ecology scholar. Postman combined his own ideas (1995; 1998) with some of the work of his predecessors into a set of ten media principles, which are essentially patterns of technology that can help people recognize and understand the effects of media. While

Neil Postman began his career as an elementary school teacher, he spent more of his time thinking and writing about K-12 schools than he did teaching in them; as a scholar, he was removed from the day-to-day challenges of students, teachers, and the primary classroom (Albrecht, 2021). Based on my own unique experiences and insights into teachers' accounts, I am distilling the wisdom of media ecologists, and Postman in particular, into six principles that are particularly relevant to teachers and learners.

Teachers and students can use these to guide inquiry and generate meaningful discussion around the effects of technologies on people, culture, and consciousness (Cali, 2017).

Teachers can use these traits to better understand how technologies shape the way they plan, teach, and assess; students can use these principles to determine how technologies affect the way they study, the way they learn, and how they reach their goals; both can use them to investigate how media shape and influence the way humans interact with each other and make sense of the world. To provide a meaningful context to educators, within each principle, I reference modern educational technologies and examples from my own teaching and administrative experience in K-12 education. In a forthcoming article (McGuire, 2022), I expand on these traits and explore some practical approaches teachers and students can use in their classroom to help enhance their understanding of media influence.

Six Traits of Educational Technologies

1. Double-Edged Devices

All educational technologies are double-edged devices that come with an inseparable exchange of costs and benefits. Postman (1995) wanted people to reconsider the popular belief that technologies mean progress without problems, or as he puts it,

“unmixed blessing[s]” (p. 146). He writes, “for every advantage a new technology offers, there is a corresponding disadvantage” (1995, p. 146), and asserts that a technology can “giveth and taketh away” (1992, p. 5). In other words, each educational technology comes with both services and disservices (McLuhan, 1964). Media act as extensions of ourselves, in that they amplify or enhance our natural abilities, McLuhan (1964) claims, but with these extensions also comes what he calls a numbing or an amputation—that is, a diminishment of our capacities. The searchable content on the World Wide Web amplifies our resourcefulness to locate information efficiently (Carr, 2011) and strengthens our ability to make decisions and solve problems (Small & Vorgan, 2008), but the speedy process of skimming through text and navigating through interactive hypermedia is a multi-sensory experience that encourages multitasking, a process which numbs the mental faculties responsible for sustained concentration and deep reading (Rose, 2010; Wolf, 2018).

There seems to be a movement in education toward everything digital. As an example, students’ increasing use of the computer’s QWERTY keyboard to type has shifted the emphasis away from pen and paper writing and almost entirely brought cursive writing to extinction. While typing on a computer is efficient, resourceful, and central to success in daily communication, writing by hand is better for retaining information, developing fine motor skills, maintaining focus, and reading historical documents (Mangen, et al., 2015; Mueller & Oppenheimer, 2014). If students cannot write in cursive, they cannot read it, which renders whole archives inaccessible to them.

Teachers' consideration of the frequency and extent of various classroom media use might allow them to “leverage their curative, consciousness-forming functioning

while severely limiting their destructive aspects” (Kouppanou, 2018, p. 159, as cited in Adams, 2018, p. 50).

2. Uneven Distributors of Services and Disservices

The services and disservices of educational technologies are not evenly distributed among school populations. Postman (1995) warns that “every new technology benefits some and harms others” (p. 146). Population and geographic location of schools often determine technological winners and losers. In my school district, schools with large student populations in urban areas are given larger school budgets, which allow them to invest in technologies. Schools with small populations in rural areas are given smaller budgets, which can create a lack of access to educational technologies, broadening their digital divide. Some teachers and students are given the opportunity to engage with networked tools while in school while other schools cannot extend the same opportunity to their school community. Teachers who require the use of digital tools to complete work at home may be creating measures of disparity among their students. This inequity of access to the internet, and often devices, presents teachers with a quandary. An increasing number of schools and districts advocate for the use of digital tools for learning, but students may not be able to access these platforms once they head home.

During the 2020-2021 school year, the first year of the pandemic, students and parents were forced to learn and work from home. I received reports from frustrated families who competed for shared access to devices and suitable bandwidth. Those teachers and students who live in rural areas do not have nearly the same internet speeds as those in urban areas (CBC News, September 26, 2021), disadvantaging them to those in urban centres. In the province of New Brunswick where I live and work, urban centres’

average download speeds are 74.2 megabits per second, as opposed to rural customers who receive approximately 13 megabits per second (CBC, September 26, 2021), which is less than the 25 megabits per second Common Sense Media recommends as a reasonable minimum standard for a single user in a virtual classroom call (Chandra et al., 2020). Lack of access to digital devices and high-speed internet at home limits people's ability to connect online, isolates them from others, prevents them from competing in the modern economy, and, especially during school closures caused by the pandemic, causes them to lose out on teaching and learning from a distance (UNICEF, 2020).

While an increasing number of teachers, schools, and districts advocate for the use of digital tools for learning, they might consider how they are also creating dependencies on technology that entrench the technology within their educational systems, benefitting some and disadvantaging others.

3. Non-Neutral Agents of Change

Educational technologies are not neutral. Each has embedded within it a hidden agenda or bias that promotes a favourable mindset toward ideas and practices and a discrimination against others. Postman (1995) explains:

Like language, every technology has a philosophy, which is a given expression in how the technology makes people use their minds, in what it makes us do with our bodies, in how it codifies the world, in which of our senses it amplifies, in which of our emotional and intellectual tendencies it disregards. (pp. 146-147)

The use of predictive algorithms in today's web-based platforms is a good example of technological bias. Search engines and social media sites not only track human behaviour in order to later predict what people are going to do but they use this

data to lead them to what a machine determines to be the most probable outcomes (Carr, 2011). With the increased awareness of our habits and activities, we are continually brought to the places that resemble where we have been, our sense of spontaneity is further and further diminished and we start to resemble predictable machines, sacrificing our autonomy and independence for convenience (Anderson & Rainie, 2018). We shape our algorithms and thereafter they shape us.

Predictive algorithms are certainly not absent from today's educational software (Adams, 2018; Baker & Hawn, 2021), and neither are their ingrained systematic biases (Akgun & Greenhow, 2021; Voithefer & Ham, 2018). As an example, New Brunswick's education department offers Microsoft 365 licenses for every student, teacher, and administrator. Among many new applications remains Microsoft's flagship software, Microsoft Word. One of the most recent features of the software tool is text predictions. As the user types, the software anticipates their next word or phrase whereby text suggestions appear ahead of their sentence to help them "complete challenging words and continue working", a feature Microsoft hopes will "empower students to articulate their thoughts" and "write faster in Word" (Microsoft, 2021, para. 1). Words and phrases are "predicted based upon the student's spelling; as they type more letters, new and more accurate suggestions will appear" (Microsoft, 2021, para. 1), enticing students to input these seamlessly into the document with a click of the tab or arrow buttons, or the swipe of a finger. It seems that rather than helping students articulate their thoughts, the software helps them articulate Microsoft's thoughts. Is this what educators want in an educational software – the ability for students to write faster using the word suggestions from a computer program? What are students learning through the aid of this software?

What will the repercussions be for students aiming to articulate themselves when they do not have access to Word? I cannot help but wonder what words or phrases are chosen and which are left out.

Educational technologies are often biased toward efficiency and production – the ability to do more in less time and with less effort. Postman (1992) and Cassidy (2004) call attention to Taylorism, a term used when Frederik Taylor’s scientific management principles of industry are applied to education. Many school curricula and instructional practices are derived from scientific curriculum making, a Taylorist process of “systemizing the curriculum through the statement of clear educational objectives, the breaking down of the material to be learned into small components, and the careful sequencing of instruction so as to maximize and streamline learning” (Cassidy, 2004, p. 59). The technological traits of efficiency and production are derivatives of McLuhan’s (1964) notion that technologies enhance the speed and power of human faculties. Cassidy (2004) contends that, from film and radio on, educational technologies have been sold to schools based on their ability to increase efficiency of instruction and learning.

4. Competing Technologies

As new educational technologies are introduced, they compete with older technologies for time, attention, money, prestige, and most of all, to change and control the worldviews of teachers and students (Postman, 1992; 1995). It is quite easy to see how the smartphone embodies all aspects of this principle. It has changed our worldview by bringing all things together. As a single device, it continues to displace countless older technologies, like the camera and video recorder, the photo album, the radio and portable music player, the calculator, the map and compass, the flashlight, the clock and

wristwatch, books and notepads, calendars, board games and gaming systems, debit and credit cards, and of course, the landline phone. The list goes on. But as it brings all these things together, in what ways is it changing our worldview of things like community and communication? As we have seen and perhaps experienced ourselves, instead of bringing people together, the smartphone, when used in certain ways, can distance us further (Turkle, 2011).

The smartphone has become a tool to connect students and teachers, especially during the pandemic. As schools incorporate *bring your own device* programs, the smartphone has become a medium through which teaching and learning occur. Its anytime/anywhere capability allows teachers and students to exchange files and assignments, correspond through messages, video calls, and surveys, and learn through digital whiteboards, breakout rooms, and virtual classes at their chosen time and place. Its Swiss Army knife functionality gives way to an expanding number of apps students can use to learn math operations, scientific formulas, musical notation, languages, and the list goes on. The smartphone can now replace educational technologies like paper, pencils, pens, paintbrushes, analogue clocks, encyclopaedias, CDs, MP3s, and DVD players, polls, poster boards, games, textbooks, notebooks, picture books, novels, and more. It can even replace reality with augmented or virtual reality. It is reasonable to say that the smartphone has won the war against print as society's prominent communication technology, as "information is now more effectively transmitted by codes other than those of written signs" (Flusser & Poster, 2011, p. 3), but schools have traditionally been places where print reigns as the dominant medium of communication. However, the

incursion of personal electronic devices in response to the pandemic has pushed print to its margins.

While what is being taught and learned through these devices may be the same, the way teachers teach and students learn is changing. If students' use of these personal electronic devices increases, does that reduce their time learning with each other in unmediated environments? As the smartphone mediates the otherwise in-person, co-present experiences of teaching and learning through its virtual tools and environments, what pedagogical habits and methods of learning are getting lost, and what new ones are being created? As the smartphone makes obsolete a number of educational tools, it risks obsolescing the feelings, thoughts, values, and behaviours we have come to learn through them, and hence new ones are learned. And while these new patterns of thought might open new possibilities, the impacts on schooling and society remain largely unknown and unconsidered.

5. Technological Change is Ecological

Neil Postman (1995) wrote, "Technological change is not additive; it is ecological. A new technology does not merely add something; it changes everything" (p. 147). For me, the internet is the clearest modern-day example of a technology that has significantly changed everything on an ecological level. It fundamentally changed the way humans live and interact with each other and the world, reshaping society's structures, values, and practices. The interconnected network of computers we call the internet made possible digital communication on a global scale, connecting human beings and breaching the otherwise limited boundaries of time and space. With over four and a half billion active users worldwide (Statista, 2021), the internet has transformed the way

we perceive ourselves and how we interact with one another and the world. The technology of the internet, Logan (2010) adds, “set[s] the pattern for the convergence that characterizes ‘new media’” (p. 238) such as the World Wide Web, social media, cloud computing, and the Internet of Things. The devices that utilize this interconnected network, which is neither hardware nor software (Logan, 2010), are now the lifeline that keeps us connected to cyberspace from our homes, offices, restaurants, cars, pockets, watches, and glasses. As McLuhan and Leonard (1967) predicted, our students’ place of learning has gone from the little red schoolhouse to the little round schoolhouse offering access to “a worldwide network of computers that [make] all of [human]kind’s factual knowledge available to students everywhere in a matter of minutes or seconds” (p. 24).

Today’s K-12 students have never known a world that isn’t governed by networked technologies. The internet is available at any time, from anywhere these days, and in turn, so are we. It shaped us in its image. Indeed, the internet has become interwoven into the very fabric of our lives, impossible to remove its threads without unravelling life as we know it. Today, we do not have the world plus the internet, we have a new world.

6. Mythical Media

All educational media become mythic, as if they are part of the natural order of schooling (Postman, 1998). As technologies become part of our everyday way of doing things, they fade to the background, and so their effects do as well. Postman used to ask his students if they knew when the alphabet was invented. His students were astonished, as if he was asking them when clouds or trees were invented. They hadn’t thought of the alphabet as a technology or a human invention, yet the technology of writing has shaped

the thoughts of the entire Western world and certainly our education system. Like Postman's students, most of us are blind to writing's influence on the development of our thought patterns, our social institutions, and our identities. McLuhan (1969) used the analogy of a fish not knowing the water in which it swims to characterize humans' ignorance of the psychic and social effects of their technologies. In the case of media environments in educational settings, Postman (1970) said we don't recognize the influence and effects of our technologies because we assume that what we're "dealing with is not an environment but merely a machine" (p. 161).

Schools are evermore being transformed into new technological communication environments. My daughter recently brought home a letter from school after her first day of grade 1. The paper provided an overview of the apps, software, and websites her school was using. I scrolled down through the list and counted ten different applications that were used to house and collect student data, communicate school information and updates, record and report student absences, pay for school and cafeteria fees, track and share evidence of learning, provide updates via social media, and connect families to their child's learning. These sophisticated data collecting machines born from industry eventually make their way into schools with the promise to revolutionize learning in innovative and progressive ways. For those school stakeholders already successfully immersed within their own connected online networks, these environments may be perceived as a natural ecology of our advancing technological society, which values "mechanism(s) for monitoring and evaluating" and data-driven decision-making (Saul, 2018, p. 55). But soon after these new, sophisticated technologically enhanced tools that measure and analyze student data are made free to schools and families, the industries

that collect and share this information look to collect their monetary share back from those who have been convinced that they need to stay connected to the personal, curricular, and pedagogical data that showcase students' life and performance at school (Saul, 2018).

Perhaps less obvious than the developer's interest in financially capitalizing on the allure of technologically enhanced tools of measurement is the undermining of human judgement and subjectivity and the valuing of technical calculation. The authority and autonomy of the teacher who listens, observes, reflects, assesses, and accounts for the growth of students in various contexts is transferred to the computer, which uses inputs and technical calculation to measure the progress of an unknown subject in quantifiable abstract symbols within a set of parameters. This loss of autonomy and transfer of authority from human to machine is a dangerous one, especially in education, as it instils in the machine the power and authority of the human, and as a result, we come to believe that the primary goal of education is efficiency; "that technical calculation is in all respects superior to human judgement; that in fact human judgement cannot be trusted, because it is plagued by laxity, ambiguity, and unnecessary complexity; that subjectivity is an obstacle to clear thinking; that what cannot be measured either does not exist or is of no value" (Postman, 1992, p. 51).

Finding Balance in Educational Technology Use

I conclude this article by bringing attention to what I feel is a main concern of the media ecologist – the notion that the health and balance of our entire ecosystem are affected by the interactions between media and human beings, that people can find a greater balance in their lives through the media choices they make. Media ecologists

believe balance of media use to be integral to the health and survival of societies. I allude to this throughout this paper (i.e., Postman's notion of maintaining a symbolic balance; Albrecht's counterbalancing the overwhelming presence of digital technologies in schools; and McLuhan's balance of media use and the human sensorium). From a pedagogical perspective, examining the biases and influences of media allows educators and students the opportunity to better understand the impact of the tools they use, and to achieve a better balance in their use of educational technologies. In a larger societal context, a healthy balance of educational media is about understanding not only the services and disservices they bestow upon people, nature, culture, and consciousness, but also “the myriad of ways in which these technologies restructure society and redefine who we are” (Albrecht & Tabone, 2020, p. 17).

How do teachers and students begin an honest appraisal of technologies in order to make mindful decisions that lead to a healthy balance of media use? Along with delving further into Postman’s principles and the work of other media ecologists, I propose three starting points teachers and students can take: (1) to regard educational technologies not as “neutral tools that, if used properly, will have identical impacts across all user demographics and social, cultural and political contexts” (Dowd, 2018, p. 42), but rather to view educational media as biased tools and techniques that create environments of services and disservices (McLuhan, 1964) that are often unevenly distributed among people (Franklin, 1999); (2) to move beyond examining only the content of media messages, as is the predominant focus of media literacy education (Mason, 2016), and to also interrogate media forms – how media functions affect, shape, and transform the thoughts, feelings, perceptions, and interactions of people; and (3) to recognize the

prevailing presence, influence, and impositions of electronic media in the classroom and counterbalance their disruptive and destructive aspects through the deliberate creation of non-digitally mediated psychological, physical, and social *counterenvironments* (Albrecht & Tabone, 2020; McLuhan, 1964). Such *counterenvironments* of the classroom might include: imaginative play; arts-based activities like singing, dancing, role-playing, drawing, and painting; reading printed literature and writing with pen and paper; oral presentations, discussions, and debates; and the continued development of the critical inquiry process (Albrecht & Tabone, 2020; McLuhan, 1964). These *counterenvironments* not only provide balance to some of the detrimental effects of digital environments, but they also bring the otherwise invisible environments and impacts of digital technologies into view. I expand on these ideas, as well as practical applications of media ecology concepts in a forthcoming article entitled *Five Pathways toward a Media Ecology Pedagogy for K-12 Educators*.

Conclusion

In this paper, I have provided teachers with a basic understanding of the field of media ecology in relation to teaching and learning, along with a few practical approaches to explore in the classroom. I am left with the question – why have we as educators (and as human beings) not invested more time and consideration toward the notion that the tools we use to make sense of the world actually shape our understanding of it? Perhaps, as humans, we tend not to recognize the influence our technologies have on us because, over time, all media become part of the natural order of things. We may not think of them as mediators to our world.

It is worth considering Postman's (1992) caution that "new technologies alter the structure of our interests: the things we think about. They alter the character of our symbols: the things we think with. And they alter the nature of community: the arena in which thoughts develop" (p. 20). As a teacher and technology leader, I have come to appreciate that the medium really is the message, that we come to create our own understanding of the world not only in *what* we teach but *how* and *why* we teach.

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Article 2: Five Pathways Toward a Media Ecology Pedagogy for K-12 Educators

Abstract

To what end do public school teachers invest time and consideration toward the notion that the tools we use to make sense of the world actually shape our understanding of it? Many media ecologists have theorized about the impacts of educational technologies in the classroom, proposing that technologies mediate our experiences and shape our thoughts, feelings, behaviours, and values, and that the introduction of technology into the classroom has a profound effect for how we teach and learn. However, public school teachers are generally unfamiliar with media ecology scholarship, and even media ecology's most influential thinkers have yet to translate their ideas into classroom praxis or significantly contribute to media education. Given the onset of new electronic communications technologies being employed in K-12 education as a response to the COVID-19 pandemic, now is a suitable time for teachers and students to start exploring and applying media ecology concepts. My unique placement as a former public school teacher, school district technology coordinator, and current media ecology scholar provides a central position of translating media ecology concepts into teacher praxis relevant in today's classroom. This article applies some of the theoretical concepts that underpin media ecology to practical explorations K-12 teachers and students can employ to identify, question, discuss, and respond to the implications of both traditional and new educational technologies in the classroom and beyond. Moreover, this work aims to help bridge the practical and theoretical divide between media ecologists and teacher practitioners as a contribution to media ecology pedagogy in K-12 education.

Keywords: media ecology, education, pedagogy, technology, COVID-19

Introduction

Today's K-12 classrooms are teeming with technologies, and the COVID-19 pandemic has further escalated their prevalence and use through the introduction of new digital means to facilitate distance learning. Educational technologies are commonly viewed as neutral and necessary (Rose, 2000; Selwyn, 2014), but there is a critical connection to be made between how students and teachers interact with technologies and how these tools mediate and reconfigure the ways teaching and learning occur. Understandably, with the many obligations teachers face in fulfilling their roles (e.g., teaching curriculum outcomes, differentiating instruction, assessment), little time remains to pause and critically reflect on the ways educational technologies influence and shape teaching and learning. As a former classroom teacher, I invested no time and attention toward the notion that the technologies I used in the classroom imposed a pedagogical sway over my teaching practices and unintentionally influenced how my students and I came to make meaning. I had not considered the idea that the tools we were using to help us make sense of the world were actually shaping our understanding of it. I only recently came to such considerations as a doctoral student studying media ecology. Media ecology offers an effective means for understanding the new learning environments these tools are creating in education. Media ecology is a different perspective, an approach to teaching and learning that can be incorporated into teachers' current pedagogy.

Media ecologists engage in conversations about education and technology (Acland, 2014), suggesting that educational technologies create surroundings that change the way teachers and students think, act, feel, and make sense of the world (see Hayles, 2007; Kuskis, 2012; Rose, 2021; Stiegler, 2010). But while media ecologists have called attention to the profound ways educational technologies mediate and influence teaching

and learning, they can assert very little about the practical implications of their ideas (Albrecht and Tabone, 2020). Moreover, the work of media ecologists remains widely unknown to schoolteachers (Kuskis, 2012; Rose, 2007), and it has not substantially contributed to media education (Strate, 2017). Albrecht and Tabone (2020) identify the need to move the intellectual tradition from “theory to experimentation, from ‘probe’ to practice” (p. 111).

Perhaps now more than ever is a fitting time for teachers and students to start exploring and applying media ecology concepts because of the onset of new electronically mediated environments being created in K-12 education as a response to the COVID-19 pandemic. If technologies mediate the way knowledge is acquired, constructed, and shared, teachers and students would benefit from an awareness of the role media play in shaping their understanding. Indeed, the introduction of these new media into learning spaces brings new ways of teaching and learning, and hence new ways of knowing.

In this article, I introduce K-12 educators to five pathways for exploring media ecology theories with their students: Probes and Pattern Recognition; Figure/Ground Analysis; The Medium is the Message; Double-Edged Devices; and Historical Critical Approach. Each pathway offers practical methods K-12 teachers and students can apply to identify, investigate, assess, discuss, and respond to the role technologies play in shaping thoughts, feelings, behaviours, values, and perceptions. I also offer media ecology scholars insight into how their work might be realized in K-12 classroom settings. My combined roles of former classroom teacher, school district technology coordinator, and doctoral student studying educational technology allow me to draw upon

both predominant and emerging technologies being used in today's classrooms. My aim is to help bridge the practical and theoretical divide between teachers and media ecologists (Rose, 2006) by offering practical explorations of media ecology concepts as a contribution to media ecology pedagogy in K-12 education. I conclude by calling attention to the importance of balance, and how teachers and students can strive to find a healthy balance of technology use in their lives in and out of school.

Media Ecology: We Learn From our Surroundings

Media ecologists use a metaphorical analogy of ecology to describe the way our technologies and techniques (i.e., media) create surroundings (i.e., environments) similar to those of the natural world (Mumford, 1934) that govern and restructure our ways of thinking, acting, feeling, and knowing (Postman, 1970). Just as a physical environment sets and sustains the parameters and conditions which govern the interactions of the species that live within it, technologies mark and maintain the possibilities and limitations of people's thoughts and behaviours within a culture. The underlying notion that connects the work of all media ecologists is "the belief that, far from being neutral, media can promote transformations, often radical, in societies and even in the way that individuals perceive the world" (Rose, 2006, p. 5).

I have previously introduced the field of media ecology to educators and made a case for its importance in K-12 education (see McGuire, 2022). Given this work, below are examples of media ecology in action; avenues through which teachers and students can explore media ecology concepts and investigate the ways technologies shape our lives and perceptions.

A Precursor to Practical Applications

Those teachers worried about time constraints and fulfilling the requirements of their assigned curricula need not worry about teaching an additional media ecology curriculum. Media ecology is not a subject or a discipline, and it should not be approached as one (Cali, 2017). What I hope this work demonstrates is that teachers and students can incorporate media ecology concepts and approaches into their everyday curricula and subject strands. Regardless of grade level or subject area, explorations can be made “from a media ecological perspective if changes in technology can be linked to changes in people, perception, consciousness, and culture” (Cali, 2017 p. 238).

Teachers can approach these exercises by using examples that are relevant to their students, and by offering students the opportunity to explore the media that interest them. To achieve somewhat of a balance in pedagogical approaches and media use, a variety of pathways are included below. These approaches are not in any order, nor is it my intent to have them considered or employed individually. These pathways are most effective when they are working in tandem; paths can and will intersect.

1. Probes and Pattern Recognition

Postman and Weingartner (1969) believe questions, or “instruments of perception” as they call them, to be the optimal medium through which teaching and learning take place, and that schools serve as the principal medium through which these skills are developed. They suggest a teacher’s “basic mode of discourse with students is questioning” (p. 34), those divergent in approach being the most important and effective, as opposed to convergent questions, which seek only one correct answer. In this way, language (i.e., questioning) is a medium through which minds are opened to

“unsuspected possibilities” (p. 34) where understanding occurs. Teachers who use the medium of the classroom to express thoughtful, provocative questions that are important and of interest to students can teach them critical inquiry skills and “the art and science of asking questions” (Postman & Weingartner, 1969, p. 23).

To examine media, McLuhan employed probes, questioning and observation techniques used to identify new perceptions and patterns of interrelationships in the world (Lum, 2006). Different from the common approach of deductive logic, probes are non-linear, multifaceted explorations and deconstructions of media (Morrison, 2006).

Teachers can use a probing approach to investigate how educational technologies shape the way they plan, teach, assess, and communicate, and students can employ probes to examine the media that affect the way they study, the way they learn, and how they reach their goals (McGuire, 2022). The following pathways can help teachers and students use a probing approach to recognize, discuss, understand, and respond to the technologies they use to make sense of the world, and in what ways these technologies shape their understanding.

DeTectives

Inspired by Adams’ and Thompson’s article *Interviews with Digital Objects* (2020), this activity asks teachers and students to act as *deTectives*, investigating a technology in order to “generate data for subsequent analysis” (p. 251). Detectives use questions and observations as investigative tools to uncover otherwise unobserved or concealed clues as to how and why something has occurred and what it might mean. In the same way, the task of deTectives is to use probes to investigate a "technology in action, as it mediates the perceptions and gestures of its human employer and as it

associates and performs with human and other nonhuman actors” (p. 251). The aim of this exercise is to encourage and strengthen teachers’ and students’ processes of critically analyzing media, bringing awareness and responses to the technologies that mediate their lives. This exercise can be an ongoing process throughout a teacher’s and student’s academic career. While questions appear before observations below, these two techniques are used in conjunction with each other, as questions can aid in the process of observation and observation can lead to questions.

Teachers and students begin by brainstorming and noting technologies (e.g., smartphone, interactive white board, bicycle, television) and techniques (e.g., reading, texting, playing video games, surfing the net) that play a significant role in their lives in and out of school. A phrase that might help them with the task is *where there is a way, there is a technology at play*. Once a list is compiled, they choose a technology or technique to investigate using probing questions and observations. The process is a two-pronged approach, beginning with critical inquiry and the gathering of evidence, moving into analysis, discussion, and meaning making. While deTechtives will develop their own continuity of questions to examine and investigate technologies, here are a few examples to get them started:

- How does this technology work? Who made it and why was it made?
- What does this technology allow me to do, and what does it prevent me from doing?
- How and what might this technology allow me to teach or learn, and by using it, how and what does it prevent me from teaching or learning? If this technology

becomes a significant means for me to teach or learn, what methods am I forgoing?

- What services and disservices does this technology provide? Who benefits and who loses from the use of this technology?
- How does this technology shape the way I represent and communicate ideas, and in what ways am I no longer communicating?
- What is the problem this technology allows me to solve, and in what ways does it encourage me to solve them? What new problems does this technology create and how might they be attended to effectively?
- In what ways does this technology change home, school, intellectual, emotional, and social environments?
- By using this technology, what messages are being conveyed more clearly and in what ways might this medium be causing more static and confusion?
- If this technology were to suddenly disappear, how would teaching, learning, and life be affected? What other technologies and techniques might be turned to in its place?

Along with asking good questions, McLuhan's probing approach included observation. Observation does not only mean the way things look to our eyes; the process is more involved than that. Observation also includes *the way* we observe things, *what* and *how* we observe, and *how we make sense of it*. Strate (2008) emphasizes the need for students to "use [their] powers of observation to reveal our otherwise invisible media environments" (p. 129). This observation method involves the other senses too, including

our sense of perception, a process of employing one's senses to learn about the world around them (Martin, 1998).

As an observational approach to gathering evidence, deTectives might employ Adams' and Thompson's (2020) four methods of attending and attuning to what a medium is "*saying and doing*" (p. 250). Their observation processes include:

- Gathering anecdotal evidence by recording interesting accounts of incidences or events involving the technology;
- Following the technology and its users around, like a gumshoe on the heels of a suspect;
- Listening for the invitational quality of the technology, the allusive ways in which the technology implicitly draws one's attention, evokes engagement, and influences thoughts, feelings, and behaviours; and
- Studying the actions of a technology's breakdowns, accidents, and anomalies, and the ensuing reactions to such occurrences.

Teachers' and students' investigations and discussions might become more enriched as they become familiar with probing media. They might broaden their scope of technologies to include designs, systems, processes, ideas, symbols, and languages. Digital technologies, such as computers, tablets, video conference calls, and learning management systems may be more easily perceived as mediators of experience, as they physically and virtually mediate teacher and student communication. Educational media perhaps not as easily recognized are grades, subjects, curricula, bell schedules, classrooms, schools, and the education system, as these things invisibly form and

structure the way education occurs, controlling what can and cannot happen within these environments (McGuire, 2022).

The 4 Laws of Media

Marshall and Eric McLuhan wrote the book *Laws of Media: The New Science* (1988), which founded four universal laws of media that could be tested and applied to any technology, technique, theory, or artifact to investigate its cultural impact and effects on people. These laws can be perceived as a process of investigation, as they require those employing them to actively observe media and inquire into their universal patterns, customs, traits, and forms. Using the Laws of Media to examine a medium in an educational context can help teachers and students systematically evaluate, predict, and respond to the ways in which media extend or modify the human senses. The Laws of Media are not to be applied in a sequential or linear order; the four effects occur simultaneously and complement each other (McLuhan & McLuhan, 1988).

When investigating a medium, teachers and students can practice their probing skills by employing the laws as questions, also known as a “Tetrad of Effects” (McLuhan & McLuhan, 1988, p. 7) by asking:

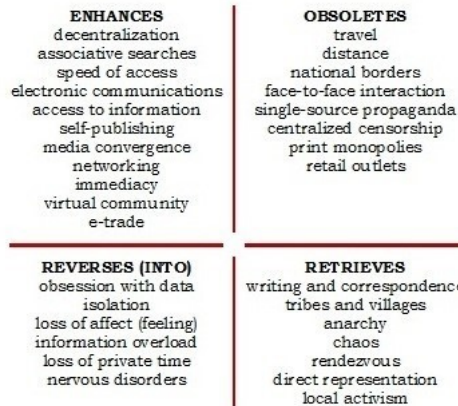
- What does the medium enhance or intensify?
- What does the medium displace or make obsolete?
- What does the medium retrieve that was previously obsolesced?
- What does the medium reverse or flip into when it is pushed to an extreme?

Students might begin to familiarize themselves with the process of investigating the Laws of Media by looking at others’ attempts at deciphering the patterns of a

particular medium. Below (Figure 1) is Soules' (2007) application of the tetrad to analyze the internet.

Figure 1

Laws of Media: The Internet



From *McLuhan Light and Dark*, by M. Soules, 2007 (<http://www.media-studies.ca/articles/mcluhan.htm>). Copyright 2007 by Dr. Marshall Soules, Malaspina University-College.

Teachers and students can review and test Soules' proposed Laws of Media for the internet and engage in a discussion around them. Do they agree with Soules' findings? Are any of the claims falsifiable? Are there any patterns or laws of the internet that are missing?

Teachers and students might wish to collectively investigate another medium before embarking on the process themselves. They might begin with a familiar tool (e.g., slide or slide deck, meme or makerspace, video game or YouTube video) or technique (e.g., writing or sketching an idea, silent reading or reading aloud, texting or video conferencing). They might also take up the authors' challenge to discredit any of their universal patterns of media by finding instances where a law does not apply, or to find a fifth law that could apply to all.

Probes and Pattern recognition is an approach that teachers and students can use as they move through the remaining paths below. By asking probing questions, making observations, and engaging in discussion, they embark on the process of critical inquiry and meaning making, and hence may come up with their own processes for examining media.

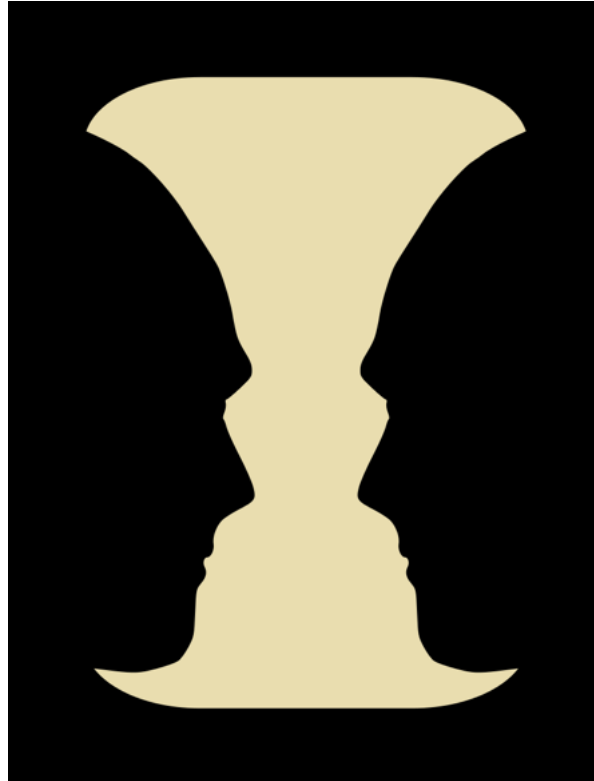
2. Figure/Ground Analysis

The terms foreground (or figure) and background are used in visual art as an essential perceptual grouping that allows people to recognize and distinguish objects using their eyes (McLuhan et al., 1977). A person's eyes are drawn to the figure while the background is mostly overlooked (Wagemans et al., 2012). Rubin's (1915) drawings, in which two pictures are juxtaposed upon each other, are a way to easily recognize the figure/ground relationship in visual phenomena. At first, we may see the vase as the figure, but when we train our eyes to look elsewhere, we discover the two faces, and the vase recedes to the background. What's important to note here is that the outline of one image is also the outline of the other; figure and ground create and define each other, which is true of all structural relations (McLuhan et al., 1977). The authors (1977) point out, contrary to popular belief, both figures can be seen at the same time, but it might take a bit of unlearning.

Figure 2

An Example of Rubin's Vase

By N. Dilmen, 2011



(https://commons.wikimedia.org/wiki/File:Face_or_vase_at_01.svg). Creative Commons Attribution-Share Alike 3.0 Unported.

McLuhan et al. (1977) believe technologies are figures that create ground. I have been referring to this ground as an environment; any given technology is the figure. A technology's ground is the environment of effects, of services and disservices, which are the result of using it (McLuhan & McLuhan, 1988). The ground is often an inconspicuous part of the picture we do not notice or recognize because the technology itself monopolizes our attention as the figure in the foreground, but the background often

provides insight into the structure of a medium (McLuhan et al., 1977). Part of the process of figure/ground analysis is to bring the ground to figure.

Teachers and students can study the interdependent relationship of a technology's figure and ground as an inquiry-based technique for seeing the entire situation created by a medium and to help recognize both its obvious and unobtrusive effects. The investigations below can be modified and used to examine the figure/ground of any technology (e.g., tool, object, game) or technique (e.g., process, activity, occurrence).

Event Commentator or The Critical Observer

In this exercise, students take on the role of commentator or critical observer of a professional sporting event, musical, concert, or any production that is intended for an audience. These productions tend to have a lot of activity occurring in the background that impact the figure/foreground. Rather than report on the action of the game or event itself (the figure), the commentators focus on reporting what is happening around the event (the ground), essentially inverting figure and ground. Students can engage in this activity by themselves, in pairs, in small groups, or as a class. They should be prepared to record their observations in some way, as the teacher may ask them to present their findings sometime afterward. Below, I use the example of a major league baseball game.

The first task of this exploration is to ask *What is the figure?* By way of analogy, in baseball, it is professional players competing against each other; pitchers pitching, batters hitting, runners running, and fielders fielding; great plays, bobbles, and bloopers. Students then move to examining the ground, paying attention to how these things influence the game being watched and played. Students may observe national anthems; the players' comradery, uniforms, equipment, and personalities; coaches strategizing and

arguing with umpires; announcers calling the game, providing stats, promoting sponsors, and taking viewers to commercial; signs on walls and corporate names on stadiums; fans eating ballpark snacks, dressed in various uniforms and colours, and contributing to a collective or competitive spirit; stadium announcers, intermittent music, tv cameras, microphones, scoreboards, instant replays, and trivia; grounds crew, mascots, staff; and the rituals of the stadium, fans, and players. These things occurring in the background can be seen as ecological patterns and effects, actions and reactions that take place within an environment and because of the environment. How do these things influence and impact the game of baseball? In other words, how does the ground affect the figure, and in turn, how does the figure affect the ground? How would the game be affected if some of these things were taken away?

Students then have the task of presenting their analysis of their event's ground in a variety of ways (e.g., creating props and acting as commentators or program hosts, writing a written report through a script, blog post, or article). Students might enjoy comparing how the figure/ground relationships are different within each event, and how these differences uniquely shape the human experience.

Teachers can use this exercise to analyze the figure/ground relationship created by a presentation tool, teaching resource, or pedagogical approach. They can observe, take notes, record themselves teaching, and reflect on their approach. The aim of this activity is to open minds to the idea that within every technology or technique is both figure and ground which create and define each other and shape the human experience. Teachers and students can critically examine the figure/ground of technologies and techniques used in and out of the classroom.

Changing Perspectives

Examining figure/ground relationships allowed me and my students to see new perspectives, develop empathy and appreciation for people and situations, and gain new insights into phenomena. When a student was accidentally tripped by a slide tackle in a soccer game, they soon made a connection to our work on perspectives, realizing in the background, the opponent was merely trying to dislodge the ball from their feet. We used microscopes to examine the hidden ground of objects and cultures otherwise unseen with the eye. We read lyrics to songs before listening to them or watching the music videos, we compared original songs to covers, and we produced our own versions of the songs. These experiences offered us new ways to explore how interpretations create unique grounds, and therefore new meaning.

Technology Timeout and Media Log

One of the simplest and most effective ways to deconstruct the hidden effects of a technology's ground is to take the technology away. This exploration asks teachers and students to embark on a *technology timeout* to help them recognize the role technology plays in their life, "what technology helps [them] do and what it hinders [them] from doing; ...how technology uses [them], for good or ill; and ...how it creates new worlds, for good or ill" (Postman, 1995, pp. 191-192).

In a podcast interview on *Visions of Education* (June 21, 2019, Episode 117), Lance Mason, Associate Professor of Education at Indiana University Kokomo, asks students to embark on a *media blackout*, a 24–48-hour loss of their smartphone or social media app, much like the experience of temporarily losing power in one's home. Teachers might go without a technology they use daily. This endeavour takes the otherwise

unexamined or taken for granted ground a medium creates by bringing it to figure, causing one to confront what life would be like without it (Mason, 2019). How does communication change without this tool, how do thoughts and habits change, and how are goals affected? Teachers and students might keep a media inventory log and record how many times they check a technology within the course of a day. Mason (2019) thinks these activities offer students a better understanding of media habits and the role media play in their lives.

Other Pathways

Students can swap out the setting of a story with another to see how ground acts as an underlying structure to support its figures. The setting in which writers situate their figure is important; the excitement of a car chase is created differently in the setting of a busy street in London than it is on a Nevada desert highway or the Indie 500.

Students might examine the figure and ground of a search engine or social media platform, observing how the otherwise unseen predictive algorithms occurring in the background use tracking and mining of historical data (e.g., web searches, site visits, user location) to predict or suggest future activities (e.g., search terms and websites, tailored content of ads), and how these environments affect life. How do these media inform and misinform people on important issues? A better understanding of these environments allows students to take more control over them by customizing settings and making better choices in the technologies they use.

Teachers may wish to *walk in their students' shoes* by using the same tools and techniques they are afforded to use in class, following the same rules, guidelines, and processes while reflecting on how these environmental structures improve or interfere

with intellectual and social-emotional learning. What kind of environment do the chairs and desks create in a classroom? What does the teacher's desk and seat look like, where are they positioned in the classroom, and how does this furniture differ from students'? Teachers might sit and work in students' seats for the same length of time they are required to sit in class. How does furniture contribute to power and equity, rights and roles, services and disservices, perceptions and behaviours, and in what ways can teachers best serve their students by using or avoiding them? How do the technologies within the classroom affect seeing, speaking, listening, thinking, collaborating, teaching, and learning? How might relocating the classroom to a different environment (e.g. outdoors) change these things?

3. The Medium is the Message

McLuhan's compelling message about technologies is that the information they carry is not nearly as important as what they do to us—how they guide the things we do, how they influence the way we think, how they orientate our bodies, and how they structure our brains (Postman, 1998). In this way, media act as environments, in which certain structures exist and where interactions take place (Mumford, 1934). McLuhan was not saying that the content of a medium was insignificant, but the content is less significant than the medium that shapes the way a message is understood. While the various messages communicated through one medium change, the broader form of the message—the *way* it is conveyed—stays the same. The medium is the message implies that the process of learning is far more critical than the content we learn (McLuhan, 1964).

Same Content, Different Media

In this inquiry, teachers and students explore how a medium shapes the form and meaning of a message. The exploration might begin with a question, such as *what does Culkin mean when he writes “we shape our tools and thereafter they shape us”* (1967, p. 52)?

Teachers and students are then tasked with composing a written message, noting the meaning they hope to convey through the message—the thoughts, emotions, or actions they hope to elicit. They keep this written message and meaning private until later. Then they choose three distinctively unique mediums through which their message and meaning will be conveyed. They can be given the autonomy to choose their media, or they might pull a piece of paper out of a hat with the name of a medium on it (e.g., Instagram, pencil sketch, emojis, charades). They work to create and present their message in the form that each medium allows. Once they have finished their three messages, they gather in groups, taking turns presenting all three messages through their respective media. After each message has been shared, those receiving the messages are given time to interpret and record responses to the following questions: (1) What is the message? (2) What meaning(s) might the messenger hope to convey through the message? (3) How does this medium contribute to my understanding of the message? When all three messages have been delivered and responded to, participants are invited to share their responses with the group.

After everyone has been given a chance to share, the messenger unveils their original written message and meaning. A discussion ensues, focusing specifically on the messenger’s ability to convey the original written message and meaning through each medium. How do the features of each medium contribute to the consistency or

discrepancy of the sender's written message and meaning? The teacher's and students' consideration of how the medium shapes the message may encourage them to think critically toward how a technology enhances or impedes their effectiveness of communicating a message, perhaps resulting in more effective uses of communications media.

Weather Gauge

The purpose of this investigation is to explore the various ways humans rely on technology to collect and represent information, and in turn, how these representations shape human values and understanding. Teachers might begin this inquiry by asking: *In what ways can we gauge the weather and what it feels like outside?* Teachers ask students to make a chart listing the various ways weather can be gauged (e.g., through bodily senses, thermometers, barometers, smartphone apps, writing and illustrating instruments). Teachers then ask students to choose and employ some of these instruments from their list to gauge and describe the weather conditions outside, ensuring students also step outside and use their bodies as instruments.

After students record and describe the weather in several different ways, they can analyze their findings, looking for similarities and differences in the descriptions and representations. What *languages* do these instruments use to represent weather (e.g., numbers, scales, words, illustrations) and how do they affect our understanding of weather? How does quantifying temperature in numbers and degrees (34°) or through an illustration improve or inhibit our understanding of weather? Weather apps often determine the “feels like” temperature by gathering environmental data such as ambient air temperature, relative humidity, and wind speed (Gilmore, 2019), but how do such

inanimate instruments understand *how* or *what* humans *feel*? How do these instruments characterize how weather looks, sounds, smells, tastes, and feels? How do we come to value and rely on these machines' *knowledge* of human feeling? Furthermore, when we come to value and rely on such machine *knowledge*, to what extent do we value and rely on our own?

Teachers and students can try these types of comparative experiments with other approaches to teaching and learning, such as the use of speech, writing, emojis, memes, paint, photography, and video to convey thoughts and emotions; the use of a pencil and paper, word processor and keyboard, and smartphone and texting to complete an assignment; the use of a paper map, compass needle, GPS, or the human senses to navigate a familiar or unfamiliar territory; and the use of multiple-choice tests, letter grades, written feedback, conferencing, presentations, or model creation to assess the extent of one's knowledge and understanding of a particular phenomenon. How do these languages affect the way we come to understand things?

4. Double-Edged Devices

Postman (1992, 1995) cautions us to not regard the changes brought forth by technologies as merely improvements, advancements, or enhancements, but to also consider in what ways they diminish, decrease, or weaken our abilities. In other words, to view technologies as progress without problems only accounts for what is gained through their use and disregards what is lost. Postman (1995) describes our relationship with technologies as “unmixed blessings”, referring to the notion that with every advantage a technology offers, there comes a corresponding disadvantage, extending McLuhan's

(1964) notion that our technologies amplify some faculties and senses while numbing others.

From my own teaching experiences, my students used green screen technology to report on historical events, people, and places with the aid of superimposed digital images and videos of historical scenes in the background. While they were afforded the luxury and convenience of simply placing scenes into their productions and uploading their videos to the net to share with a potentially wider audience, the otherwise invested work and skills gained by students through the creative design process of a play's props and backdrop creations was no longer needed, nor was the heightened excitement of a live performance in front of an audience experienced. This is not to say that green screens are not an effective pedagogical tool, or that drama and plays without technology are better than creating digital productions. My point is that I believe we as teachers need to focus on finding a balance in our educational media use, ensuring that when something of value in education is lost or diminished by a new technology (and the discontinuation of another), we offer *counterenvironments* (Albrecht & Tabone, 2020), opportunities whereby students can develop the knowledge and skills that align with those values. In other words, teachers might consider not only what is gained from using a technology, but also what is lost.

How then are teachers and students to respond to the idea that all educational technologies are double-edged devices with inseparable costs and benefits? A starting point is to examine the "duplicitous actions and twofold gestures" (Adams, 2018) of the technologies they use to teach and learn, as well as those they encounter in their lives outside of school.

Technology on Trial

Students create a courtroom scene that puts a technology on trial. They might choose to examine and cross-examine a recent educational technology prevalent in schools, such as a learning management system or a video conferencing platform. Students act as defence, prosecutor, judge, jury, witness, plaintiff, and suspect (i.e., the technology itself). The prosecution takes the side of the plaintiff and tries to uncover the pitfalls of the technology, calling attention to its biases, limitations, misgivings, and the framing of individuals' thoughts and actions. The defence builds their case on the affordances of the technology, its gifts, supports, efficiencies, and conveniences. The prosecution and defence interrogate witnesses and the suspect until the judge and jury meet to go over the hearing and make a judgement on the technology (a summation of its affordances and misgivings and whether these things contribute to the betterment of schooling and society). The process in this case is as important as the final verdict, as it puts students into the practice of critically analyzing technology.

Contrasting the Elements

Students create an artistic representation of the two sides of a particular technology, calling attention to the affordances and limitations of a particular tool or technique. Teachers and students can explore the same elements artists use to create contrast in their art to illustrate the contrasting properties of a particular tool or technique. The elements of art (line, space, colour, shape, and texture) that are used to convey meaning and to express emotion, ideas, concepts, or beliefs, can also be used to represent the features of a medium that evoke these same expressions in people, culture, and consciousness. Students can call attention to or represent the duplicitous, contrasting

elements of a particular technology through contrasting artistic properties, such as opposing hues on the colour wheel, light and dark created by tints and shades, or distinctively different textures, sizes, and other visual cues. Students may wish to depict the societal implications brought forth by a technology's two-fold gestures.

Other activities for exploring the unmixed blessings of a medium could include reading a passage from a book, watching a scene from a show, or analyzing a room or space, constructing a list of all the technologies present within them. Then, answer the following questions beside each technology: what problem does this technology solve and what new problems might this technology be creating? Create a new list of problems you are concerned with. How can these problems be attended to?

5. Historical Critical Approach

As a fifth path to examining media, teachers and students can embark on the historical critical approach, a process by which a technology's evolution is charted, from its inception to its obsolescence. The societal impact of a technology of the past is more easily observed than a current technology because its influences on society's structures, practices, and values are present in modern day (Cali, 2017; McLuhan, 1964; Postman, 1992). Studying the communications technologies of the past allows us to gain insight into how new media might influence cultural change today. A culture-shaping technology of the past (e.g., alphabet, mechanical clock, printing press, telegraph) is explored with attention directed to how it shaped the way people thought, communicated, behaved, and what things they valued. Students might approach this investigation by examining things like tools, systems, structures, conditions, rules, ideas, symbols, or languages.

Music's Metamorphic Medium

How have commercial music products and distribution methods changed over time? Songs started as an oral and musical performance as a way to tell stories and entertain people and transitioned to recorded forms people could enjoy apart from the performer(s). Students can chart the trajectory of recorded sound from the phonograph, gramophone, and audio reel of the 19th century to the 8 tracks, vinyl records, compact cassettes, CDs, and mp3's of the 20th century, and into the software and subscription tools we use today. They might investigate the various forms and transitions of sound, from live performance to studio recordings, analogue to digital signals, or the physical full-length concept album with accompanying tangible album artwork to the single digital releases that are uploaded to and accessed from the internet via music distribution services. How do these changes in form alter the way artists create music and how do they influence the experience of the listener? Who benefits from these various forms and transitions and who loses? What problems are solved and created? What might this mean for the future of music and the musician? What form will the next musical metamorphosis take?

Artistic Historian

Taking on the role of both art historian and artist, students and teachers examine the art forms of the past to learn about the present and make predictions about the future. Art historians are interested in what the artworks of the past represented during that time, what tools shaped their ideas and therefore creations, and how these tools and forms influenced cultural change over time (IESA, 2021). What beliefs and values are represented in these artworks and in the tools used to create them? How have the artistic

tools used in the past shaped the way we think and represent the world today? Students might use this exercise to make predictions of the tools and art forms of the future and how these might contribute new ways of knowing. Students can also consider the artist in this exploration, investigating who created an artwork, what elements and tools they used, when they created it, and for what reason.

This exercise moves from analysis to students creating art based on their findings of artist styles, tools, forms, and interests of that time, indicating what messages they hope to convey through their work. In what ways do these artworks shed light onto the past, what do they tell us about today, and what might they contribute to the future? Students might wish to study modern art and create their own pieces based on inspiration, choosing an artform or medium from the last two decades. Media might include digital production software, 3D printers, laser cutters, circuit boards, as well as non-electronic media. How do these tools and artforms compare to the past, in what ways do the forms of artistic media change, what do these new tools tell us about our past, present day, and future?

Conclusion

Media ecology offers a unique approach to teaching and learning, a way to better understand and respond to the role technologies play in education. Media ecology serves as a playground of praxis whereby its theories can be explored, tested, reflected upon, exercised, and realized. As Margaret Cassidy (2004) notes, technologies in education should be regarded as “the subject of inquiry and criticism in [their] own right” (p. 289). She sees, as I do, the potential for a different relationship between technology and schools, one that recognizes technology in its larger societal context. In addition, “When

the technology of a time is powerfully thrusting in one direction” as is the case with the current intensified shift to electronic communications tools in education during the COVID-19 pandemic, “wisdom may well call for a countervailing thrust” (McLuhan, 1964, p. 102). Examining the effects of educational media, their rules, structures, designs, and biases, can help teachers and students find balance in their media use.

After learning a bit more about media ecology, teachers and students might wish to employ a means of technological modesty, what Neil Postman (1992) describes as an exercising of more control over technologies, to not simply see technological innovation and human progress as the same thing. If teachers and students can make practical use of media ecology concepts, they will be better able to identify, use, avoid, redesign, or create media that help them achieve their educational goals, contribute to the common good, and shape a brighter future.

I conclude this article with a quote from Postman (1996), who said, “If students get a sound education in the history, social effects and psychological biases of technology, they may grow to be adults who use technology rather than be used by it” (para. 2).

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Article 3: The Four Laws of Microsoft Teams

Abstract

The COVID-19 pandemic caused many schools around the globe to close their doors and relocate learning to virtual environments. Teachers were forced to transition the way they educated - from classroom to computer screen, from co-presence to distance, from hands on to hands off. High school teachers in New Brunswick turned to Microsoft Teams to help safely educate students from a distance. To investigate how Teams uniquely influenced the way teachers constructed, presented, and shared knowledge, and how students responded to these approaches, I interviewed eight New Brunswick high school educators who taught in the Teams virtual environment during the 2020-2021 school year, the first full school year of the pandemic. This article provides insight into some of the potential impositions and pedagogical constraints Teams placed on teaching practices; in what sense the software guided or limited teacher pedagogy and what challenges and opportunities teachers and students experienced; and in what ways Teams might be reshaping ways of thinking, feeling, acting, and knowing. As an approach to this investigation, Marshall and Eric McLuhan's Laws of Media (1988) are employed as an inquiry mechanism by which the generalizable rules, patterns, and structures of Teams can be recognized and studied. Through these conversations, I observed the enhancement of anytime/anywhere learning; the obsolescence of the physical classroom; the retrieval of lectures; and the reversal of connectedness to disconnectedness. The Laws of Media allow education reformers to gain insight into the effects of using Teams as an educational tool before cultural norms and practices become too entrenched in the

system, affording education districts and departments time to understand them and make a judgment on if, how, and when Teams will be used.

Keywords: educational technology, COVID-19, media ecology, Laws of Media,
Microsoft Teams

Introduction

When the COVID-19 pandemic caused New Brunswick (NB) schools to close on March 16th, 2020, high school teachers were forced to confront what was likely the most jolting and sudden shift of their career: transitioning the means by which they educated - from classroom to computer screen, from co-presence to distance, from hands on to hands off. The physical classroom many high school teachers and students were accustomed to suddenly transformed into the virtual classroom of Microsoft Teams (Teams). While *what* they were teaching may not have shifted drastically, *how* they taught did.

To investigate how Teams uniquely influences the way teachers construct, present, and share knowledge and how students respond to these approaches, I interviewed eight NB high school educators who taught in the Teams virtual environment during the 2020-2021 school year, the first full school year of the pandemic. Through our conversations, I aimed to understand and represent what potential impositions and pedagogical constraints Teams placed on their teaching practice; in what sense the software guided or limited their pedagogy and what challenges and opportunities they experienced; and in what ways Teams might be reshaping ways of thinking, feeling, acting, and knowing. In this work, I draw upon McLuhan's (1964) notion that the content of any technology is not nearly as important as how it guides the things we do, how it makes us feel, how it changes the way we think, and what values are instilled through its use.

As an approach to this inquiry, I employ Marshall and Eric McLuhan's Laws of Media (1988) as an inquiry mechanism by which the generalizable rules, patterns, and structures of Teams can be recognized and studied. The Laws of Media infer that every

technology 1) enhances a human function, 2) obsolesces a former technology or human function, 3) retrieves a human function or technology from the past, and 4) when pressed to an extreme, produces a new human function or technology (McLuhan & McLuhan, 1988). The Laws of Media can be employed as questions, also known as a “Tetrad of Effects” (p. 7), to critically inquire into the impacts of any human invention or innovation and display them in four simultaneous categories to represent a totality of effects on humans, societies, and cultures. Below, I employ the Tetrad as an exploratory tool to probe into the Teams virtual meeting as an educational tool in NB. I ask:

- What does Teams enhance?
- What does Teams make obsolete?
- What does Teams retrieve?
- What does Teams reverse into when it is pushed to an extreme?

Teams is a technology with a lot of moving parts (i.e., it serves as a virtual meeting place, instant messaging tool, and learning management system). In this study, I employ the Tetrad to examine specifically the Teams video call and the use of Teams instant messaging, but I do not explore teachers’ use of the tool as a learning management system as I do in McGuire (2022). Through my conversations with teachers, I observed the enhancement of anytime/anywhere learning; the obsolescence of the physical classroom; the retrieval of lectures; and the reversal of connectedness to disconnectedness. A multitude of other patterns and correlations were observed from teachers’ shared accounts (such as the movement toward obsolescing many forms of print media), but because of the confines of space, I have only showcased one observation within each law.

Methodology

During the first full school year (2020-21) of the coronavirus pandemic, NB high schools with large enrollment switched to a new blended learning model, whereby students rotated between attending school in person on one day and learning remotely the next day. Teachers were “responsible for their entire class, whether they [were] physically present or engaged in blended learning activities” (GNB, June 12, 2020, p. 2). I wanted to interview NB high school teachers who taught in two environments at once - the Teams virtual environment and the physical classroom. I sent an initial online questionnaire (see Appendix A) via email to all high school teachers in the Anglophone West School District. 13 teachers responded to the questionnaire and eight met the criteria. These eight teachers represented a wide variety of subject areas from seven NB high schools. All eight participants engaged in a two-hour interview with me (see Appendix B). Because these interviews took place during the pandemic at the end of the 2020-2021 school year, conversations occurred via Teams video calls. Ironically, the medium being investigated also became the medium of inquiry. In an effort to yield in-depth responses about teachers’ experiences, perceptions, opinions, feelings, and knowledge (Patton, 2002), and to allow research participants opportunities to explore their emerging worldviews and ideas in unique and flexible ways (Merriam & Tisdell, 2015), the interviews were guided by my predetermined probes and open-ended discussion topics directed by participant responses. Pseudonyms are used for all teacher names. Common themes from my discussions with research participants were identified, and excerpts from teachers’ responses to the interview questions and my corresponding analysis of these themes are presented in this work.

What Does Teams Enhance? Connectedness: Anytime, Anywhere Learning

A theme that resonated in every interview with research participants was that Teams enhanced the range and frequency of connections between students and teachers. Melody, a high school music teacher, recalls a time driving home from a trip with her family. With her husband at the wheel and her children settled into their seats, she takes the opportunity to catch up on some grading in the back seat. At one point on the drive, one of her kids expresses their annoyance at her, asking why she is not paying attention to them. Melody responds saying she is busy marking student assignments. Her husband looks back at her in the rearview mirror and says, “You’re on your phone, how could you possibly be marking?” Melody holds up her phone, breezily stating that she now has access to everything she needs for work in her pocket.

No longer lugging her binders and computer home from school, Melody praised Teams for allowing her to work conveniently and efficiently from anywhere at any time. Teams increased accessibility, making it possible for Melody and her students to connect no matter where they were. When students had a question or submitted an assignment, Teams notified her, and when she uploaded a new assignment, assessed work, or posted a message, her students were alerted. But Melody acknowledged the costs that came with such enhanced accessibility. She could not sustain this level of availability saying, “I tried being available 24/7 until I began losing my mind.”

It wasn’t until Melody was working late at home one night when she knew she needed to change her practice. Melody reflected on that moment:

Without even thinking, I sent a message to a student in the Teams general channel at about 10:30PM and a conversation about an assignment started, lasting until almost midnight. The next day, my students told me they were aware of the

conversation because from 10:30PM until 11:45PM, they received a ping on their phone with every message that was exchanged.

Melody quickly learned how to create private rooms for student correspondences, but from that point on, she had to set the expectation that she may not be instantly available for correspondence through Teams as she had her own kids to look after at night and on weekends. However, she avoided creating set office hours because she did not want her students to think she was unavailable to them during certain times.

While several themes resonated out of my conversations with teachers with regards to what Teams enhanced, what was striking to me was a newfound ability to teach and learn from anywhere at any time. No longer limited to the boundaries of time and space, Teams created a new virtual classroom where learning could happen from any place at any time. While no extension in the hours of schooling was reported by the Department of Education, many teachers and students experienced a change in mindset and behaviour, and they began communicating via Teams at any hour of the day or night, regardless of their location.

Always On

All interviewees referred to Teams removing the *boundaries* of time and space, forcing teachers and students to establish their own boundaries. Many were challenged with setting and separating the boundaries of their personal and professional lives in the new Teams environment, including Terra, a high school teacher of many subject areas. When students would message her at all hours of the night, she would have difficulty not responding to them because she knew they needed her help. She acknowledged knowing how to set up office hours, but she felt responsible for helping students, especially

because she had Teams on her phone, which notified her immediately of a student's questions. She said:

If I have my phone in my hand and a kid asks a question and it pops up and they're working on an assignment at that time, there's no way that I can't answer them, and I think most teachers are like that. Teams makes the boundaries of teaching and learning harder to separate because you don't have any down time and you feel like you are on 24/7, no matter where you are. Kids expect almost immediate feedback, too, because they are so used to getting an instant response through their phone.

Terra was not alone in her reflections on these new boundaries of time and space. Jason, a high school science teacher, felt like there was a general expectation that teachers were now readily available through Teams. He was hesitant to read student messages in the evening because he knew that the eyeball icon would show students he had read their message, and he would therefore feel obliged to respond immediately.

From Anywhere

The virtual environment of Teams allowed students and teachers to communicate from any location, and teachers reported some of the benefits of this convenience. Never had students been able to message with teachers from home after the traditional hours of schooling, but because students could now use the instant message feature of Teams, the traditional borders of time and space were broken down, no longer governing the correspondences between students and teacher. Teams, especially the messaging feature, not only increased teacher correspondence with students, but it also seemed to *encourage* an instant and distant type of communication. In previous years, Jason would have

received the odd email or phone call from a student after school, but the Teams chat feature increased communication, especially outside of the walls of school. Students began using Teams' chat to notify teachers of all sorts of things. If they could not attend class, they asked for materials to be passed along to them electronically. If students forgot to submit an assignment to Jason in class, they would simply send him a picture of their work, which he appreciated and accepted. Hazel, a technology teacher, gave credit to Teams' messaging for enhancing the reach of her communication with students. Normally, if she needed to get in touch with students immediately, she had to "chase them down on [her] prep," but Teams allowed her to reach them via instant message regardless of where they were. Taylor, a high school skilled trades teacher, appreciated the newfound ability for students to ask questions in real-time, when they were top of mind, and after they had taken time to process information or reflect on their experiences. Students would not have to remember their question when they arrived back to class because they could simply send it along. At one point in our discussion, Rain looked into the camera and solemnly stated, "There were instances of students messaging very vulnerable things, and had we not had the Teams chat, who knows how they would've contacted someone."

The enhanced accessibility of Teams provided new opportunities for learning. Hazel could now offer her students virtual access to experts and guest speakers who otherwise could not have joined the physical classroom. Students from rural high schools were able to access some of the specialized courses only offered in larger high schools. Before Teams, students who were leaving for vacation had to ask for paper learning

packages to take with them on their trip, but Teams provided a way for students on vacation to attend class, no matter where they were.

McLuhan (1964) believes that technologies enhance the speed and power of human faculties, but with this enhancement comes a slowing and weakening of others. While Teams enhanced communication because of the broadened borders of the classroom walls, teachers also reported this convenience diminishing focus, attention, and comprehension. Because many students were now accessing the classroom through Teams via their smartphones, they often joined the class while playing video games or messaging with friends through social media, and students' attentiveness to the ongoings of the class diminished. Multitasking from various locations caused class disturbances. Jason recalled a time when a student accidentally turned on their microphone while having a private conversation with a friend and the whole class heard. Melody reminisced back to a time when a student's microphone was mistakenly turned on when they were in a restaurant drive-through. Unable to get their attention, the whole class had to sit and listen while the student placed their order. One student even checked in on the class from the top of the ski hill. Sophie, a high school math and science teacher, thinks the Teams environment caused retention to decrease substantially, despairingly stating, "I've never gone through a course where students had no idea what they did at the end of the course, until now." Besides the trauma students experienced from the pandemic, she attributed students' forgetfulness and inattentiveness to "The continuous rapid-fire, information overload present in today's society...whereby we try to pack more into our lives in less time."

Teachers noticed a new trend in student behaviour—a tendency to tackle schoolwork late into the evening. Sophie recalled many students waiting until 10:30PM to start their homework, and when they sent questions to her via Teams chat, she was already sound asleep. She was baffled by the time stamps of student activity, saying she received messages “at all times of the day and night.” She turned off her Teams notifications and was not available through the platform after school hours, but she felt guilty for her work-life balance choices because she knew students were trying to get their work done. Taylor tried to establish boundaries, telling students she would not be available after 6:00PM, although she admitted that students regularly contacted her after hours. A student once sent Jason assignments at 3:00AM expecting them to be included in the next day’s report card, which made him concerned about students’ work habits and sleeping patterns. Melody and Rain also expressed concerns for student health after receiving messages and assignments clocking in at all hours of the night. Both felt compelled to respond, “because of everything that was going on.”

The increased connectivity these high school teachers experienced is one being experienced by teachers across North America. Networked technologies like Teams seem to be shaping a new *always-on* culture in public schooling. The findings of a recent study corroborate the shared experiences of these NB high school teachers, claiming that the “techno-invasion” or “pervasive connectivity” of networked technologies are putting an end to teachers’ personal time and space, compelling them to feel like they are on call and obliged to respond to student messages at all hours of the day and night (Terada, 2021, p. 2). Not only teachers’ health, but also the well-being of students in this new *always on* education culture raise cause for concern.

Cassidy (2004) argues that whenever new technologies are used in schools, they reflect the prevailing pedagogy and curricula of their time. Cassidy's statement found validity in my talks with teachers, as the *always on* mentality that networked technology commands in society became a reality in their pedagogy during the 2020-2021 school year. Networked technologies have become an inseparable part of our everyday lives, and after a full year of distance learning, they became part of everyday school lives. Features such as notifications and instant messaging allow teachers and students to be reached from anywhere at any time, and as a result, an *always on* mindset can be formed and behaviours shaped accordingly, making them readily available and creating expectations of others to be the same. While this instant accessibility enhances our reach of time and space, increases our frequency of communication, and creates an *always on, connected* school culture, what time will remain for the important things we value in education that require us to *turn off* and pause? What space will there be to create the distance and quiet required for deep reading without distraction, reflection without interruption, sustained focus, and unmediated time with each other, time *away* from networked devices? As the boundaries of the traditional classroom expand with the use of networked technologies like Teams, to what extent are the personal and private boundaries of teachers and students encroached upon?

What Does Teams Displace or Make Obsolete? Co-present, f2f Interaction

Now, I would like to see you all through our magic mirror. I see Dan and Vivian. I see Marlen and Mona. I see Catherine and Harley. I see Ann and Elizabeth and Jane. I see Burt and Nicole, and I see you, too. I hope to see you all tomorrow, right here in Romper Room. (Retrontario, 2009, 0:30)

These are the host's words from *Romper Room and Friends*, a popular children's educational television show that ran from 1953-1994. The show was set in a preschool classroom where the host would welcome children to the Romper Room School. At the end of the show, the host would hold an open-framed hand mirror in front of her face and ceremoniously say that it was that time to *see* her friends in the *magic mirror*. She would then look through her magic mirror, calling out names of kids who had mailed in their names with hopes of having them read on air while they watched from home. This daily practice of calling out names to unseen faces and unheard voices is how Melody described her experience welcoming students into class as their avatars popped up on the screen. Melody's analogy seems to accurately represent the shared experiences of the high school teachers I interviewed. Students kept their cameras and microphones turned off, which often led Melody to wonder what they were doing on their side of the computer and whether they were even there. She referred to these students as her "Romper Room friends."

Perhaps obvious is that the Teams call obsolesces co-present, face-to-face learning, as the environment requires people to access the platform through a virtual medium. Less obvious is perhaps what effects and changes occur in people's behaviours and perceptions of themselves and others in this setting. Teachers noted differences in how students behaved in a virtual Teams call as opposed to the embodied, co-presence of the physical classroom. A common theme from these observations was that student faces were not frequently seen, nor were their voices regularly heard. Teachers reported two reasons for this. The first was that teachers from two high schools were told by their administrators to keep student cameras off for fear of causing anxiety, seeing something

inappropriate, or opening a window into the socio-economic differences of families. Boz, a Language Arts teacher, expressed concerns over being put in a jeopardizing position, referencing the possibility of only one student joining a Teams call from her bedroom, so it was “quickly established that, for everybody’s safety, cameras would not be turned on.” The second reason is that most students did not want to turn their cameras and microphones on. Because of these limitations, teachers called attention to two crucial teaching approaches often missing from their pedagogy: the ability to gauge students’ body language and incorporating hands-on learning activities into their lessons.

Ability to Read Body Language

Most of the teachers I interviewed bemoaned over the inability to read students’ body language to gauge understanding or to assess the effectiveness of certain teaching approaches (e.g., seeing disgruntled, confused faces or observing illuminated eyes when the *lightbulb* goes on). Most students chose to keep their cameras and microphones off, so teachers were never certain if they were listening or paying attention. A key component of Melody’s daily pedagogical practice is to greet students at the door every day with a smile, but during our interview she questioned, “How do you greet someone with a smile through a camera when they can see you, but you can’t see them?” Melody tries to read students’ bodies as they come through the door, and she can often tell what kind of a day they are having, but she struggled to do this in a Teams video call, and therefore their state of body and mind remained unknown to her, which made it difficult to know how to approach students. She returned to her Romper Room analogy, disclosing that she would greet each student through the Teams’ “magic mirror,” but seldomly receive a response “on the other end.”

Many of the teachers I interviewed lamented over the difficulty of making personal connections with students during virtual calls, also noting that students were unable to make authentic connections with their peers. A common response from teachers was that relationships were difficult to build in this environment because students' faces often could not be seen, their voices could not be heard, and their bodies could not be interpreted. Jason remarked that forming healthy relationships with his students was "significantly tougher this year." Whereas he normally needs a two-week window for students to get accustomed to his playful sarcasm and animated facial expressions, he felt like he could not convey his true personality via Teams for fear of being misconstrued. One of the teachers I interviewed lost a student to suicide during the first year of the pandemic. While the school and public community was shocked to lose them, this teacher struggled to remember what the student looked like. Having only had them in an online teaching capacity, the teacher didn't recognize the student's face when they saw it in the news. Even though the teacher described them as a diligent student who would normally make a lasting impression on people, the teacher regretfully could not remember their face.

In cases where students did turn on their cameras, teachers reported the experience of reading body language being far more limited than in co-present interactions as the screen only showcased a small frame of their heads, and with a class full of students, faces only took up a tiny portion of a laptop screen. Students' eyes were perhaps the most visible of body parts but the language of the eyes is difficult to read in a video call because eye contact cannot be "simultaneously reciprocal"; looking at someone's eyes during a video call means you are actually looking at the screen, and one

“can give the appearance of making eye-contact, but this actually requires looking *away* from the other, and into the camera” (Friesen, 2014, p. 25).

Hands-on Learning

All teachers expressed a deep desire to return to hands-on learning activities when face-to-face learning resumes. They struggled to create tactile learning opportunities in Teams. Jason explained, “you can’t simply take a hands-on activity and simulate it in the virtual realm in the same way” because of “Teams’ functional limitations.” He provided an example of an activity whereby he asks students to run up and down a set of stairs while breathing through a straw to simulate an asthma attack. In person, he can safely monitor them during this activity, asking them to pause when he recognizes a teachable moment. He could not facilitate hands-on learning activities like this one in a Teams call because “these are moments when you need in-person contact, when a student develops a level of trust with you and there’s a connection you make with them in that instance.” He went on to recognize that “there’s an instance during that activity where a student might experience a small moment of panic, and you can reach out to support them, putting your hand on their shoulder saying, ‘are you having difficulties breathing? You can stop right there. That’s what an asthma attack feels like.’” Along with functional limitations, Jason believes Teams “instills a different mindset for teaching and learning.”

Melody also struggled with the lack of hands-on capabilities of Teams. How could she ask students to sing or play instruments as an ensemble when they were all working within different confines of time and space? The varying latency issues caused by the internet connection needed for Teams prohibited students from maintaining a synchronized tempo or performing as a tight band. Taylor expressed excitement to return

to in-person learning so she could pass around tools and objects for students to “touch and explore,” a process she could only emulate through video in Teams. Terra looked forward to a time when she and her students could return to tactile learning activities, such as “getting outside and learning from the land.”

Teams makes it difficult to fully engage one’s body and mind in a learning activity as one must navigate two environments – the virtual and the physical. Teams posed several technical issues for facilitating and assessing hands-on activities. Tactile activities often require physical resources, conditions, or space that students might not be familiar with or have access to. How does one semi-detach themselves or split their senses to focus on a kinesthetic activity in two environments? How do eyes, ears, hands, and other faculties know which environment to be in at any given moment? How can students watch, teach, and learn with and from others, modeling and observing how objects and bodies are being manipulated? How can teachers effectively monitor and assess the safety and progress of a large group of students all separated in different spaces, especially if they are up moving around outside the view of the camera and the range of the microphone? To be engaged in a hands-on learning activity requires one to somewhat disengage from the Teams environment to be present, aware, and safe in their own physical surroundings, but in doing so, one becomes separated from the class and learns in isolation.

What Does Teams Retrieve That was Previously Obsolesced? Lectures

In decades past, it was common practice for teachers to stand at the front of the room and *deliver* content to their students who remained seated in rows as passive recipients of information (Morrison, 2014). The notion of the teacher as the keeper of

knowledge who pours information into the empty containers of students' brains is now widely recognized as outdated and ineffective for teaching students to think critically, solve complex problems, and make meaningful connections (McCollum, 2018). Since King first coined the term *sage on the stage* in 1993, the role of the high school teacher has changed, shifting focus from a teacher-centered approach to student-centered learning, or as the well-known cliché states, from *sage on the stage* to *guide on the side*. All the teachers interviewed in this research received various professional learning sessions focusing on student-centered, inquiry-based approaches to teaching and learning. But despite their best efforts to continue their regular teaching role as a *guide on the side*, many reported that the functional limitations and perceptual influences of the Teams virtual call transformed their teaching approaches back in time and practice to take the form of *sage on the stage*, bringing back the lecture and a teacher-centered approach to education.

These teachers were reluctant to take on the *transmittal* teaching approach of the lecture, but the Teams environment limited their pedagogical autonomy. Jason lamented on the challenge of authentically engaging students in discussion, emphasizing that it was extremely difficult to “converse with black screens with rows of avatars and initials,” and that he felt like he was “giving a university lecture, talking at them as opposed to interacting with them.” Boz commented on the very limited interactions and responses of students in this environment, comparing himself to a “radio DJ, just sending out information through a one-way medium.” But how does a new virtual platform like Teams bring teachers' practices back to the lecturing approaches of the past?

In a Teams virtual call, students appear in a grid, situated in a way that their avatars or videos are displayed linearly in rows. For teachers looking at their computer screen, this setup might resemble a classroom of old where students are seated in rows. Students are confined to their placement on the screen by the limitations of the software. To “[make] meetings feel better during the pandemic,” Microsoft introduced a new feature to the Teams virtual meeting experience called Together Mode whereby “everyone is united in a virtual space as if in a theater instead of being separated in boxes” (Lanier, 2020). The new software “uses AI segmentation technology to digitally place participants in a shared background, making it feel like you’re sitting in the same room with everyone else in the meeting or class” (Prabhu, 2021). When enabled, Together Mode seats 11-49 participants in a virtual lecture hall (Wade, 2020). Microsoft claims that when meeting in Together Mode, “people typically become more relaxed, more attentive to one another,” experiencing a “better sense of connection,” and that “it’s easier and more comfortable for people to find moments to enter a conversation” (Lanier, 2020). Despite Microsoft’s claims, the teachers who tried Together Mode commented on the difficulty of making personal connections with their students in the virtual lecture hall, observing that students were unable to make authentic connections with their peers even though they were seated virtually beside them. Teachers reported a lack of two-way communication among students, speculating that some students seemed to be intimidated by Teams’ virtual environment and responded by keeping their cameras off. In Together Mode, only those students who turn on their video are seated in the auditorium, and those who prefer audio, or who do not have video capabilities or the desire to show their faces remain secluded from the group. As one blogger puts it, “people who are joining over

audio only are relegated to a bar of shame at the bottom of the meeting screen” (Wade, 2020, para. 5).

A lecture is “the action of reading, perusal” (Oxford Dictionary, n.d.) or “a discourse given before an audience or class especially for instruction” (Merriam-Webster.com, n.d.). One definition describes a lecture as reading to an audience, which implies a one-way communication method, and the other uses the phrase *given before an audience*, which suggests a process of sending and receiving rather than a reciprocal exchange. Teams retrieves the lecture hall, a place where lectures occur, not a space in which more active learning takes place. But does a physical or virtual lecture hall influence and sway teacher pedagogy to take on the form of a lecture?

John Culkin (1967) once wrote, “We shape our tools and thereafter they shape us” (p. 54). Culkin’s statement found authority in some of these teachers’ shared accounts. When Teams’ Together Mode relocated teachers and students into a virtual lecture hall, their behaviours were shaped and governed accordingly: teachers created and facilitated lectures, speaking at students rather than conversing with them or offering hands-on learning activities. Lectures and lecture halls structure what teachers and students can see, say, and do, and they assign different roles to them in the process. Whether it be a physical lecture hall or the Teams’ virtual auditorium, teachers and students are governed by the rules, biases, and design of the medium. In other words, when a teacher is placed within the confines of a lecture hall, they take on a lecture-style approach because the technology subtly shapes one-way communication. Teachers made efforts to engage students in other learning scenarios, but the work and problems involved in using Teams

in ways that counteract its biases often created pedagogical challenges, as I explore in the next section.

Claims that the lecture as a teaching approach is endangered (Gross-Loh, 2016) seem ill-founded in today's pandemic pedagogy of distance education, and despite abolishing lectures in the physics department at MIT and efforts to rid education completely of the lecture (Wieman, 2017), videoconferencing tools like Teams seem to guide educators to a lecture-style approach through their software structures and features. Aiming to get to the bottom of why the lecture is still a common approach in teaching despite its popular view as an outdated pedagogical approach, Gross-Loh (2016) asks the question, "Is it the college lecture itself that's the problem—or the lecturer?" I would argue that the medium is a major source of the *problem*.

What Does Teams Reverse Into? Connectedness Becomes Disconnectedness

While the use of Teams allowed teachers to virtually connect with students at a time when they could not be physically connected, teachers reported students being more disconnected than ever. Engagement levels dropped dismally from what they had been in the physical classroom. Teachers and students found themselves not only physically disconnected from each other, but at times, socially and emotionally disconnected as well. Teachers indicated that the usual attitudes, behaviours, and overall mindset of the traditional classroom were expressed differently within the Teams environment. Jason believes his students felt "comfortable" interacting with each other in the physical classroom, but in the virtual setting, "there seemed to be a hesitancy and an anxiety."

Three teachers remarked on their teaching being "less personal," reflecting on how difficult it was to engage with students in a Teams meeting. Sophie pointed out that

even though Teams' analytics showed most students attending class every day, it did not represent "real, meaningful engagement." The lack of student participation in Teams was not due to the sincere efforts by teachers to engage students in a collaborative and inclusive learning environment. Jason tried Teams' Breakout Rooms, which allowed him to divide students into sub-groups to facilitate smaller group discussions, but he found that only students who were self-driven thrived in this environment. Certain students tended to "monopolize" the discussions, and it was too easy for other students to "disengage or check-out." Teachers tried to integrate other interactive software into the Teams environment, such as the web-based trivia game Kahoot. Teachers would post a link to a Kahoot game and ask students to log in to play. After providing time for everyone to join, teachers would share their screen so students could collectively participate in the trivia game through their devices in real-time. To teachers' disappointment, this approach did not work because of latency issues; the timed game would move on to the next question before the students with lagging connectivity had a chance to answer.

Terra reflected on the differences between the traditional classroom and the Teams virtual environment, saying, "In the classroom, you can have really rich discussions and set up debates, but a Teams call is a completely different type of engagement." Terra wanted to find a way to involve her students in asking questions and discussions but her traditional forms of engaging students in a co-present environment did not apply in the virtual environment. She believes an essential approach to learning is the process of inquiry, but during a Teams call, Terra often became frustrated only seeing student questions and comments in the chat box after the teachable moment had passed.

These teachers could not get their students to engage orally. Boz remarked that this process was “like herding cats because no one really participated.” When I asked Boz what the difference was between the physical classroom and the Teams call, he attributed the lack of participation to having no accountability on the part of students to show their faces or sound their voices; Teams allowed students to be *there* through their avatars “but not really be there.” Boz remarked:

It’s different when you’re in a real classroom because you are co-present and there is a respectful accountability to each other, but that is lost when a screen mediates you. We humans change when we’re behind a screen; we act differently. I see it when students talk to me and when they talk to each other.

He commented that those who didn’t care about participating in schooling before the pandemic could now be “doubly-disengaged” from both the physical and virtual classroom environments.

Out in the Ether

Hello? Hello? Is there anybody out there? Nothing... I watched and listened to Jason describe his experience teaching students in a Teams call. He regularly felt like he was teaching at the International Space Station, “just shouting at black.” Jason reminisced on the emptiness of the experience, saying, “I would look out into the *ether* seeing only little encircled avatars, calling out to student names, but the response from students was the same response I would receive from space: nothingness.”

A few teachers shared Jason’s challenges to engage students. Three teachers reported staying after class to answer the questions of those students still on the call. They assumed students remained after class to seek clarification, perhaps too nervous to

speak up in front of their peers during class time. But rather than finding students with questions, they discovered no one was there and heard only silence from empty avatars. Terra described these students as having “logged onto the call but checked out of their learning.” Melody often scanned the screen of initials and wondered “what students might be doing on the other end,” and despite Sophie’s efforts to use a digital spinning wheel to randomly select students to share their thoughts on a particular topic, she heard only crickets from encircled images of cats and pickup trucks. Boz reflected on the very limited interactions and responses of students, expressing that he was “just sending out information, not knowing where it’s going or who’s listening.” Jason, whose classroom is normally a place where students ask questions, interrupt him, or raise hands, lamented on the challenge of authentically engaging students in discussion, emphasizing that it was extremely difficult to “converse with initials,” and that he felt like he was “giving a university lecture but talking only to the ether.”

I am particularly intrigued by Jason’s analogy of students being *out in the ether*. Dictionary.com defines the ether as “the upper regions of space,” which I think a fitting analogy for one’s *place* in a Teams virtual call. When many NB students use Teams as an educational tool, they are learning in and from space. NB is a rural province in Canada and many students who live in rural areas do not have access to high-speed internet (CBC News, September 26, 2021). They must rely on radio waves to communicate with satellites orbiting the Earth to connect to a Teams call, virtually learning from outer space. Students in urban centres with high-speed internet might be tethered to access points or cell towers, but they still learn in cyberspace. Given this view, students are

virtually *out in the ether* when they are learning via Teams. They are as far removed from the physical classroom as any students have ever been.

There seems to be a metaphorical connection to being *out in the ether* as well. The shared experiences of teachers would suggest that students were *feeling* like they were out in space, astronauts disconnected physically from their teacher and peers, but also disconnected from meaningful, engaged learning. Their avatars resembling astronauts floating in space, tethered only by unseen transmitted signals. In essence, every time someone actively participates through a networked device, a part of them is outside their own body in cyberspace, what McLuhan (1964) refers to as an extension of oneself.

Conclusion

Neil Postman once wrote, “New technologies alter the structure of our interests: the things we think *about*. They alter the character of our symbols: the things we think *with*. And they alter the nature of community: the arenas in which thoughts develop” (Postman, 1992, p. 20). Employing the Laws of Media is a way to recognize the rules, patterns, structures, and biases of Teams that guide teachers’ and students’ thoughts, feelings, behaviours, and understanding in ways different from the traditional classroom. While these high school teachers and students were forced to relocate to the Teams virtual classroom because of the COVID-19 pandemic, substantial investments have been made and new habits have been formed, and it will be intriguing to see the role Teams plays in teaching and learning after the pandemic. The Laws of Media allow us to gain insight into the effects of using Teams as an educational tool before cultural norms and practices become too entrenched in the system, affording education districts and departments time to understand them and make a judgment on if, how, and when Teams

will be used. I hope the shared accounts of these NB high school teachers' views and experiences of teaching in the Teams environment are considered when educational decisions involving Teams and other technologies are made after the pandemic.

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Article 4: The Coronavirus as Break Boundary: Navigating New Landscapes in New Brunswick Education

Abstract

The coronavirus has caused what Kenneth Boulding (1963) calls a break boundary in public schooling, a transformative point at which a system suddenly changes into another or passes some point of no return. When schools across the globe closed in March 2020, students were left with no access to formal education. Over the next few months, education departments responded by investing millions in electronic devices, software tools, and infrastructure upgrades, as well as a range of professional learning to provide teachers with the skills and tools needed to move their practice from traditional place-based classrooms to computer-mediated virtual environments. Indeed, a new landscape took shape in NB public education. The escalated use of digital tools by schools during the pandemic has generated excitement and concern from a broad range of voices. Some say this increased use in technology allows for a chance to reimagine education while others caution about wholeheartedly embracing technologies as essential educational tools. A crucial discourse absent from these voices are those of teachers, who must make sense of this shift and change their practice in accordance with the corresponding rules and structures of new learning environments created by digital technologies. This work aims to encapsulate to what extent this intensified turn toward technology has influenced and reshaped high school teacher pedagogy and what these implications might mean for education in the future. Data was analyzed and themes were identified from my conversations with eight New Brunswick high school educators who participated in the blended learning environment during the first full year of the pandemic. In addition, I

offer intermittent commentary from my personal observations throughout the article, reflecting on my efforts to provide guidance and support to teachers as a school district technology subject coordinator during this time. The article concludes by advocating for education reformers to consider the voices and experiences of teachers and students who are left to make sense of these new tools and environments during this unique educational era.

Keywords: technology, education, pedagogy, COVID-19, blended learning, Microsoft Teams

Introduction

I believe we are at a point in time that could be described as a “break boundary” in New Brunswick (NB) education, a transformative point at which “a system suddenly changes into another or passes some point of no return” (Boulding, 1963 in McLuhan, 1964, p. 58). When the coronavirus forced NB schools to close on March 16, 2020, students were left with no access to formal education. Over the next few months, the NB Department of Education and Early Childhood Development (EECD) responded by investing millions in electronic devices (Poitras, 2020), software tools (Brown & Young, 2020), and infrastructure upgrades (Van Horne, 2020), as well as a range of professional learning for teachers (GNB, 2020). It was an effort to provide educators with the skills and tools needed to move their practice from traditional place-based classrooms to computer-mediated virtual environments. In the fall of 2020, a new landscape in NB schools took form. Most high school students embarked on a new blended education model, splitting classes in half to rotate between learning at school and learning remotely (GNB, 2020). All schools would eventually receive wireless infrastructure upgrades to allow for a new province-wide bring your own device (BYOD) program. While these investments may be perceived as a stopgap solution at a time of crisis, I believe they have fundamentally changed the NB education system.

The escalated use of digital tools by schools during the pandemic has generated excitement and concern from a broad range of voices. Some say this increased use in technology allows for a chance to reimagine education (NB EECD, 2020; Tam & El-Azar, 2020). Others caution about embracing technology as an essential educational tool and warn that teachers (Tutton, 2020) and students (Barret-Fox, 2020) are simply not ready for this transition, advocating for education leaders across the system to “consider

the conditions that would need to be in place for students to learn and for teachers to teach in these new conditions” (Osmond-Johnson, Campbell & Pollock, 2020, para. 2). Although research that focuses on educator experiences is now emerging (See Lei & So, 2021; Marek et al., 2021), a crucial discourse absent from these voices are those of NB teachers, who must make sense of this shift and change their practice in accordance with the corresponding rules and structures of new learning environments created by digital technologies.

Through a series of interviews, this article, which is a component of my doctoral thesis, aims to encapsulate eight NB high school teachers’ experiences and interactions with educational technologies in a blended learning environment during the first full school year (2020-2021) of the coronavirus pandemic. Rather than take a for or against approach to educational technology use, I aim to bring to light important considerations and potential implications of this heightened shift to blended education and the use of digital tools as new modes of teaching and learning. I investigate how the new blended learning environment in NB education uniquely influences the way teachers construct, present, and share knowledge, and as a result, how the manner in which students learn and come to make meaning changes. Overall, I aim to demonstrate how shifting to a new classroom environment ultimately changes the landscape of education in NB, breaking traditional boundaries of NB schooling, and with this shift comes unique impacts on teaching and learning and the reorganizing of social, emotional, psychological, and sensorial responses from teachers and students. I conclude by advocating for education reformers to consider the voices and experiences of teachers and students who are left to break trail in this new educational terrain.

Methodology

This work is part of an articles-based thesis which aims to understand in what ways NB teacher pedagogy is being reshaped by the new digital technologies and virtual environments being used to safely educate during the coronavirus pandemic. During the first full school year (2020-21) of the coronavirus pandemic, NB high schools with large enrollment moved to a new blended learning model. Students attended school in person on one day and learned remotely the next day. Teachers would be “responsible for their entire class, whether they [were] physically present or engaged in blended learning activities” (GNB, June 12, 2020, p. 2). I aimed to interview teachers who taught in two environments simultaneously - the Teams virtual environment and the physical classroom. I sent an initial online questionnaire (see Appendix A) to all high school teachers in the Anglophone West School District via email. 13 teachers responded and eight met the criteria. These eight teachers from seven NB high schools represented a wide variety of years of service, subject areas, and urban and rural regions. Associated high schools and subject areas taught have been omitted to ensure participant anonymity. Pseudonyms are used for all research participants.

In the initial questionnaire, all research participants identified digital technology as being an essential tool for learning in high school and all perceived themselves as having at least an intermediate proficiency level of teaching with educational technologies, particularly with Teams. Perceived comfort levels of teaching in the blended learning environment spanned a wide range of proficiency levels. The call for research participants was administered through a digital survey, which may have deterred those with basic or novice proficiency levels of using educational technologies from participating.

At the end of the 2020-2021 school year, the first full year of the pandemic, I asked the eight research participants to think broadly about how the COVID-19 pandemic influenced their teaching practices and philosophies. To guide their reflections, I asked them to consider what opportunities and limitations they encountered in their pedagogy, what benefits and challenges they experienced teaching with educational technologies in the blended learning environment, and to what extent the digital technologies used during the pandemic influenced and reshaped their pedagogy. All eight participants engaged in a two-hour interview with me. Conversations took place over a Microsoft Teams (Teams) video call beginning with predetermined questions (see Appendix B) and moving to discussions directed by interviewee responses.

To explore the new educational landscape being created by these new technologies, I draw upon media ecology, which is the study of technologies as environments. Not only machines and tools, the term media refers to humanity's inventions, innovations, and processes that mediate the human experience, how these things change the power, speed, and functionality of our human capabilities, and in doing so, how they also change us (McLuhan, 1964). The term ecology refers to the interactions that take place within mediated physical, social, emotional, and intellectual environments. Postman (1970) explains:

An environment is, after all, a complex message system which imposes on human beings certain ways of thinking, feeling, and behaving. It structures what we can see and say and, therefore, do. It assigns roles to us and insists on our playing them. It specifies what we are permitted to do and what we are not. (p. 161)

I also offer commentary from my own experiences as a school district technology subject coordinator throughout the article, reflecting on my efforts to provide guidance and support to teachers and sharing some of the challenges and opportunities I faced in my work during the first full school year of the pandemic. Excerpts from teachers' responses to the interview questions and my corresponding analysis are presented in this work.

As a guide to frame my interview questions, I used the four components from Danielson's (2007) Framework for Teaching that have been critically linked to improving student learning: Instruction, Classroom Environment, Planning and Preparation, and Professional Responsibilities. Danielson's Framework (2007) is "a research-based set of components of instruction that are grounded in a constructivist view of learning and teaching" (p. 202). While Danielson's work is over a decade old, it is still widely used and cited. Several other themes were identified from teacher interviews in other articles (McGuire, in press) but not included in this paper, such as the enhancement of anytime/anywhere learning, the obsolescence of co-present learning, the retrieval of teacher lectures, and the reversal of connectedness to disconnectedness.

Instruction

The core component of Danielson's (2007) Framework for effective teaching is instruction as it describes "the critical interactive work that teachers undertake when they bring complex content to life for their students" (p. 77). At the heart of effective instruction is engagement, which includes communicating with students, using questioning and discussion techniques, engaging students in learning, using assessment in instruction, and demonstrating flexibility and responsiveness (Danielson, 2007). My

findings begin with this important theme of engagement, which is central to Danielson's instructional domain.

Engagement

Back in 2019 when I was doing my second comprehensive exam for my doctoral studies, I inventoried 150 educational journals and magazines regarding the impact of educational technologies on teaching and learning. The theme that resonated in 25% of the articles was that educational technologies increased student engagement. What was unclear about this finding was what defined or characterized engagement. Technology was not identified as a means to measure or improve academic performance in most of the publications I inventoried. Only one article connected student engagement to academic achievement. I became intrigued by this idea that digital technologies increase student engagement in the classroom, and I began to question why teachers and schools employ the use of educational technologies if they are not be linked to academic success. I asked eight NB high school teachers to reflect on what engagement looked like in the blended learning environment in the 2020-2021 school year.

To facilitate the new blended learning model, a laptop or tablet was deemed a required tool for all NB high school students, an initiative the EECD said would “help avoid interruptions in learning that may result from COVID-19 and allow for more personalized learning opportunities” (April 2, 2020, para 1). Yet, despite teachers' efforts to encourage students to use their laptops for learning as part of the newly instated BYOD program, many students chose to bring their smartphones to class instead. Teachers reported that rather than preventing interruptions in learning, student devices

caused distractions and disruptions, both in the physical classroom and the Teams virtual environment.

Engagement in these high school classrooms resembled the type of engagement reported in the articles I inventoried: increased student engagement in the use of screens rather than using devices to improve learning goals. Melody, a fine arts teacher, used to enjoy students entering her classroom offering a greeting before finding their seat. Now, with a provincial BYOD program in place giving students full access to their own devices, students would enter the room with heads down in their phones, intuitively navigating to their desks without looking up. She said it was like experiencing a reversal of evolution, comparing students' disposition to the famous depiction of humans as apes hunched over with devices in hand. Melody expressed concern over her students' addiction to their phones and said, "this year only heightened their addiction". She struggled with students snap chatting during class, and eventually gave up trying to regulate their behaviour after students brazenly and boldly fought back with entitled voices. Like Melody, Jason, a science educator, observed most students deeply engrossed in their phones at any given moment, but rather than using them as a vehicle to engage in learning, he went as far as saying when students unlocked their phones, they metaphorically "left the room."

Along with the distracting allure of the devices, teachers reported typing being a significant setback because of the tiny keyboards, but that students were willing to sacrifice speed and functionality for convenience. Jason remarked that even though the functionality of Teams and other applications in the MS Office Suite were far superior for learning on a laptop or tablet, students still preferred to access them via their phones.

When I asked Jason why students preferred their phones even though there were far better tools available to them, he speculated on two reasons: students' sheer comfort with their phones and the increased accessibility of social media and other communications apps. All teachers bemoaned that student engagement levels within these devices increased substantially, sending personal messages to friends and scanning social media, but despite their attempts to have students use these phones for learning, engagement in classroom discussion and overall learning greatly diminished.

Because teachers had to attend to students in the physical classroom and the virtual environment, they too had to be tethered to their devices. Taylor, who teaches skilled trades courses, used two devices at one time while teaching via Teams. She walked around the room with her iPad in hand so she could conference with students in class while monitoring those in the virtual world. To blend the virtual and physical classrooms, she displayed her laptop screen through the smartboard. Sophie, a math and science teacher, would have three devices always running: a laptop for class meetings, an iPad to receive submitted assignments, and her phone to message with students at home. She joked saying her students said it looked like she worked for the FBI, and she said being "always connected felt strange."

Eventually, the amount of screen time teachers and students were accumulating became overwhelming for some. Sophie's students "absolutely despised the amount of screen time they were getting." They admitted to cutting back on their video game playing in favour of going outside because they were in front of screens for so long. Learning through a screen for four to five hours a day was "too much for them." Sophie

was troubled by the amount of screen time being consumed during the pandemic and feared not only for her students' health, but also for her own children's.

Sophie is not alone in her concerns as an educator. Teachers are reporting the effects of a heightened exposure to screens and other digital media in the classroom, indicating negative impacts on student learning (See Reish, 2021; Walker, 2021), inappropriate student behaviour (Sparks, 2022), and poor sleep and work habits (McGuire, in press). The American non-profit educational media organization, Common Sense Media, released a report in 2021 indicating screen use for youth between the ages of 8 to 18 spiked 17 percent between 2019 and 2021, exceeding the increase from the four years before the pandemic (Rideout et al., 2022). Screen use rose by more than an hour and 15 minutes for teenagers to eight hours and 39 minutes per day, and those increases did not include students' screen time in class or for homework. Other studies in Canada showed an increase of over three hours a day for students during the pandemic (See Holland Bloorview, 2021; Rucchin, 2021).

Assessment

The technologies used in the blended learning environment reshaped the way teachers planned and administered assessment, and they influenced the way students behaved academically. Teachers noted that they adopted a different set of assessment practices in the Teams virtual environment. The Teams software seemed to encourage assessment through quick digital check-ins. Teachers would pause and check for understanding while teaching by asking students to indicate their level of comfort or comprehension through emojis (e.g., thumbs up, frowning face) or short embedded surveys. Teachers reported that formative assessment practices, however, were extremely

difficult to administer because of the limited features Teams offered and its inability to incorporate non-digital forms of assessment, such as hands-on demonstrations of skills and knowledge.

Many teachers noted that copying and plagiarism increased due to the heightened use of electronic devices. Along with their colleagues, they were concerned about the integrity of summative assessments as there were no mechanisms in place to ensure students were not being given an unfair advantage from being at home, insinuating that they could call upon other unsanctioned resources such as web browsers and search engines to complete tests or quizzes. In the past, Terra, who teaches a broad range of subjects, would ask students to answer a question through a written response via paper and pencil. In the blended environment, she decided to try Microsoft Forms, a survey software that can be embedded in Teams. She liked that Forms could grade things for her and send students instant feedback, but she despairingly stated that students would open a window in their browser and find answers to her questions. She was looking to gauge student understanding and comprehension through a response, but she was receiving what someone else had written on the internet. She believed her traditional paper and pencil approach was a “true assessment”, but Forms and Teams were not. Furthermore, her students admitted that assessing via digital tools allowed them to avoid reading an assigned chapter because they could simply Google what it was about and respond accordingly. Jason reminisced back to a time when he setup an online quiz for all his classes. He was taken aback by the answers from one of his period three students who returned their quiz to him in two minutes. “That doesn’t seem right at all, this is amazing,” Jason recalled, until he realized the student had started the quiz that morning

and the “true test of their knowledge was enhanced by Google.” “It was the best quiz they wrote all year,” he said, pointing out that “the answers [were] close to a dissertation.” The administration offered “an unusual solution to these challenges,” suggesting teachers have students write the tests while teachers watch them through a Teams video call. It suddenly struck Jason, “they wanted me to watch them – all – write a test for an hour!” Jason and his colleagues responded to this challenge by developing a “purely online assessment model” that was only meant for home. Looking forward to future years, Jason sees a place for assessment through web applications like Microsoft Forms for formative check-ins, but not for summative assessment.

Some of the participants appreciated a Teams approach to assessment. Sophie’s assessment practices changed because students now had access to their notes and Google at home. She was not worried about students cheating or using the honour system or watching them write tests through video; what she needed students to do was to apply what they learned. Given this outlook and the scenario in which she found herself and her students, she changed her assessment practices and embedded more critical thinking and problem-solving applications into her teaching practice. She was never a fan of memorizing formulas, acknowledging that “students can locate information faster than they can memorize it,” so she changed her assessment approach accordingly.

The Chat Box

Over 20 years ago, Jaron Lanier (2001), one of the founders and global experts in virtual realities research, made the comment that “human interaction has both verbal and nonverbal elements, and videoconferencing seems precisely configured to confound the nonverbal ones” (p. 68). Over the last two decades, videoconferencing has become a

cultural norm of societal communication, but its fundamental composition as a telecommunications medium that combines virtual reality with videoconferencing (Lanier, 2001) remains the same today. While the shared experiences of these high school teachers would suggest that videoconferencing tools, such as Teams, still confound some non-verbal elements of communication, such as eye contact and body language (See McGuire, in press), they now encourage a bias toward the nonverbal communication of symbol use through the chat box.

Despite teachers' best efforts to engage students in conversation through audio and video, most students resorted to the chat box to contribute to class discussions. Aligning with the observations of his colleagues, Boz, a language arts teacher, contended "A lot of the students didn't like audio chime-ins," and that "their preferred method was typing in the chat box, which limited the types of student interactions and responses." To the frustrations of teachers, Teams chat often occupied students' attention and engagement through text, images, emojis, memes, and GIFs while they were teaching. Because of this, many educators believed their teaching became "less personal," expressing how difficult it was to engage with students who would never turn their camera or microphone on. Terra was challenged to engage students in oral discourse and referred to her efforts as "pulling teeth." She felt Teams discouraged students from contributing orally and rather encouraged them to contribute through the digital communications tools of their smartphones (e.g., emojis, GIFs, stickers). After numerous times reminding students that they needed to turn their microphones on and speak out to get her attention while she was teaching, students still resorted to the chat box to ask questions or make comments. She noted that students expressed frustration, feeling like

they were being ignored, but she also felt frustrated by not being able to be “in two places at once” only seeing students’ questions and comments after the teachable moment had passed. She found it “interesting that students were intimidated by the Teams environment”, refusing to turn their microphones on or raise their virtual hands, which she saw as the equivalent to being in class and speaking out or raising one’s hand.

There were also shared observations from these teachers that the Teams’ chat box gave voice to students who would normally avoid class discussions. Taylor believed the chat feature gave these students an extra measure of comfort, and so she often encouraged students to share one meme in class. Taylor believed the Teams chat allowed her to make connections quicker by following up on previous conversations through check-in messages. Rain, a social studies teacher, felt that the Teams chat increased her communication with students, giving her an extra avenue to strengthen rapport. The chat box gave her “more time to be silly and fun” by sharing photos and memes with her students.

Teachers reported students using the chat box as a catch-all means for answering questions, reacting to statements, engaging in polls, and corresponding with teachers, peers, and guest speakers. Students even used the chat box for submitting work, despite teachers’ having setup the Assignments tab. Perhaps this exclusive use of the chat box is due to Microsoft designing the Teams platform to position chat “at the center of whatever you do in Teams” (Microsoft, n.d.). This central positioning includes a multitude of functionalities, resembling a one-stop-shop for sending messages that include “files, links, stickers, and GIFs—whatever you need to get your point across” (Microsoft, n.d.).

What is important to note about the chat box is that while it offered new ways to get one's point across, it also changed the meaning of one's point. McLuhan's (1964) notion that the content of any technology is not nearly as important as how it guides the things we do, how it makes us feel, how it changes the way we think, and what things we come to value through its use is important to consider in education. According to Meyrowitz (1999), different media have unique ranges of expression, attributes that make them physically, psychologically, and sociologically different from other media. Therefore, when conversation changes from oral communication to symbol use, new freedoms and impositions are placed on human beings, and as a result, new ways of thinking, feeling, behaving, and knowing are developed. What can be written in a chat box is different than what can be said through oral conversation, and therefore the meaning changes.

Classroom Environment

Danielson (2007) describes the classroom environment as a key component of a teacher's ability to effectively teach and promote learning. Danielson writes, "Teachers create an environment of respect and rapport in their classrooms by the ways they interact with students and by the interaction they encourage and cultivate among students" (p. 64).

Two Environments in One

All teachers bemoaned over having two environments in which to attend to the needs of two sets of learners – the physical classroom whereby students learned in co-presence and students' homes where they learned in isolation. Each environment provided different tools and resources, and teachers and students were constantly

challenged to adapt to the unique challenges, opportunities, and supports within each environment. Teachers reported that most households were often unable to support student learning (see Barron et al., 2021), and most students preferred learning at school than from home. Sophie and Rain both commented that students “hated learning from home” and found it difficult to get motivated. They were also challenged with more distractions at home than at school, as homes were busier and noisier environments than the classroom. Student siblings were often seen and heard, dogs barked in the background and cats crawled across keyboards, and parents competed for devices, bandwidth, and quiet spaces.

Microsoft addresses the issues of busy and noisy environments through software tools that create pseudo environments: backgrounds can be blurred or images can be placed behind users to avoid seeing what is happening around them, and noise suppression software can be used to eliminate disruptive noises that “keep meeting participants focused” (Microsoft, n.d., para 1). While these tools help limit the distractions through the screen, they do not cancel or suppress the sights and sounds that surround users in their true environments. These new features can also become a source of distraction, as I recall teachers playing with various backgrounds during meetings and professional learning sessions. In a Teams call, meeting participants must attend to two environments: the physical and the virtual.

Poor living conditions of students that were previously unseen to teachers and peers became visible. At one point in our conversation, Sophie reveals that “COVID-19 has shone a light on the students we’re leaving in the dark,” and that “we’ve provided these kids with the technology to connect from home but that doesn’t mean we’ve

improved their home environment, and some students don't want to share that with us." Teachers pointed out that, in the blended learning scenario, students who had support from home had a greater advantage than students who did not, but those advantages were not as prominent within the walls of the school as students learned in the same classroom with the same supports.

In addition to the disruptions and disparities caused by students' home environments, teachers were frustrated because they had to convey the same messages, activities, and lessons twice in the same period. Whatever they said in class had to be repeated for those online. Classroom discussion was greatly affected in the blended learning environment. Rain regretted not having built-in time for a one-on-one or whole group discussion due to the struggle of managing two classrooms at once. Rain shared:

This year, it was hard because I felt torn between the students who were in class and the ones who were at home. The students at home would be messaging me and asking questions while I was trying to have a one-on-one discussion with a student in class.

She apologized to students in the class when she had to cut their conversations off short to respond to the students in the digital world and admitted, "it never felt quite right to do that, but we did it because we had to." She observed that the students in the classroom could see when she was conversing with students online, and they would respectfully wait for her attention, but the students at home with no eyes or ears privy to the ongoings of the physical classroom would call upon her with an immediate need, and they expected an immediate response. Melody noticed students in her physical class

would not listen when students in Teams chimed in with comments and questions, and that this was a time to tune out for them.

The Spotlight

During Teams virtual calls, student faces were seldom seen, and their voices rarely heard. Teachers reported two reasons for this. The first was due to administrators from two high schools directing teachers to “keep student cameras off for fear of causing anxiety, seeing something inappropriate, or opening a window into the socio-economic differences of families” (McGuire, in press, p. 10). The second reason was that many students did not want to turn their cameras and microphones on. Teachers called attention to a change in mindset between the co-present classroom and the Teams environment, stating even students who were regularly active in the physical classroom somehow lost their voice in a Teams call.

Why were most high school students who would normally speak out freely in the physical classroom less apt to share their voices and faces with others in the Teams virtual environment? Jason believes “There is a spotlight shone on students when they speak in the Teams digital world” and as a result, many experienced a type of “stage fright” by being put on the spot. Not only a metaphorical analogy, Teams also creates a visual representation of a spotlight. When someone speaks in Teams, their encircled avatar lights up and glows creating a striking, circumscribed spotlight that calls attention to them. Depending on the enabled settings of a Teams call, people who speak hold the largest real estate on the screen because their avatar or video becomes enlarged and showcased. The spotlight was an uncontrollable feature that put students on the spot and made them feel uncomfortable. For example, if an unexpected noise came from the busy

environment of a student's home, the spotlight would also call visual attention to the noise, indicating to everyone who caused the disruption. Students learned that if their microphones and cameras remained off, they would avoid the spotlight and receive less attention on the screen, keeping them housed in the bottom bar of the screen, eventually relegating them within the ellipsis, only to be noticed if someone went looking for them. Given this environment, Jason's analogy of a spotlight is a fitting one. Those who spoke in Teams stepped into a spotlight for all to see and those who stayed silent remained hidden.

Jason wondered why this feeling of a spotlight was absent from the physical classroom. Teachers noticed that when students were asked to turn on their camera or microphone, they felt isolated, like everyone was looking at them and listening to them only. Jason compared turning one's microphone or camera on during a Teams call to getting up out of one's seat in class, walking to the front of the room, and making an announcement to the group. And while some students feared speaking out in any environment, Jason remarked that other students who craved this way of contributing to an in-person class discussion avoided speaking in the Teams environment. Terra made a similar observation, calling particular attention to one student who previously contributed frequently to in-class discussions but somehow lost their voice in the Teams meeting. Sophie remembered some students feeling awkward or self-conscious because of the way the camera angle made them look on the call. The spotlight created in Teams seemed to cause students to anxiously focus on themselves during a call rather than feel like they were learning as a collective with their peers.

Planning and Preparation

Danielson (2007) describes the domain of planning and preparation as “the critical, behind-the-scenes work of organizing for classroom instruction,” which involves “teachers put[ting] considerable effort into transforming [the] curriculum so it is accessible to their students” (p. 43). In the following section, I examine how teachers used Teams to organize the content of their assigned curricula and some of the corresponding responses to this form of information management. Most notable to me were the changes in teachers’ organizational practices involving the transition from print to digital forms of representation.

Organization of Resources

When I asked teachers how their planning and preparation changed from last year, some teachers appreciated how Teams served as a hub for all course materials and its ability to make resources “readily available” for students. Melody went so far as calling this new form of digital resource allocation “the new norm.” Teams improved Jason’s practice of organizing resources for students. He used to keep a file folder at the back of the room where students could sift through and find paper resources, but Teams changed his practice, allowing him to house digital resources like projects, class notes, lesson plans, and assignments all under one roof. Jason recalls a time when one of his students forgot their textbook, and so another student took a picture of the required pages from the text and simply sent them the picture through the Teams chat. “High school students still developing their organizational skills need not inconvenience the teacher for lost assignments or resources” one teacher added, “as required resources sit waiting for them in Teams.”

Almost all the teachers I interviewed made explicit reference to never going back to paper resources again, as everything could be housed digitally via Teams. Taylor found preparing learning resources was easier through the Teams environment. Rather than photocopying documents and scaling them to fit the confines of a piece of paper, she could easily upload things online and let the software do the resizing. Taylor used to keep paper copies of her assessment and attendance records, but with Teams, she will only use digital records moving forward. Sophie said Teams made her planning easier because it synced to Word, allowing her to adjust lesson plans in real time rather than having to erase or rewrite content using a pencil and paper. Having things organized and developed digitally also allowed her to easily share resources and plans with colleagues. Melody said her students appreciated that they could access Teams to see their grades. They often used the platform to determine what assignments had been completed and which were due without having to ask teachers or wait for report cards. In this way, Teams allowed for student assessment to be more accessible and transparent.

Choice Overload

Not all teachers and students appreciated the accessibility of Teams, and many reported having too many avenues to organize resources. Sophie admitted that “There were so many different ways teachers were putting things on Teams.” Teachers uploaded materials to a channel, the Files tab, and the Assignments folder, and this lack of consistency made it confusing for students as they did not know where to find things. During my own efforts to support teachers, I found it difficult to explain that resources uploaded in the chat box of a specific Teams channel would also appear in its Files tab, but materials uploaded to a channel’s Files tab would not appear in the chat box of that

channel. There were also varying levels to which teachers created and used channels in Teams. Some teachers created a channel for everything, which made the number of channels overwhelming and difficult to determine if topics needed a channel or not. Other teachers did not create enough channels, and the few they did use became saturated by information without themes. While the Teams search field made it easy to locate files (if one knew what they were named), it did not offer a means to understand where files *belonged*. Some teachers reported feeling more disorganized in this system because resources could be anywhere and everywhere without rhyme or reason.

The multiple locations of learning resources were not the only source of frustration. Teachers found it difficult to receive assignments from students in multiple ways (handing in a paper copy, uploading through the Teams assignments tab, posting in the chat box, or placing a picture of their work in a Teams channel), and they remarked that this new submission process cost them considerably more time and effort than their traditional submission practices. Teachers then had to locate the assignment, grade it, record it in Teams, and transfer grades and comments into PowerSchool, the official NB provincial grading system that gives parents access to grades, attendance records, scheduling, and other resources (CBC News, 2014). Rather than the traditional methods of handing out assignments and getting students to return physical paper copies of their work, students now had several *convenient* ways to submit work through multiple avenues, which made it very inconvenient for some teachers.

The Desire for Print

Some teachers were surprised at their students' disdain for converting print to digital forms of representation. At one point in the year, Sophie's students' voices echoed

others in the media (See Kelly, 2020) in that they had “had enough” of digital resources and “were done looking at the screen” and wanted “paper copies” instead. They did not want to go through the process of logging on to Teams and searching for resources. Sophie’s students argued that print was an easier medium to access and submit when they were provided with a paper copy. As the year progressed, every single one of Sophie’s students kept a hard copy of everything in their binders. They acknowledged the convenience of the compact, light, and resourceful smartphone, but reported having difficulties focusing on and absorbing information from its screen. Sophie validated their concerns, as she noticed her own eyes jumping around the screen, unable to focus like they could while reading print. Hazel, a technology teacher, related to students’ need to write notes on paper, as she learns best by writing things down, representing information in her own terms. Rain believed students liked receiving written responses from her and reminisced back to her time as a master's student with the same gratification of getting written feedback from her professors. She felt students longed for the same personal connection and tactile experience she feels when flipping through pages of written feedback.

Self-Directed Learning

One of the themes that surfaced from my conversations with teachers was that the Teams environment created a shift toward self-directed and self-paced learning and a movement away from a teacher-driven approach. Taylor attributed this change to the asynchronous learning environment Teams facilitates. She noted that students struggled more to stay on task and pay attention in the virtual synchronous environment but that the asynchronous approach allowed students to be self-directed and take more responsibility

of their learning. Taylor had always wanted to employ a flipped classroom approach, and using Teams asynchronously was the catalyst she needed. She pre-recorded videos showcasing some of the machines she expected students to use in class, which allowed them to become more familiar with the safe and effective use of tools before they commandeered them. Students were able to return to the videos and ask clarifying questions, but Taylor points out that this also made it easier for students to skip class and learn on their own time. Rain said Teams “completely switched [her] classroom approach” and that the virtual environment was a different classroom whereby students had to learn to “work at their own pace and drive their own engagement.” The Teams hub offered a means for Rain to increase student enrichment by housing activities and resources to extend their learning rather than waiting for the rest of the class to finish an activity.

The Teams asynchronous environment worked well for certain learners. Sophie said students who were more solitary, introverted people thrived in the Teams digital environment, and they enjoyed the self-directed approach to learning, but that the “students we are losing in this environment are the students who are not self-engaged learners, those that can simply tune-out and turn-off.” Yet, when I asked Sophie how her teaching practice had been significantly changed this year, she said it was her “inability to differentiate instruction.” “There hasn’t been time to reach every student and allow them to reach their potential” she admitted, and that “it has been very difficult to reach the students at home.” She noted that “on paper, it looks like everyone can learn at their own pace within their own interests, but if there’s 30 students in a 60-minute class with only one teacher online, how do you make two minutes per student meaningful?” Like

Taylor and Rain, Sophie found it easier to differentiate for her academically driven students, who she called her “highflyers” by sharing more resources and content for them to access on their own, but the students who were not self-driven did not receive the support they needed. Sophie lost sleep over trying to figure out how she could help those students while they learned from home.

Why did these teachers notice a movement toward self-directed learning in the Teams environment? Perhaps the structure of Teams promotes this change in mindset. Teams encourages teachers to set up the learning environment in a way that promotes self-directed learning. For example, channels can be created for organizing and guiding certain topics of discussion and for avoiding others. Additionally, the customizable file tabs at the top of the page can help organize class materials and resources for file retrieval and submissions. Moreover, the sidebar of tools allows students to see and add important dates via the calendar, message and share files with teachers and peers through the chat software, and locate their various classes through the Teams icon. Indeed, the everything-in-one-place functionality of Teams encourages students who are self-motivated to rely less on the teacher and to become more self-sufficient in the Teams environment. What is important to distinguish here is that students are not necessarily becoming more self-directed as much as they are becoming Teams-directed. To me, true self-directed learning would see students having a choice in not only *what* they learn, but also *how* they learn.

Professional Responsibilities

Professional Responsibilities refers to the roles and duties of teachers outside the classroom and “the range of teacher professionalism” (Danielson, 2007, p. 92). While no official direction came from the Department of Education or the New Brunswick

Teacher's Federation, the teachers I interviewed reported a changing of teacher roles and responsibilities during the 2020-2021 school year. "There was so much more required of teachers this year – new roles, responsibilities, and practices that extended beyond the traditional boundaries of the classroom and the profession," Sophie affirmed.

Always On, Always There

All teachers made explicit reference to the blurring of their personal and professional boundaries through the exacerbated use of networked devices outside of regular school hours. Whereas the correspondences between teachers and students were previously reserved for the classroom, students now began messaging teachers at all hours of the night and many felt obliged to respond regardless of time or location. Sophie affirmed that teachers are frequently told "you are a teacher 24 hours a day, seven days a week, always in the public eye, so act professional and responsible," a mantra she is fine with, but "teachers should not have to stay connected 24/7, which became a stark reality this year." "Always being connected was an issue," she said, because many teachers communicated with students from dawn till dusk. Being *always on* made many teachers feel *off*.

New Roles and Responsibilities

Not only did the traditional boundaries of time and space become broadened by Teams, but teachers were faced with additional duties they felt unqualified to perform, new needs from students they were unable to meet, and an overall loss of professional autonomy. Melody said teachers were asked to be a "Jack of all trades this year...more so than ever." Teachers felt they were now expected to be technology teachers, teaching

students how to use and troubleshoot hardware and software even though they were still learning how to use the tools themselves.

Teachers reported that while technology was supposed to improve their practice and help them grow professionally while making things easier and more convenient for them, technical requirements and incompatibility issues between devices and software often limited their ability to enhance their professional practice and caused more work for them. Hazel struggled with BYOD because she had to troubleshoot all the nuances of each unique device students brought to class. She is “not a Mac user,” so troubleshooting Apple computers became a nightmare. Even the same software program looked and operated differently across devices. “It was very challenging getting programs downloaded onto the various computers,” she added, and “it would have been easier to use the computers in the computer lab because we all would have been using the same devices.”

Hazel was not alone in her frustrations. My technology team struggled to provide pedagogical support to teachers because most of their time was spent troubleshooting the wide variety of devices, operating systems, and apps being used. Most notably, the majority of students used smartphones to learn while teachers used their assigned laptops, and each medium had its own set of unique functions and rules. Microsoft added to these discrepancies by creating browser, desktop, and mobile versions of Teams with unique affordances and limitations for each. There were technical idiosyncrasies across platforms (e.g., Teams would only function using certain web browsers and not others), so as a starting point to troubleshooting issues, we created a flow chart for each platform.

There were only nine of us to support over 1500 teachers, so teachers often had to stall, shift, or forgo lessons until help arrived.

In my role, I observed that the unique technical functions across platforms were less significant than the different environments they created and the biases they evoked in the way they were used. Students used Teams in the way smartphones are designed to be used, communicating mainly through text, images, emojis, GIFs, and memes on small screens from anywhere at any time. Meanwhile, all the professional learning teachers received around video conferencing was based on using Teams through a laptop, looking at larger screens with web cameras on, ready to engage with students through the camera and microphone. Each medium created a different environment with its own set of rules, structures, and biases, and the biases of each medium often caused communication discrepancies between teachers and students. Teachers' use of Teams via their laptops directed the way they performed their professional responsibilities and created expectations for how students should learn. At the same time, students accessed Teams through their smartphones, which elicited a separate set of behaviours and responses than those of laptops. Sophie and her students also experienced many technical issues (e.g., files would not upload, documents appeared but would not open, pages would not load properly). Many older student devices proved to be incompatible with the Teams platform. "I'm here to teach music, not solve students' computer problems," Melody retorted, expostulating that:

We can't be everything all at once. There will come a time when we need to ask: do you want me to teach kids or fix computers? We are going to need IT support for students in the building if this is the direction we're headed.

Along with IT specialists, teachers spoke of taking on many non-teaching roles. During our interview, Melody closed her eyes and said, “I am beyond exhausted. I have been a mentor, nurse, councillor, social worker, IT specialist, teacher, and everything else. I’m not immune to the pandemic, I’ve had to be things for my own family, too.” Indeed, teachers reported receiving requests for support that were outside of the scope of their teacher training. Teachers had to respond to concerning issues of student mental and physical health, noting that the Teams chat feature facilitated a way for students to reach out. Terra called attention to the vulnerable position teachers found themselves in – the responsibility to care for their students’ social-emotional needs without the formal training to do so. Melody recalled a time when she could not get the attention of one student in class who left their microphone on, and “a lot of violent screaming was going on in the background.” She did not know whether to mute the student’s microphone or listen in hopes that she might somehow support them. She eventually brought the disturbance to the attention of her guidance and administrative team.

Loss of Teacher Autonomy

Teachers felt a loss of autonomy with the digital tools available to them, not because they were unopen to learning about potential ways to enhance their practice, but because they felt limited by the technical designs and features of educational technologies, and they were seldom consulted on which tools might best support their pedagogy. Jason felt more power and control were taken from him and given to Microsoft, telecommunications companies, and the government because they now determined *how* students would be educated. Jason’s concerns were not unfounded. Teachers reported finding out about significant changes to the education system (e.g.,

returning to in-person instruction) through their students and social media before they were advised themselves. As a technology coordinator, I received daily requests from teachers to access digital tools like Google Classroom and Seesaw, but those requests were denied because NB is a Microsoft province, and these tools were incompatible with Teams and unsanctioned by the province. Decisions as to which pedagogical features in Teams would be available to teachers were made at the department and district levels. Teachers often had to discover and adapt to changes in the tools that directly affected teaching and learning. When the Teams chat feature was turned on, allowing students to send private messages to each other, I received requests from principals to turn the new feature off, at least until teachers and students could be educated on how to use them responsibly. But the changes had already been made and teachers would need to shift their practices accordingly and immediately. In some instances, these changes caused significant problems. I recall an instance where a group of students from another city messaged a student from my school district with threats and abusive messages, only to find out later that they had misidentified her for someone at their school with the same name. Other than reporting the incident to the authorities, there was little the principal or I could do, and we never found out what came of the matter.

While unsanctioned tools were not permitted in classrooms, teachers felt vulnerable and concerned because Teams allowed unsanctioned and unknown guests to join a call. Terra reluctantly shared that one student's partner drew a penis and uploaded it to the chat during one class, and Sophie was mortified retelling the story of the entire class seeing one student's father getting out of the shower. Hazel's colleagues were

worried that students might record them teaching sensitive subject matter (e.g., sex education), take it out of context, and share it across social media.

Rain acknowledged the shift in teacher responsibilities that took place over the school year, noting that "For the first time, teachers were responsible to support students' physical and mental well-being. Everything has been put under a microscope [and] COVID-19 has forced us to self-reflect on our roles as educators." "There is a shared experience this year," she added, and hopes this changing of responsibilities is examined and addressed, not only by teachers, but also by policy makers, instructional designers, and curriculum developers. I would add that if these new roles and responsibilities become part of teachers' pedagogy, we consult educators on what technologies and techniques might help fulfil them and which might pose barriers.

Conclusion

Despite a vast global movement toward digital technologies to safely educate during the pandemic, there seems to be very little discussion in public education circles about how these digital tools are creating new learning environments that are reshaping ways of thinking, acting, and knowing. Substantial investments in infrastructure upgrades and educational technologies bring with them noteworthy changes to the way teachers teach and students learn. The accounts shared by these teachers suggest that new technologies redefine the nature of engagement, alter perceptions of self and others, change the means and meaning of communication, expand the roles and responsibilities of educators, and create new classroom environments that foster new approaches to teaching and learning. Indeed, a new digital mindset is being conditioned while other traditional approaches to teaching and learning are being abandoned. But as new

educational technologies make older ones obsolete, they also risk obsolescing the thoughts, emotions, values, and behaviours we learn through them while new ones are learned. And while these new practices might open new possibilities, the impacts on education and society are yet to be realized. These new learning environments have created a suitable petri dish in which to study a changing culture in education. To what extent has the classroom environment and the landscape of education been fundamentally changed with this intensified taking-up of digital technologies, and what potential impacts will this shift have on teaching and learning and the reorganizing of social, emotional, psychological, and sensorial responses from those in education?

I hope this article provides insight into how this break boundary in NB education is influencing teaching and learning in high schools so that considerations and informed decisions can be made by educational partners during this unique period in NB's history. Rather than take a for or against approach to educational technology use, a critical examination of the potential implications and opportunities of this heightened shift to blended learning and the use of digital tools as new modes of teaching and learning needs to be made. To better understand the complex and unforeseen challenges and opportunities brought by this break boundary in NB education, reformers can learn by listening to the voices and experiences of school administrators, teachers, and students who must navigate this new educational terrain and make sense of these environments.

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Conclusion

To address the issues caused by the coronavirus pandemic, educational jurisdictions across Canada and the world turned intensely to digital technologies to safely educate students. New Brunswick (NB) is without exception to this broad sweeping digitization of schooling and the education system during the pandemic. The province invested tens of millions in infrastructure upgrades (Van Horne, 2020), digital hardware and software (Poitras, May 6, 2020), online learning platforms (Brown & Young, 2020), *bring your own device* programs, and professional learning for teachers to move their practice to digital environments (GNB, 2020). In this new educational era, many NB high school teachers are being asked to make a significant shift in how they educate students, moving their practice from traditional classrooms to digital environments, resulting in momentous changes to their pedagogy and student learning.

While these changes to the education system may be perceived as a stopgap solution to the coronavirus pandemic, I believe they have created a new landscape in schools and fundamentally changed the NB education system to a point of no return. While NB schools have since returned to face-to-face learning in classrooms, some of the policies, programs, and habits that formed in the technologically inducted blended learning environments during the COVID-19 era remain in place. This doctoral dissertation aims to deepen the discussion around the impact of this intensified shift toward digital media in K-12 education in NB, and it argues that as a province, we must take notice of the effects of this great transition and make conscious decisions of what we want to support on a go-forward basis.

While this intensified turn toward digital tools in education during the pandemic has generated a broad range of enthusiasm and apprehension, it is the voices of teachers that can bring critical understanding to the services and disservices of these new digital tools and learning environments. In this articles-based doctoral work, I sought to understand in what ways these new digital environments reshaped NB teacher pedagogy and student learning, and what role these environments played in influencing ways of thinking, feeling, acting, and knowing. To understand the pedagogical constraints and opportunities, and the changes in student learning brought forth from this ubiquitous use of new digital tools, I interviewed eight NB high school teachers who taught in the blended environment during the first year of the pandemic. I also reflected on my own experiences as a school district technology coordinator and educational technology scholar. It is the field of media ecology from which I approached this investigation.

Media ecologists are interested in the role technologies play in our lives, how their structures, rules, and biases shape how people think, learn, act, and feel (McLuhan, 1964; Postman, 1970). Media ecologists have found that technologies have profound implications for how teachers teach and how students learn (See Adams, 2008; Albrecht, 2021; Hayles, 2007; Rose, 2021; Stiegler, 2010; Turkle, 2015).

Given the intensified turn toward technology to educate during the pandemic, I believe this doctoral thesis is a timely and effective resource through which NB education stakeholders can be introduced to the idea that technologies create environments that shape how we educate and learn, and that this reshaping is worthy of their sustained scrutiny and critical judgement. This work can help education leaders look discerningly at the influence of technologies on teaching and learning so they can make more

thoughtful, informed decisions around the use of educational technologies. Within these pages, I've argued that there is a crucial connection to be made between how teachers and students interact with technologies in classrooms and how media alter the environments in which they teach and learn.

Article one bridged the practical and theoretical divide between teacher practitioners and media ecologists, and it brought to light the need for a critical approach to technology in education. I introduced teachers to the field of media ecology, and the idea that technologies (i.e., media) are not unbiased machines, but rather mediators that influence, shape, and alter our experiences, perceptions, and behaviours. Using my own insights and experiences as a teacher, technology coordinator, and media ecologist, I distilled some of Neil Postman's ideas (1995, 1998) and those of media ecologists into a set of six principles teachers and students can apply to educational technologies to better understand the role they play in shaping thoughts, feelings, behaviours, and values. I concluded article one by calling attention to the notion that the health and balance of the education ecosystem are impacted by the interactions between media and people, and that media ecology can help us understand the effects of these interactions.

Article two created *pathways* toward a media ecology pedagogy, practical classroom explorations of media ecology concepts. *Pathways* are organized under the headings: Probes and Pattern Recognition (McLuhan, 1964; McLuhan & Carson, 2003); Figure/Ground Analysis (McLuhan, Hutchon, & McLuhan, 1977); The Medium is the Message (McLuhan, 1964); Double-Edged Devices; and Historical Critical Approach (Cali, 2017). Through these *pathways*, teachers and students can explore the media that influence and shape their educational experiences and their lives. Furthermore, because

awareness is not enough (McLuhan, 1964), these *pathways* can help educators and students better align and assign media to the tasks and goals they are inherently designed to achieve. In addition, “When the technology of a time is powerfully thrusting in one direction” as is the case with the current intensified shift to electronic communications tools in NB education during the pandemic, “wisdom may well call for a countervailing thrust” (McLuhan, 1964, p. 102). This work also offers educators and students ways to countervail the effects of media in order to achieve educational goals and maintain a balance of technology use.

These proposed practical classroom applications of media ecology concepts provided new considerations for the theoretical assertions of media ecologists, as well. I offered media ecologists a deeper understanding of how their work can be realized in K-12 classroom settings, as well as applications for their own teaching worlds.

The combination of media ecology theories from article one and the practical explorations of them in article two provided teachers with a starting point to become “media ecologists of the digital” (Adams, 2018, p. 46). A media ecology pedagogy offers educators and students a way to be attentive to the effects of media and make mindful decisions around their use. Moreover, these two articles served as a means to help bridge the practical and theoretical divide between teacher practitioners and media ecologists (Gushue, 1969; Kuskis, 2012) by using a language both groups can understand and by suggesting practical examples of the theories that apply to both audiences.

I suggested practical applications NB teachers and students could use to examine the effects of technology on teaching and learning in article two, but I did not actually employ any of the tools to deeply explore any particular educational medium. In article

three, I used media ecology theories to examine the effects of Microsoft Teams (Teams), a provincially mandated learning management system for NB teachers to use as a primary teaching tool during the COVID-19 pandemic.

As part of this examination, I interviewed eight NB high school teachers who taught in blended learning environments during the 2020-2021 school year. Through our conversations, I sought to understand: what potential impositions and pedagogical constraints Teams placed on their teaching practice; in what sense the software tool guided and limited their pedagogy; how the rules, patterns, structures, and biases of Teams differed from those of the traditional classroom; what challenges and opportunities they experienced; what educational practices and values were taken up and lost as a result of this prevailing shift in pedagogy; how student learning was affected; and in what ways Teams might have reshaped ways of thinking, feeling, acting, and knowing.

As a tool to probe into these inquiries, I called upon Marshall and Eric McLuhan's *Laws of Media* (1988) as a mechanism by which the generalizable rules, patterns, and structures of media can be recognized and studied. These laws infer that every technology 1) enhances a human function, 2) obsolesces a former technology that was used to perform that function, 3) retrieves a function or technology from the past, and 4) when pressed to an extreme, produces a new function or technology that is a complementary form of the original technology (McLuhan & McLuhan, 1988).

Using the *Laws of Media* to examine Teams in an educational context provided insight into the environment of effects Teams created and uncovered some of the laws, structures, and characteristics of the software that ultimately governed teaching and

learning in that environment. The accounts of these teachers' experiences suggested that shifting to this new classroom environment was not simply a matter of moving their teaching content into a learning management system or "digitizing" their current practice, but rather that Teams created a new environment altogether that evoked a set of attitudes and behaviours different from those observed in the co-present environment of the classroom. Teams uniquely influenced the way teachers constructed, presented, and shared knowledge, and as a result, the manner in which students learned and came to make meaning changed. Through my conversations with teachers, I observed the enhancement of anytime/anywhere learning; the obsolescence of the physical classroom; the retrieval of lectures; and the reversal of connectedness to disconnectedness.

Article three provoked avenues of thought that consider educational technologies like Teams from an authentic and critical perspective so that informed decisions about pedagogy in NB education can be made. The Laws of Media allow education reformers to gain insight into the effects of using Teams as an educational tool before cultural norms and practices become too entrenched in the system, affording education districts and departments time to understand them and make a judgment on if, how, and when Teams will be used. McLuhan wrote, "since all media are extensions of ourselves, or translations of some part of us into various materials, any study of one medium helps us to understand all others" (McLuhan, 1964, p. 139). The four Laws of Media can be applied to understand the impact or effects of any technology, artefact, or idea (McLuhan & McLuhan, 1988).

In the fourth and final article of this doctoral work, I made the claim that we are at what Kenneth Boulding (1963) calls a "break boundary" in NB education, a

transformative point at which “a system suddenly changes into another or passes some point of no return” (as cited in McLuhan, 1964, p. 58 and McLuhan & McLuhan, 1988, p. 107). Article four gave voice to eight NB high school teachers who taught in blended learning environments during the first full year of the coronavirus pandemic. These teachers revealed important implications of having to change their pedagogical practices to accommodate a blended education approach, the heightened use of digital tools, and the corresponding responses from their students. Drawing upon these teacher voices and my own experiences as a district technology coordinator, I illustrated some of the unique and significant instances where digital technologies reorganized social, emotional, psychological, and sensorial responses from teachers and students. I organized these examples under the four components of Danielson’s (2007) Framework for Teaching - Instruction, Classroom Environment, Planning and Preparation, and Professional Responsibilities. The experiences shared by these educators indicated that these new technologies and teaching approaches redefined the nature of engagement, altered perceptions of self and others, changed the means and meaning of communication, expanded the roles and responsibilities of educators and students, and created new classroom environments that cultivated and formed new approaches and responses to teaching and learning. While these digital environments fostered new experiences, perceptions, and practices, other ways of thinking, knowing, and behaving were forgotten. What’s worthy of consideration, deliberation, and responding to is that while new educational technologies cause older ones to become obsolete, they also endanger the thoughts, emotions, values, and behaviours that are learned through them. Meanwhile,

new educational technologies cultivate new perspectives, feelings, attitudes, beliefs, and practices whose implications on schooling and society are not always realized.

The heightened use of new educational technologies during the pandemic offers us the opportunity to examine the roles media prompt us to play, how they guide and shape human experiences, the ways they encourage us to think, see, feel, and act, what kinds of things we come to value, and how they discourage old ways of knowing in favour of new practices (Nystrom, 1973; Postman, 1970). The learning environments being created by the influx of new digital tools used in response to the coronavirus pandemic are cultivating a suitable petri dish in which we can study a changing culture in education, what some are calling the world's biggest educational technology experiment in history (See Barnum & Bryan, 2020; Bennett, 2020; Hattie, n.d.; Shultz, 2020; Zimmerman, 2020).

While the potential long-term impacts on NB education have yet to be realized, this work contributes a body of knowledge that points to potential implications of this unique educational era. Throughout its pages, it made a series of considerations and suggestions for educational leaders. For policy makers and government bureaucrats, it addressed the questions: how can we better understand the constraints and affordances of the medium of our current education system, and in what ways can we improve this system? For those responsible for developing and revising curricula, it brought awareness of the curriculum as a technology that structures and defines knowledge and learning in the form of quantifiable and measurable outcomes (Hull, 2013) that guide and limit teaching and learning. For those responsible for designing instruction, it offered a unique understanding into the ways technology influences and shapes teaching and learning and

challenged the assertion that education is broken and can be fixed with technology (Williamson, 2020).

The notion that the pandemic is an opportunity to reimagine education has been a common narrative (See Tam & El-Azar, 2020) and one shared by the NB Department of Education and Early Childhood Development (EECD). When the NB government released the *Continuity of Learning Plan* in April 2020 in response to the COVID-19 pandemic, George Daley, Deputy Minister of Education, stated:

I am excited about the energy that I have seen around this, ... and I know we're in a difficult situation here, but I think coming out the other side, we've got a chance to reform education in a way that we've never had before. (NB EECD, April 2, 2020, 38:05)

The educational implications of the pandemic have become the topic of experts in education. These experts advocate for “education leaders across the system to consider the conditions that would need to be in place for students to learn and for teachers to teach in these new conditions” (Osmond-Johnson, Campbell & Pollock, 2020, para. 2). But how do education departments and school districts reimagine a better education for students, and how can they provide the optimal conditions to reform education to allow students to grow and “develop the attributes needed to be lifelong learners, achieve personal fulfillment and contribute to a productive, just and democratic society” (EECD, n.d.)?

To provide opportunities for growth and development requires a commitment to determining and ensuring the best conditions in the educational environment for growth to take place (Franklin, 1999). When we plant a seed with hopes for a healthy organism,

we do so by understanding the environment and ensuring it has optimal conditions of air, light, nutrients, space, and water (Franklin, 1999). Media ecology is an inquiry approach that can help the EECD and its school districts better understand the environments that are being created by the systems and technologies being put in place, and how to create and sustain the optimal conditions in which students can reach their goals during and after the pandemic.

The disruption to NB education caused by the pandemic offers department officials and district staff an opportunity to understand the role technology plays in the education system and to enact changes that improve the conditions for student learning. This dissertation, the work of media ecologists, and the voices of teachers, students, and school administrators can help those in the EECD and their affiliated school districts assess and evaluate the costs and benefits of new technologies, anticipate the consequences or effects of adopting technology, and provide considerations to those looking to devise policy regarding their appropriate use.

To better understand the complex and unforeseen challenges and opportunities brought by this break boundary in NB education, and to better anticipate, locate, and respond to the services and disservices created by educational technologies, education stakeholders should seek out and consider the voices and experiences of school administrators, teachers, and students who must break trail in this new educational terrain and make sense of these environments.

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Appendix A

Initial Online Questionnaire

The following will be provided in both fillable PDF and online formats (Microsoft Forms). Questions 1 – 6 will have a blank, fillable field in contrast to predetermined choices.

1. Full name
2. Pronoun(s)
3. Gender Identity
4. Grade level(s) taught
5. Subject area(s) taught
6. Number of years taught as a full-time teacher
7. Affiliated school(s)
8. Are you 19 years of age or older? [Y/N]
9. Can you read and write English fluently? [Y/N]
10. Are you a 1.0 B contract high school teacher in the Anglophone West School District? [Y/N]
11. If yes, approximately how many years have you taught in the Anglophone West School District as a 1.0 high school teacher? [Field]
12. Have you primarily used Microsoft Teams to teach in a blended learning environment during the majority of the 2020-2021 school year? [Y/N]

13. True or false: digital technology is an essential tool for learning in high school. [T/F]

14. On a scale of 1-5, how would you rate your level of proficiency using educational technology?

1 – basic 2 – novice 3 – intermediate 4 – advanced 5 – expert

15. On a scale of 1-5, how would you rate your level of proficiency using Microsoft teams?

1 – basic 2 – novice 3 – intermediate 4 – advanced 5 – expert

16. On a scale of 1-5, how would you rate your level of proficiency teaching in a blended environment?

1 – basic 2 – novice 3 – intermediate 4 – advanced 5 – expert

17. Have you heard of the field of study called media ecology? [Y/N]

18. If yes, on a scale of 1-5, how would you rate your awareness of media ecology concepts?

1 – basic 2 – novice 3 – intermediate 4 – advanced 5 – expert

19. Please detail any considerations or accommodations you wish to share in order to ensure you are comfortable engaging in this research. This will be discussed further with the Researcher to coordinate an appropriate time, space, and environment for interview sessions. [Field]

20. May the Researcher contact you to discuss participation details, including an information brief and consent form? [Y/N]

21. How do you prefer to be contacted? [Email/Phone/Microsoft Teams]

22. Is there any additional information you wish to disclose? [Field]

Appendix B

Interview Questions

Introduction

- Introduce self
- Discuss purpose of research
- Explain structure of interview and expectations for follow-up
- Ask if Participant has questions
- Ensure virtual space is comfortable and conducive to the interview
- Provide consent form and obtain signatures (provided to Participant in advance)

Background Information

- Ask Participant to introduce themselves (using pseudonym if previously agreed upon)
- Ask how they wish to be referred to in conversation
- Confirm pronouns
- Confirm grade level(s) taught
- Ask what subject(s) they have taught this year
- Ask current location(s) of teaching assignment
- Ask how many years they have taught in the Anglophone West School District as a 1.0 high school teacher

Conversational Guide

Planning and Preparation

- In what ways have the new educational technologies and the blended learning environment introduced during Covid-19 affected your ability to do the following:
 - plan and prepare lessons
 - design effective assessment
 - form healthy relationships with your students

Classroom Environment

- In what ways does the Microsoft Teams' (Teams) learning environment differ from the traditional classroom?
- How has your ability to create an environment of respect and rapport been challenged or strengthened in the Teams' learning environment?
- How is the culture of learning different in Teams than in your physical classroom?
- In what ways has communication in the classroom changed as a result of using educational technologies this year?
- In what ways has the blended learning experience affected student engagement levels in your classroom?

Instruction

- What challenges have you experienced with regards to engaging students in their learning in the blended learning environment?
- What opportunities have you experienced with regards to engaging students in their learning in the blended learning environment?
- In what ways has your teaching practice changed as a result of Covid-19?
- In what ways do you anticipate your teaching practice remaining changed after the pandemic?
- What teaching practices will you return to?
- What pre-pandemic aspects of your teaching will you no longer practice as a result of this experience, if any?
- What pedagogical opportunities were you presented with during the Covid-19 pandemic?
- What pedagogical challenges have you experienced during the Covid-19 pandemic?
- How have your assessment practices changed in the blended learning environment and what might this mean for student learning?
- What opportunities does Teams offer for you as a teacher?
- In what ways does Teams limit your teaching?
- How has Teams affected your ability to demonstrate flexibility and responsiveness to student needs?
- Have you ever discussed with your students the ways Teams as a platform affects teaching and learning? If so, please elaborate.

Professional Responsibilities

- In what ways has your practice of reflecting on teaching changed during Covid-19?
- How has your practice of maintaining accurate records been affected in the blended learning scenario?
- Were any of your educational values challenged this year as a result of Covid-19? If so, what were these values and how did you address these challenges?
- In what ways has your communication with families changed during Covid-19?

Students

- In what ways did students benefit from educational technology this year?
- In what ways were students disadvantaged from educational technology this year?
- Are there any other ways student learning has been affected by educational technology this year?

Additional/Potential Questions [in addition to questions/clarifications prompted through conversation]

- How has this educational experience affected you personally?
- What considerations should those responsible for devising policy make when involving the use of technology in New Brunswick schools?

- What considerations should those responsible for developing curriculum make when involving the use of technology in New Brunswick schools?
- What considerations should those responsible for designing instruction make when involving the use of technology in New Brunswick schools?
- What are your worries for New Brunswick education moving forward?
- What are you excited about for New Brunswick education moving forward?
- What is your hope for New Brunswick education moving forward?
- In what ways might Covid-19 reshape the future of education in New Brunswick?
- What do you hope to gain from participating in this research?
- Do you have anything you would like to share?
- May I contact you with further questions as necessary?

Concluding the Interview

- Thank the Participant
- Ask if Participant has questions
- Reiterate items regarding confidentiality and Participant rights
- Reiterate how interview data will be used and stored
- Confirm Participant will be provided a copy of all research products
- Discuss further interviews and contact, as appropriate

Curriculum Vitae

Matthew Richard Thomas McGuire

Universities Attended:

Bachelor of Arts, St. Thomas University – 2000-2004

Bachelor of Education, University of New Brunswick – 2005-2007

Masters in Education, University of New Brunswick – 2011-2014

Refereed Publications:

McGuire, M., Downey, A. (January 2020). Metaphors beyond the duet: A reflection on shared teaching. *Canadian Music Educator*, 61(1), 12-17.

Forthcoming Publications:

McGuire, M. (in press). The four laws of Microsoft Teams. *Explorations in Media Ecology*, 21(1), 1-25.

McGuire, M. (under review). The Coronavirus as break boundary: Navigating new landscapes in New Brunswick education. *McGill Journal of Education*, 56(2), 1-20.

Conference Presentations:

McGuire, M. (August 23, 2022). Keynote speaker – Introducing the New Brunswick Digital Literacy Framework. *The Digital Learning Network Retreat*, St. Andrews, NB.

McGuire, M. (August 2021). Keynote speaker - Beyond the screen. *LearnE@st Education and Technology Conference*, Fredericton, NB.

McGuire, M. (June 2020). Presenter - Teaching tools in the classroom and their influence in the learning environment. *21st Annual Convention of the Media Ecology Association*, Adelphi, NY.

McGuire, M. (October 2019). Presenter - Teeming in attunement: Toward team teaching. *Creative Connections Conference*, Fredericton, NB.

McGuire, M. (June 2019). Introducing Ursula Franklin as a Media Ecologist. *20th Annual Convention of the Media Ecology Association*, 1-35. Toronto, ON.

McGuire, M. (2019). Presenter - Toward a New Brunswick Digital Literacy Framework. *New Brunswick Education Research Symposium*, University of New Brunswick, Fredericton, NB.

McGuire, M. (2017). Presenter - 10 ways to connect globally. *ISTE Technology Conference and Youth Summit*, San Antonio, TX.

McGuire, M. (2015). Presenter - Mystery Skype. *ISTE Technology Conference and Youth Summit*, Denver, CO.

McGuire, M. (2015). Co-keynote speaker - Students as content creators in the 21st century. *Google Ed Tech Summit*, Guatemala City, Guatemala.

McGuire, M. (2013). Keynote speaker - Tear down the walls of your classroom. *LearnE@st Conference*, Fredericton, NB.

McGuire, M. (July 2013). Learning in 4D: Augmented reality in the classroom. *iEARN Conference and Youth Summit*, Doha, Qatar.

McGuire, M. (2012). Presenter - Reading across the globe. *Lausanne Learning Institute Conference*, Memphis, TN.