Making Waves:

Intra-actions with Educational Media at the National Film Board of Canada, 1960-2016

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A DISSERTATION SUBMITTED TO THE FACULTY OF GRADUATE STUDIES

IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF

DOCTOR OF PHILOSOPHY

GRADUATE PRODRAM IN COMMUNICATION AND CULTURE

APRIL 2017

YORK UNIVERSITY

TORONTO, ONTARIO

ABSTRACT

This dissertation aims to excavate the narrative of educational programming at the National Film Board of Canada (NFB) from 1960 to 2016. The producers and creative staff of Studio G – the epicentre of educational programming at the NFB for over thirty years – produced extraordinarily diverse and innovative multimedia for the classroom. 'Multimedia' is here understood as any media form that was not film, including filmstrips, slides, overhead projecturals, laserdiscs and CDs. To date, there have been no attempts to document the history of educational programming at the NFB generally, nor to situate the history of Studio G within that tradition. Over the course of five years, I have interviewed thirty-four NFB technicians, administrators, producers and directors in the service of creating a unique collective narrative tracing the development of educational media and programming at the NFB over the past fifty-six years and began to piece together an archive of work that has largely been forgotten.

Throughout this dissertation, I argue that the forms of media engagement pioneered by Studio G and its descendants fostered a desire for, and eventually an expectation for specific media affordances, namely the ability to sequence or navigate media content, to pace one's progress through media, to access media on demand and to modify media content. As new waves of mediated practices emerge throughout the time-period here covered, the complex interconnections between media innovation and pedagogical practice are revealed to be deeply interwoven within the political, social and economic pressures of particular historical moments. The first of these waves focuses on the media produced by Studio G primarily during the tumultuous 1960s to the mid-1980s. The second wave (early-1980s to mid-1990s) marks the shifts in practices and social expectations with the rise of the PC computer. The third wave (mid-1990s to 2004) recognizes yet another shift as Internet technologies and the privileging of

consumer expectation eclipsed what were by then seen as dated practices. In the fourth wave (2004 to 2016), the NFB's focus on interactivity is co-opted as a strategy of audience engagement in an ever-more competitive media landscape. The four affordances are realized to a greater and lesser degree in each of these waves.

The narrative of the NFB's production of educational multimedia provides an ideal lens through which to identify and more deeply understand the nuanced and complex intra-action between technology, practice and society in which the interface is revealed to be far from neutral.

DEDICATION

With gratitude to my parents, who did not live to see this milestone reached, but whose support and encouragement made it possible. They would have been delighted, of this, I am sure.

With apologies to my children, Matthew, Jessica, Cody, Kieran and Quinton, who grew up with a mother who must have seemed always to be buried in books or on the computer. You are, and always have been what I have cherished most in life.

ACKNOWLEDGEMENTS

I was gifted with an uncommonly wise, insightful and very experienced committee, and for that I will be forever grateful: Dr. Caitlin Fisher (Supervisor), Dr. Gail Vanstone (Committee Member) Dr. Seth Feldman (Committee Member), Dr. Kevin Kee (external examiner), Dr. Steven Bailey (Dean's Representative), and Dr. Chloë Brushwood Rose (Internal-External Examiner).

I will have everlasting respect and affection for to Caitlin Fisher and Gail Vanstone, whose loyalty, encouragement and belief in the value of this project have been pivotal to its completion. Time and again, they have proven that scholarly excellence and authentic relationships can co-exist, and indeed reinforce each other.

Floyd Elliot and Tamara Lynch who figure prominently in this dissertation, provided countless emails, phone calls and conversations over the five years this project took to complete. It was they who brought to life for me the magic and frustrations that infused the creative spirit of Studio G. It is my most fervent hope that this work, in some small way, might repay their generosity and kindness by ensuring the legacy of Studio G is never forgotten.

Every person whose has been entranced by media technology has had someone in their life who opened their eyes to its possibilities and taught them how to envision new ones. For me, that person was Kelly Parke, a gifted media designer, producer, teaches and problem-solver who has been unfailingly generous with his time and knowledge for many years. He not only urged me to reach for the sky, he became my wingman in the process.

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CHAPTER ONE:

INTRODUCTION - AUDIENCE-CONTROLLED MEDIA

Many children who grew up in post-war Canada have memories of sitting in darkened classrooms, their heads propped up on their hands, watching filmstrips and slides about the beaver, Native Canadians, the Habitants, and early explorers produced by the National Film Board of Canada (NFB). The images were projected onto a blank wall or a screen pulled down from the ceiling and teachers provided explanations of the images being shown, oftentimes with students contributing questions or comments. Periodically, the sound of a chime was heard, and the students who had begun to drift off were brought to attention as the teacher clicked the remote controller to advance to the next image. For generations of Canadian students, these lessons formed an early understanding of a Canada that was far removed from their daily existence, faded with the passage of time, but to which they were inexorably connected. This is where they learned the official narrative of their national identity, and for many, it was also their first encounter with the NFB, whose brand was signaled by the iconic Man Seeing logo, designed by Georges Beauprés in 1967 (see fig.1), that appeared at the end of every production, immediately followed by the blinding glare produced by the classroom lights being turned back on.

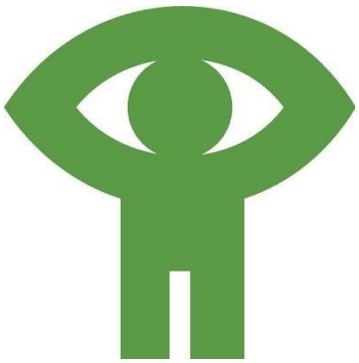

Figure 1: The NFB's iconic logo was designed in 1967 by George Beauprés. It depicts a human figure raising its arms in celebration. The head and arms double as an eye, which references visionary or animated man (Evans 149).

These NFB media presentations were welcome breaks from the regular routine of both students and teachers as early as the 1950s.[1] They provided professionally produced complements to the curriculum, supplementing the often-meagre classroom resources teachers had to animate the curriculum for young attention spans. Sometimes, students would be rewarded for good behavior with the promise of a movie or filmstrip, and particularly deserving students would be given the much envied honour of operating the projector, rolling the filmstrips into their canisters, or loading up the slide carousel (Baron 2013). This was the first time most students had encountered media technology beyond their family cameras or televisions. The ability to click a button to advance a slide at the sound of a tone or to replay a particularly interesting filmstrip-story were novel experiences for both students and teachers living within a pre-computerized landscape where people did not interact with media to the degree they do today. In this sense, the NFB not only educated students about Canada and their place within it, it was arguably the most ubiquitous venue through which Canadians learned to use multimedia to extend their own communicative repertoire (Möller 1963). Using these media forms, teachers and students learned to integrate multimedia into their presentations, they used them to animate lessons and generate conversation, they even learned to create and share media they devised themselves in the form of slides and overheads (Möller 55). In essence, they developed a dialogic relationship with multimedia, shaping it to their purposes, and in turn, the various affordances of these media shaped the pedagogical practices of the teachers who used them.

This dissertation is a preliminary investigation into the complex relationships between educators, their students, and the NFB-produced multimedia they used to teach and learn about their world. In so doing, this study fulfills three purposes. Firstly, it documents some of the ways

[1] Although educational materials intended for schools began during a post-war repurposing of civil servants and equipment used for wartime propaganda in the 1950s, it was not until the hiring of Hans Möller in 1958 did the NFB begin to establish its position as a leader in Canadian educational media. This dissertation therefore focuses on educational production and programming from that time.

in which these encounters helped shape the technological imaginations and pedagogical practices of Canadian teachers and their students both before and after the introduction of computers. Secondly, it recovers the near invisible, almost lost story of Studio G, variously called the Filmstrip Unit or the Multimedia Studio, where, for more than three decades, some of the most familiar and innovative educational multimedia were created. Finally, I suggest that when the 'digital age' finally arrived at the NFB, it might be thought of as remediating some of the established practices and beliefs developed through decades of electronic multimedia production and experimentation, many of these issuing from Studio G, more than it invented new ones.

The perspectives and memories of NFB staff, both current and retired, are a crucial element of this research in light of the lack of documentation of the history of NFB education media. Outside of industry magazines for teachers, and a handful of Master's theses (Gauthier, Baron 1989, Lynch-Dalgleish), documentation of Studio G is missing in the literature. This dissertation is the first dedicated study on the NFB's educational media. It is informed by thirty-four personal interviews with these NFB staff members, conducted between 2012 and 2016 and supplemented with additional archival research to provide substantiating evidence. As such, this dissertation offers a corrective to the chronic amnesia pervading the institutional memory of the NFB in terms of its own accomplishments in educational media production, and its recognition of the contributions and expertise of these early creators of multimedia.

These creators were a different breed from the gifted auteur filmmakers who have received the lion's-share of recognition both internally at the NFB and throughout the international film community. Filmmakers are artists first, and their canvas consists of celluloid film and video. NFB filmmakers, during the time-frame of this study, were limited only by their prodigious imaginations - their status as auteurs earned them a creative blank slate, and ample

budgets with which to bring their visions to the screen. In contrast, multimedia creators of educational materials were designers more than artists. No less creative or talented than their filmmaking colleagues, and just as, if not more recognized within their industry for their accomplishments, these men and women worked with production parameters over which they rarely had much control, such as the curricular mandates of particular provinces, the reading levels of students, or the media literacy of their teachers. Likewise, their production budgets often came from sponsors who had vested interest in the final production.

In spite of these considerations, they were able to create multimedia to inspire, educate and delight, sometimes introducing new unfamiliar technologies and opening up new pedagogical possibilities. These NFB creators were arguably amongst the best in the world at their craft as evidenced by the many awards and honours accrued over the years in both national and international competitions.[2] Despite being largely ignored by the Board's filmmakers and administrators, the insights and experiences of these creators infiltrated the NFB culture as they were shuffled throughout the Film Board due to shifts in funding and management. This narrative inquiry is the first to chronicle the lived experiences of the men and women who produced educational media at the NFB. The design decisions they made, the challenges they faced, the visions they had – these are all interwoven within and through the narrative of the changing media landscape at the NFB which they helped to shape. It is not an authoritative history, but narrates a reality that is, perhaps because of that, a more authentic, and ideally, more useful account of this overshadowed aspect of the NFB.

[2] Because most of these awards were specific to the education industry rather than the film industry, they were infrequently included in the NFB's annual reports. Nonetheless, NFB's educational productions were often finalists and winners at the Association for Media and Technology in Education in Canada (AMTEC) awards, and many American based educational award competitions (Lynch personal communication 13 Jun 2012).

This is not an exhaustive chronology of educational media production and programming at the NFB in the manner of the Board's most notable historian Gary Evans. Nor is it a complete account, in that it focuses almost exclusively on English-speaking studios, mainly because the lion-share of educational production was in English. It is, rather, the tracing of what Karan Barad calls the 'agentive reality' of education production and programming at the NFB (Barad 2007). Agential relativity rejects the notion of objective truth in favour of an emergent reality which is formed through our participation with various tools (materials) - what we do with them, and how we articulate these experiences (discourse), which taken together create the range of possibilities that we recognize as agential reality. In the agential reality of educational media production and programming at the NFB, most of which requires physical interaction with the audience, what is interesting is not only the design of various forms of multimedia, but also how their design informed and were, in turn, informed by the way they were used, by whom, and for what purposes. What practices emerged from these encounters with multimedia, and how did these, in turn, influence the technological imaginations of media creators, educators and their students? It also includes the ways in which the creation and adoption of new educational media influenced the way designers of Studio G, no less than educators, felt about their professional relevancy and expertise. Using Barad's parlance, I suggest the material-discursive intra-actions amongst NFB multimedia creators, their audiences, productions, the pedagogical practices for which they were used emerged out of and to varying degrees, influenced, the shifting socio-cultural, economic, technological pedagogical apparatuses in which they developed (Barad 237). These interrelationships are integral to understanding not only the shift from analogue to digital media at the NFB, but more strikingly, how little these profound changes fundamentally altered how educational media was used. As a result of this interrogation, I suggest that the most significant

changes wrought by new educational media produced by the NFB over the years included in this study, were less functional than cultural. Innovations in education technology may have made media interaction more sensually stimulating, efficient and immediate, but more importantly, these changes often disrupted the power relationships between teachers and students.

As mentioned above, even analogue multimedia produced by the NFB required some activity on the part of the audience - selecting the length, pace or content of each media encounter, for instance. By enabling Canadian educators and students to control the dynamics of the media they were viewing, the NFB helped them to better understand not only how multimedia worked, and what they could do with it, but also to identify what they wished multimedia could do, or would not do. Such encounters, I argue, developed the technological imaginations of generations of Canadians - to be able to think using technology to create new possibilities (Balsamo 7). Educational institutions play a unique role in this process because they provide an alternative perspective to corporate influences from which their burgeoning, young 'citizens' might imagine new democratic possibilities (Balsamo 138). Indeed, it was the youth of the 1960s and 1970s who grew up having access to these nascent forms of electronic multimedia. They would eventually become the first generation of digital immigrants, making computer technology the most significant mode of meaning construction and expression in the 21st century (Prensky 2001).

The NFB functioned (and still does) as one of the most important institutions of public pedagogy in Canada, providing a haven for media creators to experiment with emerging media, buffered from the pressure to produce content palatable to the lowest common denominator in order to survive in the competitive media marketplace. As such, it functions as a cultural apparatus through which ideals of citizenship have been enacted through engagement with

multimedia in the classrooms and living rooms of generations of Canadians. In the classroom particularly, students and teachers have come to expect a high degree of agency in the multimedia they use to learn and educate. Likewise, they expect media to be available when they choose to use it. The prioritization of unfettered agency and choice at the interface may have become fetishized with the emergence of the Internet, but, as already stated, the desire for it did not begin here (Salecl 2010). I contend it was born out of years and years of media use prior to the invention of computer technology: from students unable to access the books they need because their peers had beat them to the shelf, to teachers being forced to wait until the conclusion of a film before they could ask their students questions about it. The desire for the computer and the Internet arose out of the technological imaginations of generations of educators, out of their understanding of what they wished were possible beyond the media choices they had at their disposal. This desire emerged at the same time that citizens were demanding more changes in the political, social and cultural contexts in which they felt stifled and marginalized as expressed through civil protests and second wave feminism. This congruity seems to reinforce Balsamo's claims about the reciprocal relationship between the cultural and technological realms. The NFB was, and is still today, in a unique position to be able to bring these realms together in creative and innovative ways.

To date, much scholarly writing has explored the historical significance of the NFB as a state-sanctioned producer of media (Rodney 1968, Winston, 1984, Evans 1991, Feldman 2003, Druick 2007, Khouri 2007, Vanstone 2007, Waugh, Baker and Winston, 2010). None of these contributions, however, have provided more than a cursory mention of educational programming at the NFB, that is, media and supporting resources designed for use in schools, museums, not-for-profit and government agencies for purposes of education or training. Studio G earned only a

few lines in Evans' authoritative history of the Film Board, *In the National Interest*.[3] This, despite the fact the educational sector was, and arguably still is, considered to be the primary audience of the NFB and perhaps more significantly - its strongest, internally-generated revenue stream (Evans 292; Grigg).

Created in 'small media' forms, such as filmstrips, slides, overhead projecturals, one-minute film-loops, and later, in laserdiscs, CDs, DVDS and the first interactive websites at the NFB, these educational productions did not have not the cache of film-based documentary and animation. Amongst NFB filmmakers and administrators, educational productions were perceived as an unpleasant but necessary service motivated more by the demands of sponsors than the artistic vision of the director (Elliott 2012, Baron and Lapointe 2012, Lynch 2015). The awards garnered by educational productions were not considered as prestigious as those bestowed on film productions, nor did they attract the international recognition of the radical Challenge for Change and Studio D feminist films. Yet the quantity of educational media produced by Studio G, also referred to variously as the Filmstrip Studio and the Multimedia Studio, was many times greater than these better-known studios.[4]

Floyd Elliott, the last and longest reigning executive producer of Studio G ruefully admitted in conversation that "[o]ur biggest obstacle was that the film board didn't need us or want us – we brought in money but not fame. We were the Cinderella - worked and was ignored. We were making 'tools' and they were doing something else" (Elliott 11 Jun 2013). Elliott's lament was echoed by many of the interviewees offended that their expertise as media designers

[3] In one of the few references to Studio G in his 407-page history of the NFB, Evans describes Studio G as "a forward-looking and energizing element in English Production" (304). In an email dated 21 Jun 2016, Tamara Lynch states: "Studio G was the only studio in either English or French production that worked as a fully bilingual entity – rather unique."

[4] This statement is qualified by the fact that this is largely because of the differences in size, length and budgets of the final products. A slide set will not require as many resources to make as a feature length film, and Studio G produced a lot of slides. However, they also produced many complex multimedia productions that were as demanding and time-consuming to produce as a film, so the statement is valid.

was not understood and therefore could not be recognized. Further compounding the insult, Studio G production staff were paid lower salaries than their counterparts in other units (Baron & Lapointe 2012). This was largely because they were not considered artists, but rather, staff performing a media production service for governmental agencies and school boards - an obligation of the film board that generated revenue and thus ensured the Board's continued funding.[5] Studio G staff report they often heard their colleagues dismiss their work with the disparaging phrase "there's nothing happening there" (Elliott 2012, Baron & LaPointe 2012). According to Elliott:

> The reason we survived for so long was no one really understood what we were doing or why, and as long as we weren't taking up the sound stages, or camera and editing suites – we did all our stuff in our own little rooms and got our own money, so they tended to leave us alone.
>
> (Elliott 11 Jun 2013)

As disheartening as it must have been to work in such a climate, it is likely this state of affairs was exacerbated because NFB administrators and their colleagues in other departments would rarely see the finished productions, as they were launched without a glittering opening night and media fanfare, but would quietly show up in NFB catalogues and educational media trade shows that often accompanied professional development conferences. In fact, Elliott's tendency not to attract unwanted attention from NFB administrators as he sought unconventional

[5] Thanks to Gail Vanstone who pointed out that in this, multimedia designers in Studio G shared the same ignominious reputation in the NFB as the feminist filmmakers in Studio D, who were accused of making "craft" not "art" (Vanstone 153). Indeed, it appears that with few exceptions, male mainstream filmmakers at the NFB had claimed exclusive rights to the club called "artists" and anyone who was not a member had no claim to that title.

sources for funding upcoming projects may have contributed to the Studio feeling unrecognized for its contributions.

Despite the impression that Studio G was merely an A/V service department, such contracts accounted for less than fifty per cent of their catalogue.[6] Sponsors of these productions included federal government ministries and agencies, various unions and professional associations and non-governmental agencies. Elliott seemed to have no trouble identifying potential sponsors who, like himself, were genuinely interested in the potential pedagogic uses of emerging media. What many people outside Studio G did not appreciate was, that even when sponsored externally, they kept full control over all production decisions (Elliott 5 Oct 2013). Negotiating this control is the bane of a designer – balancing what will work with what is requested by the client, or required by the parameters of the project. It is finding that creative space between what must be, and what could be, that distinguishes the designer from the artist, and it was perhaps this more than anything else that made Studio G designers feel like they were not fully accepted by their filmmaking counterparts.

Studio G designers sometimes had to negotiate the structure and/or content of their projects with their audiences, that is, teachers across Canada, through the mechanism of test audiences and beta testing. Where this differed from the use of test audiences in other studios, was that Studio G did this step *before* the project was finished so the feedback could inform the final version:

> We would take something that was half finished out to a classroom and let the teacher teach with it, and see how the kids reacted to it, and get feedback from the

[6] Calculated with the statistics provided in NFB annual reports from 1948-9 to 1995-6, which are approximations provided by executive producers.

> teacher of how things went and what should be fixed, but we kept this at arm's length - we weren't going to let them co-opt the project.
>
> (Elliott 11 Jun 2013)

Media was often designed to be appropriate to more than one subject or grade level, so a particular teacher might request changes that would align a production more with a particular class, but that would make it inappropriate for another teacher. Additionally, some teachers had less media literacy than others, and teaching styles were idiosyncratic so teacher feedback could be far from uniform. Nonetheless, such testing was strategically important because if the Studio could show that the film was teacher-approved, and the teachers involved in the testing felt that their expertise was being respected, the final production was much more likely to sell well (Elliott 11 Jun 2013).

Within the Studio, a spirit of enthusiastic experimentation prevailed, and the Studio G designers interviewed were unanimous in their description of the exceptionally close and supportive relationships they forged together, with egotism usually taking a back seat to a common purpose when the visions for a project differed. Collegial suggestions were encouraged and designers had a shared concern for the needs of their audiences (Baron & Lapointe). They understood that it was not enough to develop projects for their own satisfaction, but that they required a practical relevance to their audience. This meant that, unlike their filmmaking counterparts, multimedia producers also had to be involved in training their audiences - teachers - who would present this material. As many teachers had no prior multimedia training, they required instruction in the use of a variety of technologies if these technologies were to be successfully adopted into their teaching practices. Studio G, consequently, organized workshops, professional training events and individual in-class demonstrations. Therefore, classroom

teachers often found themselves working collaboratively with Studio G staff - many of whom were, themselves, experienced teachers. This occurred at all stages of production - from conception, through the actual production process to usability testing during the post-production stage. This type of audience involvement in the production process was similar to practices of Studio D and the Challenge for Change Program (CfC) in fostering a sense of Canadian citizenship and agency through participatory media-making techniques that strengthened media literacy while validating the unique experiences of the collaborators[7] (Evans 1989, Vanstone 2007, Waugh et al. 2010). Indeed, Studio G surpasses these studios in terms of the range of media technologies they experimented with and the variety of ways in which they were used. It is remarkable, then, that Studio G has been until now the only major studio at the NFB that has not been documented either by the NFB or the academic community.

This focus on participatory practices of media production informs not only the subject of this dissertation, but also its methodology which is based in narrative inquiry. Tracing, as it does, material-discursive phenomena out of which emerges the account of educational media production and programming at the NFB, the inclusion of the participants' perspectives is as crucial to the integrity of the research as is the archival material. Narrative inquiry, an interdisciplinary qualitative methodology used commonly within educational research, has an affinity with the field of practice which is the focus of this study (Chase 2005, Denzin 2005, Leavy 2009, Kim 2016). Unlike in positivist paradigms where fact-based truth can be measured and accurately replicated, truth in narrative-based methodologies is negotiated between the lived experiences of the subjects, the researchers, and the way language – verbal, visual, audio, or print – is interpreted. The narrative-based researcher is thus a story-teller, and the illusion of 'objective

[7] I do not mean to suggest that teachers performed the same function as subject-participants in the CfC program, but rather that their insights and experiences as subject matter experts and teaching professionals were valued, and informed both the content and structure of the productions that came out of Studio G.

truth' is replaced for a richer, more nuanced telling of the events, practices and experience brought into being by this dissertation. Here I follow in the practices of narrative based researchers such us Gail Vanstone, Jeong-Hee Kim, and Marlene Kadar.

Barad too, rejects the notion of objective truth, but also rejects the dichotomy of subject (user) and object (technology) in favour of understanding these as emerging through a mutually–constitutive set of entanglements – a process which she calls 'intra-action' (Barad 2007 33). The positions of subject/object are given shape through their intra-action, not before them. Barad critiques the process of scientific experimentation that aims to make sense of the 'truth' of physical phenomena which is then established as undisputable scientific fact. The technologies of observation she associates with the scientific method (e.g., petri dishes, thermometers etc.) to reveal physical phenomena are analogous with pedagogical media and the technologies on which they are transmitted (e.g. projecturals, overhead projectors, slides, projectors, interactive CDs etc.) which are used to teach students 'facts' about the world. Just as intra-action with technologies of observation configure what can be perceived within the context of the laboratory, so too our understanding of the narrated world is shaped in part through our intra-actions with media in pedagogical contexts. By layering overhead projecturals atop each other to trace geological shifts caused by glaciers over millennia, or by curating a playlist of video clips from various documentaries, teachers and students are able to make meaning via new configurations of media even though these configurations may not capture every aspect of the phenomena they represent. For instance, a dynamic event like a bolt of lightning can be illustrated in a 2D image, but that only represents a millisecond of the whole process. Even a video of a lightning bolt fails to capture the scent of ozone, or the electricity that makes hair stand on end or the earsplitting crash as the bolt connects with a solid object. We accept the image as accurate, even as we know

it is a truncated rendering of a much more complex and dramatic event. Whether the interface is a page in a book, an image on a screen or interactive software on a computer, it is not simply a conduit of information - it shapes what it transmits to fit its own contours. Furthermore, these interfaces are not neutral[8], and by engaging with them, we perform our identities as both consumers and citizens within the contexts of the nation, state and marketplace. These "agential realities" are the spaces within which we intra-act, which are material-discursive phenomena rather than objective realities (Barad 235). In other words, that which we recognize as 'reality' is a result of intra-action between humans and their technologies, not a precondition for it. Thus, within agential reality, subjects and objects are continually re-constituted (Barad 146).

If our descriptive characterizations do not refer to properties of abstract objects or observation-independent beings, but rather describe agential–reality, then what is being described by our theories is not nature itself, but our participation within nature. That is, realism is reformulated with the goal of providing accurate descriptions of agential reality – the reality within which we intra-act and have our being – rather than some imagined and idealized human-independent reality (Barad 236). Because it is constituted through our practices, we as agents can shape our agential realities, and consequently have a degree of control over them (Barad 237). The dynamics by which agential reality is made is constructivist in its logic, and thus retrievable though narrative inquiry.

Barad's conceptualization of intra-activity offers a particularly elegant theoretical perspective from which to frame my examination of audience-controlled, educational media at the NFB. However, the usage of the term 'interactivity' is so embedded in digital culture that any

[8] Here I self-consciously evoke Dionne Brand's transformative book, *No Language is Neutral*, in order to suggest that the systems and structures of meaning-making in any society are not only complicit in the meanings that can be made, but also frame the positions and perspectives the user/audience/viewer/reader must take to perceive what is being transmitted. These positions become part of their lived experiences, and thus their identities.

attempt to introduce a new term is likely to be confusing and ultimately futile, as evidenced by Donald Norman's failed attempt to recoup his use of the term 'affordance' with 'signifier' (Norman 2008). Despite Norman's preference for the term 'signifier' over 'affordance', in this dissertation I use affordance as defined in his original publication: "a relationship between the properties of an object and the capabilities of an agent that determine just how the object could possibly be used" (Norman 2013 11). As to the quandary of whether to use interaction when the phenomena is more accurately articulated as 'intra-action', the research faces the same problem of semantic inheritance faced by Norman.

In the scholarly community, defining the term 'interactivity' has been elusive. Jen Jenson, a scholar in the field of interactive media, defines the term as "a measure of a media's potential ability to let the user exert an influence on the content and/or form of the mediated communication" (Jenson 201). But this is only one definition in an enormous body of literature that questions every nuance of interactivity, resulting in a frustrating lack of consensus as to what it actually means (Bucy 373). Communities most affiliated with interactive technologies are Human-Computer Interaction (HCI) and Interaction-Design (ID), both of which are mandated to establish standardized 'best practices' for the design and production of interactive technologies to set standard practices. HCI and ID are fields directed towards designers, with "typical users" brought in to test whether interfaces behaved as expected and/or if users felt 'satisfied' in the process, not unlike rating the satisfaction of a patron in a restaurant. Thus, the experience and emotional expectations of computer users as consumer are assumed within the very standards by which virtually all interactive media is measured. Good design within the HCI and ID contexts is understood as offering the user just the right amount of choice – enough that the user's agency and sense of satisfaction is ensured, but not so much that they feel overwhelmed (Rogers,

Csíkszentmihályi, Sharp & Preece 2002). The user, like the customer, is not to be disappointed lest they 'take their business' - in this case, their attention - elsewhere. Thus, the locus of innovation is tightly connected to market success, situating it as a key strategy of economic control rather than a means of challenging or resisting the status quo. In the contexts of HCI and ID, the user and the technology are understood as being in an unproblematic dichotomy, pre-existing the moment of engagement in contrast with Barad's ideas.

In an attempt to balance the need for specificity over convention, I will collocate the term 'intra-action' with the description of the interplay between media and the contexts in which they were developed, distributed and used but will continue to use 'interactivity' when describing what occurs between the user and the interface in the moment of usage. By 'interactive media' then, I refer to media with which the user must take physical, intentional actions to alter the structure or, in some cases, the content of the message. In this sense, the message emerges as a result of interaction, rather than being entirely pre-determined as is typical with traditional books and films where the author/director produces the structure and content of the media and the audience simply consumes it in its final published form. Interaction then subsumes, but is not analogous with the types of idiosyncratic interpretations of meaning that individuals bring to any form of communication. With interactive media, the viewer is afforded particular options that can be used to determine and/or influence the message intended by the creator of the media to various degrees and for both intended and unintended purposes.

In the intra-active context of pedagogical media designed to support the curriculum, the NFB's state-funded role as the producer of films "interpreting Canada to Canadians and the world" (Evans 14) enables the audience to "watch, exchange and network around creative content" (2013-18 NFB Strategic Plan 6). In effect, this provides one of the most important state-

sanctioned and funded means by which individuals (citizens) can actively shape their lived experiences of Canada, and for most, as Canadians. Canada, then, is not a single reality, or even a multi-cultural one, but is better understood as an agential reality emerging through ongoing intra-actions between the people, the state, and their material-discursive relationships with state-sanctioned media institutions, e.g. Canadian broadcasters, newspapers and publishers. This was enacted at the NFB through their audiences, producers, and their interactions with the apparatuses of observation that they use to create narratives of "Canadianism".

The story of the production and programming of education media at the NFB is traced through what is described as four waves of intra-action between NFB designers, their audiences, the NFB itself and the social-political climates in which they were embedded. The term 'wave' is used as a descriptive metaphor for the overlapping nature of these developments. Although, for some, the wave metaphor may be irrevocably linked to its connotative usage in the description of feminist chronology (Nicolson 2010), my use of the metaphor of waves leans more to its denotive sense, as in the field of physics, where it refers to "disturbance moving through a medium" (dictionary.com). A physical wave sweeps over a terrain, disrupting it and then retreats, refolding over itself only to reappear, traversing over its previous path but stretching out in new, unexplored directions, sometimes extending, other times diminishing its reach. Each wave produces its own unique effects while carrying antecedent traces. The impact of waves advancing and retreating over time produces an agential reality, the result of the intra-actions of many waves, each with its own properties, with their environment – the wearing down of rock into sand, or smoothing of a log to driftwood, for example. Without holding too dearly to the metaphor, the dynamic of a wave is congruent with Barad's concept of intra-action in the realm of quantum physics in terms of its reciprocity with its context over time.

The movement of waves also informs the structure of this dissertation. Although by virtue of being presented in the analogue structure of a book, albeit a digital one, the scope and order of the chapters do not insist on the chronological beginnings and endings of the waves on which they focus. In most cases the intra-action therein described flow across the chapter boundaries, and can be recognized in various permutations throughout the dissertation. There are however, innovations which were foregrounded at different times at the NFB, and they form the structural logic of this narrative.

The first wave constitutes the second chapter, in which the NFB begins its program of educational programming in earnest. Beginning in the late fifties and extending into the nineties, NFB producers and directors affiliated with Studio G worked closely with teachers and educational administrators to create and integrate what has been already described as 'small media' – slides and filmstrips, with and without synchronized sound, overhead projecturals, VHS tapes and film-loops to supplement traditional teaching methods and materials. These reinforced, and sometimes disrupted the established positions of power and expertise between teachers and students by requiring an ongoing negotiation between the teacher and the media throughout the lesson. Integrating media into a lecture is now commonplace in the contemporary classroom, but this was not always the case. It was in post-war classrooms that teachers began to experiment with filmstrips and slides to attract students' interest and attention. In turn, these practices fostered a demand for new technologies with which to project these media, thus opening further possibilities for using multimedia to teach. It is during this wave that teachers and students, often without any explicit training, developed familiarity with both the process of operating media technologies, as well as integrating audio-visual media into their oral narratives. This wave can be understood as a precursor to the development of PowerPoint now so popular in classrooms

and boardrooms. Learning how to produce and use these media strategically was a process of trial and error for both Studio G producers and teachers who worked in tandem during this stage. It was during this wave that teachers and producers began to appreciate the pedagogic value of having individual control over the sequence of and navigation through media to progress a narrative or search for elements of interest to the user. Media produced during the first wave were designed as much for teachers as for students in the time before computers emerged, and were designed to support their teaching needs as much, if not more than the learning needs of their students. Although this wave is fundamentally analogue in structure, it embodies many of the interactive potentials realized to varying degrees throughout the subsequent chapters.

This second wave, which is more fully described in the third chapter, began in the 1980s when personal computers started to emerge in classrooms as pedagogical media rather than as a technology to be studied as it had been in computer science classes since the 1970s. With the introduction of computers into the classroom, learning became a more individualized process with the use of CD-ROMs, DVDS and laserdiscs, and teachers found themselves trying to teach with technologies with which they were neither familiar nor could guarantee access to when needed. The freedom to sequence media that had been foregrounded in pedagogical practices during the first wave, is further developed and enhanced by the ability to navigate through media as it appeared on the computer interface. This ability was marketed as ‘exploration’, ‘discovery’ and ‘play’, which promised to increase a sense of agency on the part of students as well as engendering enjoyment within the learning process, while reinforcing the pedagogical shift from the teacher as “the sage on the stage to the guide on the side” (King 30). This development was not universally embraced by teachers, some of whom felt that giving students individual control of their media usurped their authority to determine when and where to proceed in the lesson.

However, as students customized their learning experiences through individual access to media, this innovation increasingly became an expectation, creating a seemingly insatiable demand for greater access to high-quality, digital media that could be adapted seamlessly into the curriculum at every grade level. The majority of Studio G productions were created during these first two waves, although its media designers had begun to experiment with Internet based projects before the Studio was closed in 1995-96.

In the fourth chapter, I trace the third wave as it emerges with the Internet in the mid-to-late 1990s, which was initially understood primarily as an apparatus of distribution and access to information. Even this improvement, welcome as it was, brought with it new challenges. Not only was it easier for students to access previously unimagined volumes of educational resources through the Internet, it was as easy for them to access content that was far from appropriate for the classroom. Issues of media control and access continued, and even heightened with these developments. A short-lived NFB program, named Animation, Children, Interactivity (ACI) explored the pedagogic, creative and social potential of the Internet during this wave.

The fourth wave is detailed in the fifth chapter, and references a shift to using the Internet not only as an apparatus of distribution, but also a creative and social apparatus. Through this time, starting in the early 2000s, there emerges a recognition that the Internet could also be a place to build community, identity and provide a space for younger media users to develop and share their creative work and their ideas. Interestingly, this stage also provides educational audiences with intensive forms of face-to-face engagement with the NFB through its workshop programs.

Although each of the four waves has unique characteristics and tends to be expressed through human interaction with particular media technologies, they should not to be read as a

taxonomy of media forms. Rather, together they trace the iterative strategies of experimentation and appropriation which engaged users with audience-controlled media during the time span of this study. That is, the waves reference episodes of embodied mediatic experience, where technological innovation is as much a result of, as it is a motivation for, engagement. As the media literacy of users increased, their technological imaginations became more sophisticated, motivating them to explore different, sometime unexpected possibilities with media, as well as to expect emerging forms of media to facilitate these practices.[9] Within the context of the NFB and its audiences, these four waves account as much for how multimedia has been used in the past as they do for how these practices foster innovation in new media forms and usages in the present and perhaps the future. Despite the media innovations explored at the NFB spanning the fifty-six years covered in this dissertation, practices that coalesce through these four waves of intra-action remain amongst the most salient markers of interactivity. This, of course, begs the question – in which ways are these waves now being manifested through the NFB's recent experimentation with interactive documentary and virtual reality? Perhaps a fifth wave is swelling at the Film Board.

To greater and lesser degrees, throughout all four waves, particular affordances are privileged. These affordances include:

1) Sequencing/Navigation - self-determining the sequence of, or navigation through, media to progress a narrative motivated by the curiosity or requirements of the user;

[9] Brian Winston, in his account of technological change and innovation (2002) is a useful complement to the dynamics laid out here in that he articulates the technical and the social spheres as deeply implicated in each other and it is this that motivates innovation. However, in his account, the social and technical spheres, however mutually reinforcing are understood to exist outside their interrelationship, refusing Barad's insistence that agencies do not exist as individual elements but only through their "mutual entanglements" (Barad 33).

2) Pacing - self-determining the pace or speed at which one progresses through media to facilitate the purposes for which it is being used including but not limited to discussion, study, reflection and review;

3) Access - accessing media whenever a particular production, media form, or topic is desired. This affordance subsumes keyword searches to access specific content within a media resource;

4) Creating/Sharing Content - contributing to or creating content in a manner that may or may not be transferrable or apparent to other users, thus expanding the role of the user from consumer to producer in ways described by Henry Jenkins as "participatory culture" which enables participants to use media (often Internet-based) for artistic expression and civic engagement (Jenkins, 2006 xi).

Together, these affordances of engagement are now so fused with a popular understanding of the benefits of digital media that many people do not realize people were creating their own multimedia, and mentoring each other in its use, much earlier than the rise of computer technology. Each affordance can be observed to some degree throughout the four waves of media intra-action at the NFB, and thus are not meant to be interpreted as exclusively associated with each wave. While it is possible that the patterns of mediated intra-actions described in the contexts of the NFB programming may map successfully outside of it in other institutions of public pedagogy, the study of this is outside the scope of this dissertation. Likewise, although the affordances are not in themselves novel, in this study, they are framed only within the parameters of English educational multimedia programming and production at the NFB from 1960 to 2016.

The four waves of media intra-action at the NFB, and the affordances of these media have enabled generations of Canadians to develop varying degrees of proficiency in strategic engagement with multimedia, and thus to actively participate in the mediated public sphere (Jenkins 2006 61). Through these encounters, NFB designers became internationally recognized experts in the creation of cutting-edge, interactive pedagogical multimedia. No less significantly, the media literacy of hundreds of thousands of Canadians has been cultivated through their encounters with these forms of multimedia. NFB's designers and audiences have performed as both media consumers, and citizens through interactive media technologies. This duality is implicated in the two terms Siobhan O'Flynn uses to distinguish two types of viewers of interactive documentaries (i-docs), namely "user" and "interactant" (O'Flynn 2012). The former can make only "choose your own adventure" types of functions, like the affordance of sequencing and navigation, which, in the context of i-docs, she implicitly critiques for its "utilitarian and consumer orientation" (144). The latter, interactant, is used to foreground the potential for agency facilitated by dynamically designed interfaces where viewers can playfully shape their mediated experiences and is more closely akin to the fourth affordance – creating and sharing content (144). While the interactive i-docs designed to delight interactants no doubt creates, as O'Flynn contends, more emotional resonance, than do flat, cause-effect interfaces, this can be as much a consumer-oriented strategy as point and click i-docs. In the context of educational media however, where media is not only viewed but enacted, the choice of content and its order is an important aspect of knowledge construction. This is not to suggest educational media should cultivate users more than interactants, indeed, both are important aspects of media literate citizens. However, interactant is more closely suggestive of complex forms of interactivity, so it is preferred over user in this dissertation. Within the context of this research,

the assertion that there is a strong relationship between media interaction, consumer satisfaction and citizen engagement that is both interwoven and in constant tension will be discussed in the context of each of the waves.

At this point, I will clarify my use of the term educational media, which has the sense of being explicitly designed as part of a state-sanctioned curriculum. It is also a commonly used term to refer to media only intended to complement the curriculum, and thus is subject to the policies that governing bodies have for determining what is appropriate in publicly-funded institutions. As a federal agency, the NFB avoided aligning themselves with the curriculum as education in a provincial mandate, and the provinces tend to be very territorial over the portfolios they control. Nonetheless, even at the NFB these media are usually discussed as educational enrichment resources (Cournoyer & Lynch 2012). In fact, NFB designers worked closely with the provinces to ensure they were pitching the content of the media appropriately for the intended age group and subject (Baron & Lapointe 2013, Lynch 2016). Pedagogic media is a more accurate term to describe the media the NFB designed for teaching and learning purposes as the term does not insinuate curricular intent as directly as does the term educational media. Rather, it can be understood to encompass the dynamic, interactive arrangements of artefacts, practices, techniques, and instruments that exist within any institution of public pedagogy and through which the public engages with institutional and/or state priorities (Barry 11). Pedagogic media can be created for use within any institution with a mandate "to provide citizens with those critical capacities, modes of literacies, knowledge, and skills that enable them to both read the world critically and participate in shaping and governing it" (Giroux 137). Thus, pedagogic media is a cultural apparatus of 'public pedagogy' to draw focus to strategic practices that enact the cultural apparatus within which they operate and from which they usually depend for

funding. Although the term pedagogical media is more accurate, in deference to the popular use of educational media both within and outside the NFB, it is used also in the context of this dissertation.

The NFB has demonstrated remarkable resilience and considerable integrity in devising programmatic responses to the many budgetary cutbacks it has faced over the years. It has attempted to honour a mission devised in a historical era, far removed from the present day, balancing its allegiance to film – a media form that is becoming increasing archaic – while managing to leave space for innovation and creative risk-taking that has been at the core of its success. Studio G and later producers of education media have been central to this legacy. Nonetheless, the pressure to compete in the open market with multi-billion-dollar entertainment juggernauts has forced the NFB to embrace interactive media technologies that it might otherwise have had little motivation to explore. So pervasive have these technologies become in the contemporary media landscape, that the very name The National Film Board is becoming more of an anachronism than a description.

Within these shifts and changes, the audience emerges as an agent of consequence in the agential reality of the NFB. With film, NFB audiences are a given entity - assumed and, until recently, not actively considered in production decisions. This is a marked contrast with Studio G for whom audiences were a pivotal concern. Even as recently as the publication of the NFB 2002-2006 Strategic Plan, references to 'the audience' were few, occurring only seven times in the entire document. The NFB was, even then, firmly clinging to its allegiance to filmmaking and the auteur culture it engendered, in which the audience was at best a secondary consideration. The NFB, as a key influencer of Canadian cultural identity, and protected from the competition of the media marketplace with its buffer of government funding, had no need to

compete for audience loyalty. By the time the 2013-18 Strategic Plan was released, however, the media landscape in Canada had been transformed by digital media and strategies of audience engagement became critical to the impoverished NFB, as it struggled for survival after a series of crippling budget cutbacks. In stark contrast with previous reports, references to "the audience" in this newest strategic plan occur no less than fifty times.

The intent behind this new vision of the NFB is not only to provide "a place where artists can develop the appropriate grammars for the new technologies" but also to engage the audience in a revitalized public sphere, made accessible through media created in collaboration with and through the NFB (2013-18 Strategic Plan 12). This is not so far removed from the Studio G's focus on experimenting with new technologies through collaborative projects with educators. In this sense, and perhaps without realizing it, the NFB seems to be returning to the multimedia roots sprouted through their interactions with humble media some fifty years ago. The time is ripe for retelling this almost lost tale about media, practices, changing technology, audiences and learning. The language of the document attempts to reassure filmmakers and the public that this strategy does not undermine the historically-situated ideals of the NFB, i.e. the reflection of Canada to Canadians and other nations, particularly through auteur documentary and animation. At the same time, it recognizes that under a fiscally-conservative federal government, there is an economic need to vie for the attention of a younger audience demographic who, having been raised on high quality, interactive media, have come to expect and indeed demand this of all their media choices both inside and outside the classroom. The dual nature of interactive digital media then, as the manifestation of both consumerist-focused, neo-liberalist ideals as well as more egalitarian, social-democratic ideals is understood. The need to attract not only audiences but interactants through media engagement is being promoted and, more importantly, funded. For

more than fifty years the NFB's Studio G has, through the four waves of intra-actions described here, exploited the affordances of interactive educational media to inform, inspire and invite its audiences to participate in and co-create as collegial interactants with the NFB. The remaining chapters will document these dynamics and the important insights that the Studio G stories provide for the current moment in greater detail. By tracing these fluctuating dynamics of media technologies, social landscapes, pedagogical practices and media literacies, the story of educational production of programming based on interactive media at the National Film Board will begin to take shape, and, the contribution of these extraordinary media designers to the education of generations of Canadians can finally be recognized.

CHAPTER TWO

FIRST WAVE: HUMBLE MEDIA – LEARNING TO USE MEDIA

> It is not always the most expensive equipment that yields the best results. The less glamorous visual and audio media can give amazing and, often, better results than the newer media. … We hear little of these "humble media" in the educational press; if you didn't know better, you might conclude they didn't exist. Yet, these are the very media that teachers and children use every week, even every day.
>
> (Möller 1970 9-10)

This chapter traces the first wave of the NFB's experimentation and engagement with audience-controlled, pedagogic media in order to excavate the story of these 'humble media', the ways they were used and how these uses established the NFB's role as an institution of public pedagogy in post-war Canada. Hans Möller was the visionary and inaugural executive producer of Studio G, where these media were produced for some 35 years between 1960 and 1995. Möller adopted the self-depreciating term 'humble media' to refer to the slides, filmstrips, 2x2 slides, 16 mm film loops, and overhead projecturals that were popular in Canadian classrooms at this time (Möller 1970 10). The term refers to the low status such media held relative to the more illustrious status of film at the NFB. The folksiness of the term, although Möller never made this point, might also have caused these media to appear to be more friendly, and less intimidating to teachers who were wary of unfamiliar technologies. Certainly, he encouraged their integration in the classroom through missives written in professional publications they were likely to read. (Möller 1963, 1964, 1969, 1970). It was though interactions with these media that generations of Canadians learned how to use multimedia *in situ* - by not simply consuming media as a passive audience, but as interactants with strategic control over their conditions of observation, and the skill to weave multimedia though otherwise oral communication events such as lectures and

presentations - this, an almost forgotten aspect of how technological imaginations were developed before the onset of computer technologies.

Although humble media were not usually described as 'interactive' by NFB designers interviewed for this dissertation, students and teachers did in fact engage interactively with these media – loading strips of film into projectors, slides into canisters, progressing the media manually, or using a remote control, even occasionally creating their own media in the form of overheads and slides. This contrasts sharply with O'Flynn's position discussed in Chapter One where she argues that navigational choices of the user are simply the utilitarian options without significant impact beyond altering sequence. In fact, navigation of a computer interface is closely akin to the sequential choices teachers made when preparing humble media for presentation, but where the former simply advances the user through one of several prescribed routes through the interface, with humble media the sequencing of the content shapes the focus of the lesson.

To date, the relationship between the affordances of electronic pedagogical media and interactive digital media have not been adequately documented. To redress this gap, this chapter traces the complex agential reality out of which pedagogical practices using humble media emerged, and the affordances of control that these media offered, many of which and are now considered 'given', if not defining, affordances of digital media. In this sense, these early media forms can be understood as precursors to everything from electronic media to spatial mobile storytelling, in particular, during this first wave, the ability to control the sequence and pace of navigation through media are foregrounded, although being able to access media on demand and create and share customized media content also begin to be seen as desirable options in multimedia designed for the classroom.

From Propaganda to Education

The Film Board began producing filmstrips in 1943 through the sponsorship of the National War Finance department. By 1944, this demand necessitated the launch of the Filmstrip Division, which produced audio-visual materials informing troops and citizens about official policies, procedures and appropriate wartime behaviour, all the while fostering a sense of personal contribution to the war effort (1948-1949 Annual Report 9). Filmstrips proved to be a very useful apparatus of propaganda. They were light and easy to transport to locations that could differ significantly and unpredictably with regards to access to amenities such as screens and electricity, coverings to darken windows, and sufficient chairs to seat an audience. These media were, by default, silent because audio could not yet be synchronized to projected images. A filmstrip or slide show was presented by an official who could easily pause or reverse the presentation at any point to answer a question or insert an update or comment. Thus the authority of the official was not usurped by the media as might have been the case with traditional film - in which the narration was embedded in the media - leaving the presenter merely to supplement the main message after the film was over.

The studio began as the Wartime Propaganda Poster Unit supplementing the NFB's production of news reels and shorts that were shown in theatres and community centres throughout the country with messages jokingly referred to as "loose lips sink ships" and "how to avoid getting syphilis" slides and film strips, training both civilians and troops on their responsibilities in the war effort (Elliott 3 Jun 2013). Using overhead projectors, filmstrips and slides, army personnel and government officials could present to large groups of people and provide visual aids and verbal explanations efficiently with media that was reliable, cheaper than film to produce, and could be easily customized for different audiences.

In these early days, the unit was most commonly referred to within the NFB as the Filmstrip Unit to differentiate it from the various film units. Indeed, the moniker "Studio G", originally designated for a French Studio in the decade immediately following the war, would not be publicly affiliated with the educational programming of the (former) Filmstrip Unit until the 1980-81 Annual Report.

As the NFB struggled to reinvent itself in peacetime, it instituted what would become the legacy of John Grierson, the Board's founding Commissioner – the making of films as a matter of public service and artistic vision (Evans 4). A good citizen was an informed citizen and Grierson aimed to produce films to inform and imbue Canadians with a sense of national pride built on the sense of unity fostered by the war effort (Evans 4). This vision transformed the NFB from an apparatus of propaganda - essentially the mouthpiece of the government - to one of public pedagogy, with a broader social mandate fostering nationalism, no longer constricted by wartime priorities, in an extension of Grierson's belief in 'propaganda as education' that had solidified the Board's role as the national producer of wartime propaganda (Evans 3).

After the war, the NFB retained the world-class production facilities they built up in wartime, as well as a staff of producers now experienced in their use. Both could be repurposed to create audiovisual materials to enhance public school curricula in the areas of social studies, science and math, as well as provide a broad range of Canadian-focused training and marketing materials for other organizations and governmental agencies[10] (Möller 12 1963).

[10] During the war, school boards were unable to acquire equipment they needed. Everything from typewriters to projectors were reserved for the war effort, with the understanding that when the war was over, these would be given to schools. Unfortunately, this did not happen (Phillips 8).

Hans Möller's Arrival at the NFB

With the baby boom that followed the return of the troops, there was a radical increase in the number of students in classrooms, resulting in a spike in the number of schools being built and a subsequent increase in demand for media appropriate for the classroom. In 1953, Albert W. Trueman, a former high school teacher, school superintendent and university administrator, was named Commissioner of the Film Board. Appreciating the potential market for the NFB organizing to meet this growing demand, Trueman hired Danish wartime hero and teacher Dr. Hans Möller. His job was to revitalize the NFB's tired educational catalogues and in so doing, Möller devised the strongest and most consistent revenue stream generated by any NFB program since (Grigg 2014).

Möller had a PhD in Danish Language and Literature from the University of Copenhagen and had been the Research Librarian at the Copenhagen Royal Library. By secretly transporting hand grenades and illegal newspapers for the Resistance during the war, he was an active participant in the Danish rescue of hundreds of Jews (Montreal Gazette). Möller was to the Filmstrip Unit what Grierson was to the Film Board. He was passionate about the potential of filmstrips, in particular, to animate pedagogical practices of the day. In a paper written to extol the virtues of the lowly filmstrip written in 1964, he laments the misconceptions so many of his colleagues had about the value of filmstrips:

> … filmstrips have too often been used as a substitute for something else. The most common sin committed against the filmstrip medium is to consider it the poor-man's motion picture. … Some years ago, when I moved from film production to filmstrip production, many of my film friends felt sorry for me; to most people the filmstrip was a step down; personally, I shall never regret it, and I

> was surprised myself to discover what a tremendous potential the filmstrip has when it is properly understood, and properly used…. I am thinking, of course, of their flexibility, their analytical ability, the logical step-by-step development of a theme, the teacher control, etc. … It seems that the new look in film strips is well in step with the many new trends in education; indeed, it is, of course, the result of these developments.
>
> (Möller, NFB 7 Jan 1964)

This new look to which he refers, is in contrast to the abysmally unattractive wartime filmstrips. Those produced for the classroom under Möller's leadership boasted high-quality images, with short clear captions, arranged in a logically organized order to focus the viewers' attention. They were accompanied by a teacher's guide complete with explanations for each image to ensure teachers were well informed and could confidently answer students' questions regardless of the subject matter. Möller's filmstrips regularly took top honours in the prestigious American Film Festival (Möller 14 1963). With dogged determination and clarity of vision, Möller researched and planned the transformation of the Filmstrip Unit into a world-class producer of pedagogical media. By 1957, production began on a French-language retelling of the Cinderella story *Cendrillon*[11], the first production to have an original score, with its illustrations created by schoolchildren (1956-57 NFB Annual Report 13). Within a decade, with a staff of roughly a dozen permanent NFB employees, Möller led the Filmstrip Unit to a firmly established position as one of the most significant producers of filmstrip media in Canada and the United States.

[11] "Studio G was the only studio in either English or French production that worked as a fully bilingual entity – rather unique, another often overlooked aspect of the studio" observes Tamara Lynch, longtime Studio G director (personal email 20 Jun 2016).

His enthusiasm for this medium was not shared by all, especially not Grierson, a strong proponent of the power of film. Before his death in 2015, Möller recalled having an extensive conversation with Grierson during one of the icon's post-retirement visits to the NFB, in which Grierson's skepticism regarding the value of filmstrip media was the subject of some debate. After demonstrating how it could be used and what affordances it offered, Möller triumphed in convincing Grierson of the media's intrinsic value, remembering: "[Grierson] said to me, 'I had a hard time understanding the value of filmstrips but now I do and can only say that in terms of educational value, you are absolutely right'" (Möller 8 Jun 2013). After participating in Möller's demonstration, Grierson saw that filmstrips could, indeed, facilitate active discussions and thus engage students more deeply than could film, which the audience simply watched quietly with any opportunity for questions or conversation deferred to the end of the screening.

Although filmstrips were championed by Möller, they were but one of the media types he produced during his tenure at the NFB. Möller made it his mission to ensure his audiences – teachers and students, civil servants and workers – had access to a full repertoire of media types, and were trained in how to use them proficiently and strategically. He understood that his designers could not afford to disregard the needs and expectations of their audiences. To ensure this did not happen, Möller actively recruited teachers and other educators as consultants, oftentimes involving them directly in the production process itself, writing scripts, directing photography on location, shooting photographs, preparing artwork, and editing visuals (Möller 1969 39).

Prior to Möller's arrival, the suitability of many post-war productions for classroom use was questionable, as they had been produced by wartime staff and veterans who were focused more on content than quality (Möller 1964 4). Additionally, the final products were often too

complex or not appropriately paced for lower grade levels (Elliott 5 Oct 2013). Involving professional educators helped avoid some of these issues, but Möller was not satisfied with half-measures, and made it his priority to personally examine the curricula of school boards across the country to better understand regional variations in focus and terminology that emerged under Canada's provincially mandated education systems. To strengthen teachers' confidence in the ability of Studio G to produce cutting-edge, pedagogical media, a school psychologist was retained to conduct research to determine the reactions of students at different ages to NFB productions and to identify themes that would be most relevant to their needs (1950-51 NFB Annual Report 8).

As a federally-funded agency, the NFB needed to be very careful in its production of materials to be used in provincially-funded classrooms. It would have been prohibitively expensive to produce regionally-appropriate materials that were 'curricular' *per se*, because these would have to be modified to meet the unique mandates required by each province (Elliott 4 Oct 2013). Furthermore, any such effort by a federally funded agency like the NFB was likely to be considered suspect, particularly in Quebec where NFB productions were banned from every school in the province from 1954-1961, due to the belief there were hidden Communist elements at the Film Board (Evans 16, 19, 66).

By the early '60s, after almost a decade of steady but modest increases in the number of productions completed, Möller was successful in convincing the Film Board administrators that his workload had increased to the point that he needed more help. In due course, Floyd Elliott was brought in as a writer and director. Elliott, an elementary school teacher, was an early adopter of educational media and had been facilitating workshops in the summer teacher-training programs sponsored by the Ontario Ministry of Education and the Ontario Audio-Visual

Association (Elliott 11 Jun 2013). His arrival coincided with the hiring of Douglas MacDonald, a geography high school teacher from British Columbia – another strategically-wise decision of Möller's. Because his educational experience had been acquired overseas, Möller needed home-grown talent like Elliott and MacDonald - practicing Canadian teachers at both the elementary and secondary school levels – to provide educators with the assurance that the NFB was producing pedagogically-sound materials, appropriate for Canadian classrooms, produced by and in concert with professional Canadian teachers (Elliott 15 Oct 2013). Elliott's congenial nature, his positive 'what-if' attitude, and an uncanny ability to arrange production schedules and budgets strategically, led to a period of truly impressive creative experimentation and innovation at the NFB. Within three years of Elliott's arrival, Studio G was in regular production of slide sets with bilingual notes, some synchronized with audio tracks, over-head projecturals and a new product - the 'multimedia kit', an assemblage of multimedia and artifacts focusing on a particular topic. The unit also began to adapt and revise media for international audiences in multiple languages.

Under Möller's leadership, the Filmstrip Unit produced a huge catalogue of age-appropriate and curriculum-relevant media, designed to take no more than thirty minutes to view - a suitable length to allow time for discussion within the average forty-minute classroom period. These were produced at a cost low enough to be attractive to cash-strapped schools. A single filmstrip could be purchased for as little as $1.50 for black and white, or $3.00 for one in colour (1956-57 NFB Annual Report 13). Within two years of Möller's arrival, the education market had increased by almost 2 million annual sales to 7,374,900. The Filmstrip Unit began selling filmstrips accompanied by audio discs and a series of curated print illustrations of a single theme or topic for five dollars each (1955-56 NFB Annual Report 15). This enabled schools to purchase

media that could be kept in their Resource Centres and libraries, avoiding the need to order through school board offices. The costs were low enough that even individual teachers could afford to buy personal copies of favourite productions to be kept in their own classrooms. This greatly increased the certainty that media could be accessed when needed.

With varying degrees of success, Möller spent a great deal of time and effort exhorting teachers to integrate audio-visual material into a "total learning environment" rather than keeping them for special occasions out of student reach except under teacher supervised conditions (Möller 1970 18). "If we are to encourage individual progress and independent study activities, we must have materials the children can reach and use by themselves" (Möller 1970 28).

Möller's Vision – Humble Media in the Classroom

The eventual integration of audio-visual materials into classrooms long dominated by textbook illustrations and blackboards was a top-down process frequently met with resistance and suspicion by teachers (Baron 1989 19-20, Elliott 4 Oct 2013). While senior educational administrators tended to rhapsodize about the potential of student encounters with media to revolutionize the learning process, many teachers were less convinced. Indeed, some resented being told how to do their jobs by people who had never taught (Baron 27 May 2013). Others were intimidated by what they perceived as a disruption of their tried and true teaching practices and, worse, a challenge to their authority in the classroom (Möller 1970 19). Unfamiliar with the technology, and unsure how to integrate it effectively into their lesson plans, teachers worried they risked damaging their authority in front of their students. Consequently, if these early media forms were used at all, the tendency of teachers was to save them as a form of review or respite after the real teaching had taken place (Möller 1970 13). Students, on the other hand - far from being intimidated - were typically stimulated by the visual richness of the media itself and

interested in learning how to operate the projectors (Möller 1970 29). In the culture of the classroom, being able to physically touch the media was a highly coveted privilege. Nonetheless, in spite of Möller's urging, teachers were slow to give students access to filmstrips and slides, possibly because they personally paid for them, or created them out of their own photographs, or perhaps were projecting their own fears that the media was fragile and could be easily damaged. Those of us who can remember our first fearful encounters with computers might sympathize with this concern.

Prior to Möller's arrival, audio-visual media were already familiar, if sporadically accessed, resources in Canadian schools and institutions (Möller 1963 12). Films were the most common media form at that time but could not be used frequently for a variety of reasons. They were expensive to buy so most schools could only stock one copy of a film, and the projectors were cumbersome to move from room to room. The impact of high quality, feature-length films on learning was mitigated by the fact that they were usually too long for a regular-length lesson, leaving no time for discussion afterwards. The teacher could not stop the film once it started to ask questions or highlight a particular point without risking damage to either the projector or to the film itself. While not an ideal solution, the remaining option was to talk over the film.

In terms of architectural design and basic structure, school buildings were simply not hospitable to the introduction of such audio-visual materials. Typically, schools had large windows to let in lots of sunlight, often impossible to adequately cover to the degree needed to see film images well. Pull-down screens on which to project the image were not in every classroom and blank classroom walls were in short supply. Films were expensive and most schools were in possession of only one or two projectors at most, likewise expensive, meaning that screenings needed to be booked well in advance and shared amongst teachers.

Films, distributed regionally by district school boards, also needed to be booked weeks in advance. Their arrival on the day requested was often a hit and miss affair as multiple teachers frequently ordered the same films for the same units of study. Cash-strapped school boards could not keep up with teacher's demands for multiple copies for more popular films, and as a result films often had to be returned the same day they were delivered. This sometimes forced teachers into the position of screening films without first being able to review them to ensure their appropriateness in relation to the unit being taught (Elliott 2013). This inability to depend on being able to access media when needed for a particular unit was a great disincentive for integrating multimedia into lesson plans. These issues pointed to a need to create a cheaper, more reliable media and humble media satisfied these needs admirably.

By the 1960s, filmstrips and slides had emerged as the pedagogical media of choice in Canadian classrooms from kindergarten all the way up to high school and beyond, extending to university classrooms. Indeed, filmstrips and slides were often preferred to films as they avoided many of the problems recounted above (Baron 2013). Even though the teacher was required to adopt a more hands-on approach (film as an alternative, allowed the teacher to grade assignments or enjoy a little downtime while their students sat quietly watching the screen), the orchestrated viewing of slides and filmstrips allowed the teacher to tailor lessons specifically to generate students' interest in a given topic. Unlike printed illustrations, projected images could be seen easily by an entire class, enabling students to simultaneously focus their collective attention on the same image, almost impossible to do when they were flipping back and forth through textbooks or looking at illustrations and photographs passed around the class as the teacher lectured. Details of illustrations could be easily zoomed into, and classroom discussion could be focused on a particularly relevant element of a slide.

Intra-actions: Pedagogical Practices, Media and Democratic Ideals

The introduction of humble media into Canadian classrooms was inspired by educators, policy-makers, and producers who saw in them the potential to increase the agency of students and teachers by giving them more control over their educational resources (Schaffer 4). This aligned with the pedagogical priorities of educational ministries during the social turbulence of the 1960s (Gidney 57, Hall and Dennis 139-40). Individual teachers, and in some cases students, could customize slides or overhead projecturals to suit a lesson developed for a specific class, often using images they captured themselves on vacation. These media could catalyze discussion throughout the presentation, not only at the end of the presentation (Möller 1964 8). This kept students' attention focused and enabled them to more actively participate in the lesson than if they watched a film (Möller 1970 35). Thus, the understanding of a subject emerged dynamically through conversation catalyzed by the media, and co-created by the teachers and students in conversation (Möller 1963 20). Unlike NFB documentaries, known for their expository narrations, the narratives that accompanied the viewing of humble media were formed by teachers and students. When teachers paused a mediated presentation – slide, filmstrip or overhead – the important points could be discussed and scaffolded to the students' level of understanding and students could participate in the building of the narrative and in so doing, see the relevance of their own perspectives (Möller 1970 10). Thus, the ontological authority of these media was rendered contingent rather than absolute. The realities being developed through these lessons were, in Barad's parlance, agential.

This heightened sense of agency in the usage of humble media aligned ideologically with a national interest in the training of technologically adept citizens at a time of rapidly emerging technologies, such as nuclear power and telecommunications (O'Sullivan 312). Students and

teachers alike were encouraged to engage and experiment with pedagogical technologies featuring affordances that facilitated a sense of agency and competence considered necessary for the development of a technologically savvy populace (Barry 1998 27). In Canada, this imperative dove-tailed with democratic priorities and a belief in the social role of education:

> Education is the only institution designed and funded as the agent of a larger society in protecting the core value of its citizenry: democracy. The essential value of the public school in a democracy, from the beginning, was to ensure an educated citizenry capable of participating in discussions, debates, and decisions to further the wellness of the larger community.
>
> (Allan 1999 8-9)

I argue that humble media then, became a pedagogical apparatus through which democratic ideals could be reinforced. It enabled teachers and students to use media to animate their ideas, to construct them collectively through classroom discussions rather than lectures. Teachers, as well as students, could customize their presentations by including slides and images they created themselves, which then could be shared with others, foreshadowing the participatory media practices of today. When digital media finally arrived in the classroom, it would further develop the sense of agency and creative control that interactants had enjoyed with humble media through activities such as social networking and participatory culture.

In fact, early encounters with pedagogic media reinforced teachers' expectations that they *should* be able to manipulate their media, customizing it to their own purposes. What started out as an innovative design feature became a pedagogical imperative to support a learner-centred curriculum and the development of more active and engaged citizens. While the NFB was by no

means the only player in the media market-place at this time, it was an important producer of pedagogic, state-sanctioned media both in and outside of Canada.[12]

The milieu in which the NFB was immersed in the sixties and early seventies had a significant impact not only on what the NFB produced during this time, but also in how they produced it. Marshall McLuhan's ideas were highly influential in both educational and cultural spheres during the 1960s. He conceptualized the 'message' not merely as content, but as a change in social patterns, altered by new meanings. The 'medium' was not so much the conveyor of messages as it was the means by which the human sensorium could be extended and enhanced through technological prosthetics, enabling human beings to communicate beyond their genetic limitations (Federman). While McLuhan's ideas were much disputed and oftentimes considered unintelligible to the general public, in educational circles they fostered a sense of urgency for the expansion of pedagogical media beyond the printed page. Suddenly, sensory stimulation, particularly sight, sound and touch, made possible by a range of technologies had become fused with unlimited potential for expanded human performance, and an enhanced sense of human identity (McLuhan 1962 158). These exciting, albeit somewhat confounding ideas may not have caught on as they did without several not altogether unrelated events occurring contemporaneously.

The 1967 International Exposition in Montreal (Expo '67) was a smorgasbord of audio-visual media, where consumerism, spectatorship and citizenship were inextricably fused, embodying McLuhan's idea of the 'Global Village'. The NFB's contribution was an impressive multi-screen exhibit entitled *Labyrinthe*, designed by Studio B directors Colin Low and Roman Kroitor, which the two directors believed could have the potential to transform cinema. The

[12] As early as 1963, NFB educational filmstrip production was lauded as one of the most extensive in the world, and its quality the result of integration with and thus access to NFB trained media creators (Möller 1963 12).

influence of Expo ’67 on Canadian school curricula contributed to the conviction that technology could prepare students for the brave new world it would build (Marchessault and Lord 30).

At the same time, the Ontario Department of Education was in the middle of its first comprehensive curricular review since 1937. In a preliminary policy paper, its priorities were extolled by educational historian R.D. Gidney, who quoted from “The Interim Revision Introduction and Guide” published in 1967:

> Within each classroom there should be provision for a wide range of experiences and activities in order that children may take an active part in their own learning. Rich and varied materials stimulate curiosity, experiment and discovery. Children should do as much as possible by themselves since the more they learn through their own experiences and discoveries, the more meaningful and lasting their learning will be.
>
> (Gidney 69)

The following year, these ideas were reiterated in one of the most important documents of educational reform in Ontario to be articulated since WWII. Entitled “Living and Learning: The Report of the Provincial Committee on Aims and Objectives of Education in the Schools of Ontario” colloquially known as the Hall and Dennis Report - after the names of its ‘public’ authors effected a major impact. The actual author was, in fact, Dr. Hank Hedges of the Ontario Institute for Studies in Education (OISE). The report was informed by McLuhan’s presentation to the Provincial Committee on Aims and Objectives of Education, co-chaired by Justice E.M. Hall and Lloyd Dennis in 1966 (Dennis 1997 168). Hall and Dennis were influenced by McLuhan, who condemned the existing education system as belonging to another century. They cited McLuhan directly in their report: “Children today are in a new electronic age. They think

differently, learn differently, and respond differently because they are tactile people, aural people …" (McLuhan qtd in Dennis 1997). Embracing the spirit of these differences suggested to Hall and Dennis that a new curriculum was needed, one that provided multiple opportunities for choice and opportunity not only to learn, but the meta-level ability to learn *how* to learn (Hall and Dennis 54 – 57). Echoing McLuhan, the report's authors eschewed learning practices of the past where students were considered a "captive audience" to be stuffed full of facts, extolling, instead, the value of reframing 'education' as a critical component of self-realization. Text-based learning was out, and self-directed, experiential learning in which choice-making was foregrounded was in. Calls for 'child-centred' learning, and 'open-concept classrooms' where students could explore and discover in new ways that fostered curiosity and creativity were both terrifying and exciting for the conservative culture of the educational system where radical reforms were viewed with suspicion (Daly 1969). The purpose of education was being reframed as a means of enabling students to reach their unique potentials, as opposed to being proficient rote-learners of prescribed social duties and expectations (Gidney 72). Educational media that students could manipulate individually or in small groups would play a key role in this new vision:

> Educators ought to employ every conceivable device and means that society can make available. But a word of caution is in order. The majority of audio-visual aids that the Committee has seen in use have been employed in a narrow, didactic manner and with groups of children all presumed to be learning the same thing at the same time. Our perception of how learning takes place, and of the kind of teaching that facilitates the process, requires that the teacher understand the use of a variety of techniques in the interests of every child. Information contained on

> film, records, and tape, and in pictures and books must be accessible to each child when he needs it. The technology to make this a reality is feasible; the dangers of thought control, passivity, and a stultifying uniformity are too grave to permit indiscriminate use of films and educational television.
>
> (Hall and Dennis np)

Initial responses to the report were effusive, described enthusiastically by one critic as a "chorus of "hosannas and hallelujahs" (Daly qtd in Bennett 6). The report was seen as exemplifying Dewey's principles that "the child lies at the heart of education for a democratic society." In other words, the report suggested that while learning comes naturally to every child, schools as institutions "throttle[d] the free flow of individual thought and action" (Dewey qtd in Bennett 2). The linking of customized learning and democracy permeated the report, making it difficult to criticize it without appearing 'undemocratic'.

Within a few months, the rapture began to fade as strong voices of protest began to circulate. One the most salient, in the form of a polemic entitled, "Education or Molasses: A Critical Look at the Hall-Dennis Report" (1969) came from Dr. James Daly, a McMaster University professor of English and History. Particularly, Daly disputed the report's focus on the process of learning as separate from content (Bennett 11). Rather than focusing on what was being taught, the Hall-Dennis Report focused on learning conditions from a highly idealized and altruistic perspective which made many teachers uneasy. In spite of Daly's impassioned crusade, the Hall-Dennis Report exerted an important influence in the curriculum reform already underway (Bennett 11).

The educational system was not, of course, the only institution undergoing profound transformation during the 1960s. Institutions of public pedagogy were also being affected by the

changing social and political landscape (Palmer 55). The Exploratorium in San Francisco and The Science Centre in Toronto, both of which opened in 1969, marked a radical shift in how public pedagogy supported the growing need for citizens to understand scientific and technological concepts in their everyday lives. Dr. Frank Oppenheimer, founder of the Exploratorium, took the lead in this transformation, effectively tearing down the 'proscenium wall' that separated citizens from the sanctity of the scientific realm (Oppenheimer 1980). Prior to Oppenheimer, science museums had clearly demarcated between scientific expertise and the curious (if uneducated) public using the material and metaphoric form of glass panels and rope barriers in front of displays to create a distinct physical barrier between the scientific object and members of the public. Visitors were cautioned not to touch displays by warnings enforced by vigilant security guards.

The opening of the Exploratorium and the Science Centre transformed the pedagogical focus of science museums from a one-way flow of information from expert to novice to an interactive environment where visitors, particularly children, were encouraged to touch, experiment and play with the displays, which responded in sometimes unpredictable ways. This 'play' methodology was designed to encourage visitors to explore ideas and concepts embodied in the environments and to consider how these were relevant to their individual lives (Hein 8-9). This approach enabled visitors to experience the thrill of discovery that scientists themselves experienced, and was designed specifically to motivate youth to pursue scientific understanding because it was interesting, even fun. In the process, active, responsible and informed citizens were being prepared to play a productive role in the technological age (Barry 1998 127).

The industrialized world was understood as one in which technological advances would pervade everyday life. Everything from televisions, to dishwashers, family automobiles and any

number of household gadgets beckoned to technologically-savvy citizens who were able to interact capably with a range of technologies and who understood the science on which they were based as a necessary precondition to establish national significance on the international, post-war stage (Purcell 60).

In this era, ordinary people could be called upon to make decisions and carry out everyday tasks requiring a level of scientific knowledge and understanding previously enjoyed only by 'experts' (Barry 2001 48). Interactive displays and activities in these museums of science and technology were regarded as 'democratic empowerment' for the masses, enabling visitors-come-participants to gain greater confidence in their own ability to understand the way the world worked, a requirement of informed citizenship in a technological age (Barry 1998 135). During this era, interactivity evolved from a new term in the media landscape to a *topos* - a stereotypical discourse linking cultural desires and objects, in this case the desire to interact actively with technologies, infusing it with an idealism that continues today (Huhtamo 2013 15).

Indeed, labelling something 'interactive' became, inherently, a marker of high quality (Huhtamo & Parikka 28). Thus, science museums, in creating new, interactive exhibits, enabled themselves to compete with other forms of entertainment such as themes parks and television for the public's attention (Barry 1998 134). Positioned in this way, under the umbrella of tourism rather than education, museums increasingly found themselves encouraged to respond to consumer demand to be entertained rather than, more significantly, determining what was in the public interest. Consequently, interactive designers were brought in not only for pedagogical reasons, but to enable visitors (customers) to effectively customize their own experience of the exhibit. That is, as consumers they were given a heightened sense of agency that not only made

their experience of the exhibit feel more relevant, but also satisfied that consumerist desire to be personally satisfied with the experience of something for which they had paid.

Buffeted by these forces, the 1960s became a decade whereby public pedagogy was elevated to a cultural priority and civic participation was fostered by strategies of social activism, exemplified in the NFB's Challenge for Change program, and, a decade later, in Studio D, the world's first state-funded feminist film studio (Prakash and Stuchul 512, Vanstone 36). Both programs used media-making processes to transform film subjects through participatory filmmaking and community-based discussions between filmmakers, their subjects and their audiences (Vanstone 84). In both cases, the concerns of the individual were understood as inextricably connected to and in tension with the social and political systems and structures within which these citizens lived. Such NFB experiments in engagement with media were understood as a strategy to heighten subjects' sense of agency within the national public sphere (Evans 176). In this way, ideals of democratic empowerment were realized, and engagement with technology was the primary mechanism through which these inseparable imperatives were contested (Barry 6).

It is not surprising, then, that educational endeavours emerging from Studio G would be marked by three influences: curricular reform to increase a sense of agency; a push to foster technologically-savvy citizens and, finally, the creation of participatory filmmaking as a mechanism for engagement in the public sphere. All three shared an implicit assertion that experimentation and engagement with interactive media would empower individuals more actively than print-based media, indeed, even more so than other visual media forms such as film. The basic principle underwriting the whole was that active engagement with these media was analogous to active engagement in the public sphere. Without explicitly using the term

"interactivity", the NFB, through Studio G, was beginning to foster a desire for the technological means though which viewers could participate in the subtle activity of manipulating, even creating the agential reality that was Canada's national mythology:

> The object of the Film Board should be to help viewers gather, focus, and even change their thoughts about an issue that is in the national interest. Such activity is more subtle than the earnest presentation of fact alone. Thus, there remains one last bit of uncharted territory; the manipulation of fact and truth to articulate a national mythology.
>
> (Evans 319)

That the Board did not recognize the role interactive media produced by Studio G had in involving citizens in the creation of this national narrative is one of the most egregious oversights in the institutional memory of the NFB.

In this enterprise, Studio G, along with other national institutions of public pedagogy, were beginning to realize that the national interest, and by extension, their own funding, was served as much by *how* they engaged Canadians as it was with the content they were disseminating. In other words, the *topos* of interactivity was becoming not just a means to an end, but an end in its own right. Citizens *used* media, they did not simply watch it.

The Affordances of Control - Humble Media

In effect, the 1960s and '70s constitutes what Margaret Morse calls the "cultural novum" of interactivity, representing a cultural schism forming "[a]n egalitarian impetus [that] opposed one-way hierarchical relations in society at large" (17). Humble media were not simply consumed, like a product, they were used to create individually crafted presentations – they were, in this sense, interactive media. Through these interactions with humble media teachers,

and sometimes their students, were transformed from passive viewers to active interactants. It was the affordances of control that suggested the range of ways in which interactants could use these media to teach and learn.

Filmstrips and Slides

Filmstrips and slides alike offered powerful affordances of control, the most significant of which, in pedagogical contexts, was pacing (Atkins 338). Having control over the pace at which media progresses is essential not only for the purpose of synchronizing images with the teacher's voice during a lesson, but also for reinforcing the power structures of the classroom. Experienced teachers are accomplished storytellers. They take pains to ensure the focus and language of each lesson is fully customized to their particular teaching context (Kuyvenhoven 2009). With silent filmstrips and slides, the teacher has complete control over the narrative as she advances images at intervals of her own choosing, sometimes electing to show only a segment of a filmstrip or a portion of a reel of slides relevant to the specific unit being studied at the time (Baron 2013). Some images would be accompanied by a caption or question, but it was, generally, the teacher who provided the text that linked the image to the lesson. Teachers could balance their lessons with periods of student engagement according to the attention spans of each class, giving students the opportunity to ask questions or offer comments throughout the lesson. In effect, each image formed a new 'agential reality', as discussed in Chapter One, whereby intra-actions between teachers and students and the collection of images worked together to create understanding of the subject at hand. The knowledge acquired, then, emerged out of this intra-action with the facts, images and explanations intermingling with students' ideas, examples and own experienced lifeworlds to create, not so much an objective truth, as one constructed collaboratively.

Controlling the pacing of the media allowed the teacher to create a space for knowledge to be constructed and negotiated, not merely received and memorized, enacting the very pedagogical priorities espoused in the Hall-Dennis Living and Learning Report. This, of course, was not the case with every image in every instance. Much depended on the skill of the teacher to use multimedia to tell stories to captivate her students. However, it was the potential for these rich learning experiences that helped make filmstrips and slides the pedagogic media of choice for teachers, and motivated them to learn to use the technology (Möller 1964 7). This created significant market demand for Studio G to produce these humble media, which continued into the late 1980s when attention would shift to CDs and video (1989-90 NFB Strategic Plan).

Reliable access to lightweight filmstrips, slides and easily-operated projectors on which to view them enabled teachers to plan their classes with full confidence. They were now able to access and competently operate the appropriate media at the most relevant points in each teaching unit (CFI 2). This was a critical prerequisite for fully integrating multimedia into the lesson plan. The simplicity of the projectors facilitated their operation, making it easy enough for even young children to manage. Teachers were more willing to use the media without fear of technological problems, which helped to assuage their concerns about allowing their students to use them directly (Möller 1970 28).

Regardless of the degree of control teachers and students had over the pacing of and access to filmstrips and slides, these media differed in one important aspect. With filmstrips, the interactant could not control the actual sequence of the narrative, since control was already set by the analog order of the filmstrip images, consisting of several feet of celluloid film. Likewise, except for a few technically adventurous souls who taught themselves how to produce their own filmstrips, teachers had no ability to customize filmstrips. This may not have been considered a

problem, as it relieved teachers of the responsibility of providing content for a short period of time. However, it did mean that instructional information assumed a predetermined nature, and could only be consumed in its intrinsic order. Some teachers worked around this by cutting frames of filmstrips and inserting them into slide frames, so they could re-order the content the way they preferred (Elliott 9 Jun 2013).

Curricular reform, it might be argued, mirrored the social upheaval of the 1960s, grounded in a belief that the ability to individuate learning experiences encouraged children to be more personally invested in what they were learning and to be motivated to learn above and beyond the minimum requirements of the curriculum (Möller 1970 34-35). This led to the rise of the open classroom concept, where rows of individual desks and walls separating classrooms were transformed into large open spaces. Here, teachers could facilitate learning with small groups of students working in large open forums where they could, likewise, roam about freely. This reconfiguration of physical space also encouraged a transformation of process, whereby students eventually were given the ability to select and/or to operate projectors as they completed particular tasks or assignments (Möller 1970 28).

The development of smaller, cheaper and more portable, even handheld, filmstrip viewers meant there could be more media technology in the classroom, giving all students the opportunity to interact personally with media. Teachers reported that allowing students to access educational media on their own without the official filter of the teacher felt like ‘cheating’ initially (Möller 1970 29). Möller argued against this perception of student-focused learning, maintaining that children do not think the same way as adults. One child might be fascinated more by one projected image rather than another, and more apt to examine it closely when given control over the pacing. It was thought that students who were proactive learners would more

likely become the self-directed and responsible citizens needed in a technological society. To that end, slides enabled the interactant to control sequencing, which made them particularly effective as self-organized, pedagogic media.

It is surprising then, that Möller chose to privilege filmstrips over slides in his discussion with Grierson, since, from a pedagogical perspective, slides offer greater flexibility and control. Perhaps Möller felt that filmstrips were closer in type to film, and thus more prestigious, while slides might be considered little more than remediated photographs. At the Film Board, film was unsurprisingly the premier media, and producers of any other media form did not have the same level of status as did the filmmakers. Möller's stance suggests that he was sensitive to this disparity and worked hard to make analogies between filmstrips and film – an easier relationship to argue, perhaps, than between slides and film – slides were more akin to still pictures. After all, however well-known and respected the photography division of the NFB may have been, it never enjoyed the status of the film units (Langford 1984). There is no compelling reason pedagogically to privilege filmstrips over slides, and they might be considered to be as closely related as filmstrip are to film, but he seemed bent on promoting filmstrips. Indeed, Möller goes to some lengths to emphasize the parallels between filmstrip and films, especially in the North American context.

In a 1963 article in a trade magazine for teachers discussing the improvement in 'new filmstrips' produced at the NFB, Möller makes a pointed comparison between European and North American filmstrips. In the latter case "the connection with the movie industry is clear and, in common with the motion picture, the best filmstrips have sequence and continuity" (Möller 1963 14). Likewise, he emphasized the complexity of the production process of filmstrips, and its similarity to that of film production:

> …the stages of filmstrip production are much the same as those of a film …most of the photographs used in today's filmstrips are shot on location … assembling all the material and putting it on 33 mm film requires planning, and a specially trained staff, because a high degree of care and accuracy is absolutely necessary. Finally, the test print comes from the lab and it is hardly ever quite acceptable. Colour adjustments are necessary, or a caption or a layout fails to turn out just as expected when projected on the screen. It often takes several shootings and several test prints before the result is right.
>
> (Möller 1963 16)

Although Möller was enthused by Canadian content in NFB filmstrips, in terms of professional production, the contrast he insists upon is between Europe and North America. This detailed explanation, represented only in part here, might have been intended as much for his disparaging filmmaking colleagues at the NFB and overseas who had felt sorry for his demise into humble media production, as it was for the illumination of teachers for whom this comparison would have had little relevance. This might be the one instance where Möller's desire for professional recognition trumped his pedagogical beliefs. Möller acknowledges that teachers found slides preferable to filmstrips due to their flexibility, and that the fact they could structure them according to their own needs was a clear advantage (Möller 1970 55), yet he advocates much more vehemently for filmstrips. In an organization like the Film Board, where media constituted status, this preference is perhaps not so difficult to understand.

Historically, the genealogy of filmstrips and slides is murky. It appears that glass slides may have evolved from the old lantern shows, eventually transforming into filmstrips, which then would position filmstrips as derivative of slides, and perhaps as a precursor of film.[13]

It is not clear which came first during wartime at the NFB, but slides and filmstrips were both in production from its earliest days. Photographed images could be shared with larger audiences by being fit into two by two-inch hardboard frames, although occasionally steel and glass frames were used for durability. These would then be pre-packaged thematically, in sets of various sizes ranging roughly from ten to thirty slides, and sold as part of multimedia kits or in clear plastic three-holed divider sheets for easy access and storage (see fig. 2). Coincidentally, these plastic sheets were designed by Dr. Hedges - author of the Hall-Dennis Report - at the request of Elliott, who needed an effective way to manage slide collections. Dr. Hedges also worked closely with Elliott as a science consultant at the NFB. These sheets seemed to encourage teachers and students to be more diligent about carefully storing the slides than when they had to stuff them back into little plastic boxes (Elliott 22 Aug 2014). Over four hundred such sets were listed in the NFB annual reports between 1963 – 1989. The sets were accompanied with a resource guide that provided content for teachers' narratives when presenting the slides during a lesson. The slides and guide together provided both content and structure for a lesson.

[13] In an email discussion of this topic between Brian Winston, Charlie Musser and myself (May 17-19 2014) Winston states: ".35mm was introduced in 1895 as a standard cinematographic gauge which rapidly removed rivals-- 17.5mm, 28mm, 70mm. Short strips were put into a stills camera in 1925 by Leica" which, Musser adds, "I think was a move away from glass slides, which could break and even the 35mm slides that could jam, get out of order, etc. It ensured that the images were shown in the right order --and not upside down. And of course a strip was even cheaper to make than individual slides".

Figure 2: Slide sets focused on topics relevant to the curriculum and were produced by the filmstrip unit (later known as Studio G) from 1950s to the mid-1980s, with some translations continuing on into the '90s. Slide sleeves such as the one shown here were developed and designed by Dr. Hedges – a science consultant with the NFB - who needed an effective way to manage slide collections.

As previously mentioned, many teachers could easily create their own customized slides from the illustrations and photographs they had collected over the years for bulletin board displays about key subject units. It was not unusual for well-travelled teachers to take photographs for the classroom on their vacations and use them to build up their own slide libraries. Images captured by a regular 35 mm camera could be easily transferred onto blank celluloid using an inexpensive device often found in school AV departments. These customized slide sets enabled teachers a level of control that was unequalled at the time, foreshadowing the

rise of prosumerism and the privileging of digital tools of curation in the contemporary moment. This level of control over high quality images in the form of audio-visual media was unparalleled at the time. Unfortunately, images on slides faded much more quickly than filmstrips, so they needed to be replaced every few years which was frustrating and costly over time (Baron 2013).

So great was the desirability of these affordances, that some teachers bought filmstrips and cut them apart to create their own slide show version of the content (Elliott 11 Jun 2013). Teachers soon discovered, however, that an image meant to stand alone is very different in terms of design and content than one designed to relate to content on previous and following slides, particularly in narrative-based sequences. The quality of images on slides had to be much stronger or more specific than on filmstrips, where captions and sequencing contributed to the aesthetic and semiotic weight of each frame (Möller 1963 14). The time needed to develop a new visual storyline would be greater than what most teachers likely had to devote to the task. Pre-sequenced slide shows alleviated this problem, but each slide had to be loaded and unloaded into the slide carousel - a job often 'awarded' to students. Complicating this process, carousels were notorious for tipping, thus throwing slides out of order and necessitating the time-consuming task of reordering – another job frequently allocated to students, as I recall from my own school days. Consequently, convenience often trumped affordances of control, resulting in slides being less commonly used than filmstrips by elementary school teachers despite their pedagogical benefits and expressive affordances. At the high school level, where teachers tended to have greater subject matter expertise and course content was more detailed, more complicated material - charts, graphs and maps - were in more frequent use than at the elementary level. Thus, at the secondary school level, then, slides were more commonly used than filmstrips (Baron and Lapointe 2012).

By the mid-1960s, the affordances of sequencing, pacing and content-control were lost with the emergence of what was seen as a novel and exciting 'improvement' to silent slides and filmstrips – the addition of synchronized audio. The addition of sound made filmstrips seem more like film and television. Audio could include documentary-style narrations, theatre-like dialog, ambient music, and natural sounds such as bird calls or running water to animate still images. Not inconsequentially, these 'improvements' also necessitated the purchase of new, and more expensive audio-visual projectors, which slowed their penetration into rural markets where the tax bases and funding levels were lower than in large city centres. Nonetheless, a carefully paced stream of innovations, such as audio-enhanced filmstrips and slides, did much to strengthen the growth of a burgeoning educational media industry, even as innovations that brought humble media onto the timeline and closer to film gently set back its more radical potential. At least for a time.

Initially, audio and visual elements of sound-enhanced filmstrips and slides were complicated, being played on separate devices: a projector and a turntable with a 78-rpm record, which later evolved into to a tape deck and cassette. The audio track was synchronized by advancing the image manually, and later with a remote-control device at the sound of a tone or bell. Not surprisingly, this system was rife with problems that would interrupt the synchronization. In an attempt to mitigate these issues, the synchronization of sound was automated, enabling an audio cassette tape to play on an integrated projector that could be advanced manually or automatically, necessitating the purchase of yet another device by the perennially cash-strapped schools and boards. This improved the process of playing the media, but that came with a price, namely the loss of control over pacing.

While the addition of audio was marketed as an innovation in audiovisual communication, and was purchased for classrooms by well-intentioned administrators, excited by what they were convinced was better, more dynamic media, experienced teachers remained skeptical, and rightly so (Elliott 4 Oct 2014). Undoubtedly the audio track, often including music and trained voice actors, added a level of aesthetic interest that far exceeded that of silent slides, but with professionally recorded audio tracks, teachers were no longer able to create their own narratives to customize the media explicitly to the needs of their students. Because the pacing of the presentation was determined by the audio-track, viewer ability to linger over a particular image was limited. Nor could viewers go back and re-visit a previous image without interfering with the synchronization of the audio with the images. While the aesthetic quality of audio-enhanced media was evocative of film, it required audience members to behave as though they were watching a film. Thus, teachers and students alike watched quietly and waited until the end of the presentation to discuss the content. Additionally, there was no way for interactants to modify audio-enhanced media with their own content, as they had been able to do with slides. Moreover, the participatory co-creation of knowledge though on-the fly conversations were no longer possible.

The role of the teacher in the use of audio-enhanced slides and filmstrips was far less salient than with silent media, which was used as a marketing benefit. Not required to provide the narrative herself, the teacher could assign a student to the task of advancing the frames at the tone, while the teacher performed other tasks (Baron 18 May 2012). The ‘real teaching’ occurred after the presentation, and, while this approach ensured a standardized quality of presentation, it did little to encourage individual interpretation.

At roughly five to fifteen dollars each, a teacher or librarian could afford to purchase sound-enhanced slide sets or filmstrips themselves, resulting in more reliable access than with films. Audio-enhanced slide sets and filmstrips were, however, more expensive than their silent counterparts and required investment in specialized projectors, and as a consequence, many schools 'made do' with the silent media versions. School board officials often made purchasing decisions about learning technologies without consulting teachers who would be expected to use them (Elliott 4 Oct 2013). In such cases, teachers would be strongly encouraged to use these innovations, regardless of whether they felt they offered real pedagogical value. This was, and continues to be, a common problem in schools. In the case of audio-enhancement, these innovations were actually a step backwards in terms of their pedagogical value. Nonetheless, the appeal of these new innovations was compelling, and eventually, they became the gold standard. Sound and visuals together had the look and feel of film and television, making silent media feel rather old fashioned. While Möller went to some lengths to assure teachers he recognized the intrinsic value of all media, he pushed production of multimedia over mono-media during his tenure.

Multimedia Kits

Multimedia Kits were not so much a new type of media, but rather well-established instructional media units, dressed up in new packaging in the form of boxed 'multimedia kits'. These kits were similar to the "jackdaw kits" [14] that had originated in Britain. A form of 'authentic' educational material, the jackdaw kits were thematic collections of print reproductions of primary source material and supporting secondary source materials, often in audio-visual form (Pitcher 65). The NFB produced kits, however, enjoyed an advantage over the

[14] The term "jackdaw" is in reference a small blackbird, notorious for its inquisitive nature and tendency to collect items of interest in its nest (Rasinski 4).

traditional jackdaw kits, containing a substantially greater amount of teacher support material, including activity suggestions, explanatory materials, small artifacts and presentation materials such as projecturals. Producers of jackdaw kits assumed that teachers were subject-matter experts in the course they taught so did not include scaffolding materials like lesson plans or classroom activities for teachers to draw on. In consulting archivist Ken Osbourne's view, "any teacher worth their salt doesn't need to be told by me what use he [sic] can make of the document. Just give him the document, and leave the rest to him". In fact, evidence demonstrates that this was naïve. Lacking support materials and suggestions on how to integrate the materials into their lesson, teachers were more likely to use kits for display purposes or simply leave them on a classroom shelf, untouched (Osbourne 35).

Between 1968 and 1978, Studio G produced upwards of twenty multimedia kits. These were beautifully packaged assemblages of various media including filmstrips, slides, overhead projecturals, study prints, small samples and/or simulated artefacts. Additional supports included print materials -- maps, charts and booklets all related to a single subject or theme. Marketed as a 'field-trip in a box', media kits were a very popular, although now an almost forgotten aspect of NFB programming, even as they provide rich insight into contemporary digital practices of spatial storytelling and emerging technologies like augmented reality. Although the Ontario Institute for Studies in Education (OISE) had begun producing multimedia kits before the NFB, OISE kits were very large, heavy and cumbersome. Elliott, having heard about multimedia learning kits in the United States, took it upon himself to design 'classroom-friendly' versions at the NFB (See fig. 3).

Figure 3: The first media kit launched by Studio G was the Rocks and Minerals Kit in 1968. The kit included 15 actual samples of rocks, minerals, maps, geology reports, a filmstrip and a learning guide. Looking Behind You (1988) combined a document folio of unbound reproductions and photocopies of original source material, with sound enhanced filmstrips.

The first media kit, entitled 'Learning about Rocks and Minerals' was called 'rocks in a box' inside Studio G, belittling its status as media (Elliott 5 Oct 2013). For an organization

committed to film, being forced to accept filmstrips and slides was one thing, but producing what must have seemed like something out of a toy store was something else altogether. When it was being readied for mass production, the head of the Film-Promotion Division balked, and warned Elliott that they would be produced "over his dead body". For a time, Elliott found himself *persona non-grata* amongst the staff responsible for inventory and shipping, who were tasked with the job of having to order, warehouse, assemble and ship a bewildering assortment of items for Elliott's kits including rock and mineral samples, pine cones, large posters, filmstrips, slides, audio cassettes, picture sets, booklets and three-dimensional replicas of various artifacts (Elliott 5 Oct 2013). Every media kit was different, and contained upwards of a dozen components, each of which had to be individually produced or sourced and then packaged. Fortunately, the Director of English-Production Grant McLean did not consider this internal resistance an insurmountable obstacle, and production went ahead despite the protests (Elliott 5 Oct 2013).

This galvanized a shift in the perceived mandate of Studio G, resulting in it being referred to as the Multimedia Unit for the first time in the NFB's 1968-69 annual report rather than the Filmstrip Unit. The use of the term "multimedia" to refer to an assemblage of media types in a kit makes up an entire chapter in Möller's book *Media for Discovery*, published in 1970, marking a very early use of the term in the analogue media landscape of Canada. When digital multimedia eventually came to the NFB, it simply adopted the label without acknowledging the legacy.

Not surprisingly, the production of multimedia kits did not last long. They were expensive to produce and the component parts were easily and quickly lost (Pitcher 67). The last multimedia kits were listed in the 1977-78 NFB Annual Report. Nonetheless, the multimedia kits represent an interesting example of what Balsamo calls socio-technocultural 'assemblages' -

clusters of devices and media within and through which meanings and possibilities are negotiated with interactors (Balsamo 8). In the case of multimedia kits, the range of assemblages that could be formed out of interaction with the kit components, was determined as much, if not more so by students than their teachers. In essence, the kits functioned like multimodal databases without a prescribed intention or function. Students were limited only by their imaginations as to how to use the media provided. This 'sandbox approach' to learning privileges the agency and curiosity of the student over their ability to remember the right answer, opening new possibilities for individualized knowledge construction. More than with filmstrips and slides, the students learned through 'playing' with the kits rather than through memorizing and note-taking. Motivated by their own curiosities, these students enacted the vision of learning by discovery espoused in the Hall-Dennis Report. This was the result not only of student ability to self-select components and operate the technologies to view the media provided, through haptic interaction with the artifacts that were in the kit, they added an additional sense to the students' learning experiences, creating a potentially more immersive experience.

The dynamics of sandbox learning is used metaphorically even today to connote the interactivity of an actual sandbox, where children have the ability to creatively play within defined parameters, using a range of media and other tools intended for the activity -- sand, water, shovels and pails, for instance. At the same time, they might co-opt other materials as inspiration strikes -- toy flags, figurines, rulers, cups -- whatever is at hand. Sandbox play is an example of what constructivists call a "microworld" environment (Papert 1981, Reiber 1992). A microworld is a small but satisfyingly complete version of an interest domain (Reiber 1996 46). A sandbox provides all that a child is able to "live" rather than "study" within the microworlds she creates, and here, she has a sense of agency and creative control. Playing in a sandbox is

perhaps the quintessential form of play based learning activity, and is still used today in classrooms and day care facilities. Construing the microworld in this fashion makes it congruent with agential reality. In sandbox play, children don't simply interact with the sand and tools, they intra-act with them in the creation of their individualized microworlds. In sand box learning environments, the exploration of imaginative possibilities and emotional engagement are as valuable as cognitive attention in such 'learning by discovery' activities. Multimedia kits represent possibly the first attempt to replicate the dynamics of sandbox play using multimedia, an impulse that continues to be evoked in the digital world as exemplified by the many augmented reality apps being developed for the classroom such as *Wikitude, The Fantastic Flying Books of Mr. Morris Lessmore, Earth AR* and *Science AR*[15].

The production of multimedia kits by Studio G put the NFB in the middle of the constructivist movement in education – not the only producer, but certainly a significant one. The kits enabled a degree of playfulness and exploration – of interactivity – that embodied the very core of the Hall-Dennis Report in a way that did not sacrifice content for process. Unfortunately, it was almost impossible to keep the kits intact, since teachers were just as likely as their students to abscond with favourite pieces (Elliott 5 Oct 2013, Baron and Lapointe 2012). Nonetheless, media kits represent an important innovation of audio-visual media for learning through play, which, after their demise, would not be recouped until the rise of interactive digital media some twenty years in the future.

Film Loops

The least well-known group of media produced by Studio G was a series of 8mm film loops. Their production life was short, lasting only five years, from 1966 to 1971. During that

[15] Teach Thought has a range of examples of educational AR for teachers: teachthought.com/the-future-of-learning/technology/32-augmented-reality-apps-for-the-classroom-from-edshelf/

time, approximately 527 one- to four-minute length film loops were produced and mounted in plastic cartridges in both Standard 8 and Super 8 formats. The film was spliced at the beginning and end to form a continuous loop capable of playing for repeated viewings. The plastic casing enabled easy insertion into a projector when needed, while the film was protected from prints, dust or other damaging effects of students' fingers (1966-67 NFB Annual Report). Similar to the competition between VHS and Beta for video supremacy, the need for a separate projector for each format bifurcated a market reluctant to invest in either until one reigned supreme. As it turned out, the demand for film loops died out before this could be determined. Nonetheless, the film loops were effective for demonstrating short, dynamic, single concepts than were the static media of filmstrips and slides (Moeller and Cox 1971 30). The 8mm format was much less expensive than 16mm or 35mm film stock, enabling individual schools to build their own collections to facilitate on demand access. These silent films focused on a single concept that could be demonstrated in a few short minutes and replayed again and again until the rhythms and patterns were perceived and firmly grasped. Single-concept film loops were particularly effective in situations where the ability to envision a process was an important aspect of understanding a concept, e.g. a butterfly's construction of and emergence from a chrysalis, the building of an igloo, or glacial movement over millennia (Elliott 11 Jun 2013). Not surprisingly then, the 8mm film loop really came into its own within the physics curriculum where dynamic, complex processes - traditionally explained through illustrations and equations - could be repeatedly and accurately demonstrated, often in slow motion, until the nuances of the phenomenon could be perceived and understood.

The NFB pioneered the development of techniques for filming physical phenomena such as the speed of bullets and the gravitational acceleration that made this media so pedagogically

desirable. As a government-funded institution committed to technical experimentation in a context not controlled by market demand, the NFB was able to produce these materials at a fraction of the cost of a private film-house (Elliott 4 Oct 2013). Indeed, it was this fact that attracted the attention of Harvard University when it began development of The Harvard Physics Project in the mid-1960s. It commissioned Studio G to produce the forty-nine 8mm film loops required by this ground breaking, multimedia curriculum because it would only have to pay for the media itself as the production staff were paid for by the Canadian federal government. This project provided not only the funding that enabled Studio G to create a truly world-class facility for the production of film loops, but also a rich training ground for producers and filmmakers (Elliott 4 Oct 2013). By the end of the Harvard Project, the NFB was producing film loops for consumption in Canadian classrooms as well.

As a European immigrant, Möller knew that silent film loops were broadly and enthusiastically used throughout European schools, but he found them to be a hard sell to North American teachers despite their demonstrable usefulness (Möller 1970 28). Students were apparently much more impressed than their teachers with these humble media, and enjoyed repeating the images again and again, undistracted by voice-overs or music, an aesthetic later popularized in early QuickTime movies and graphics interchange format (GIFs) (Möller 1970 28). Teachers were surprised by their students' interest in film loops since this was at a time when the emergence of colour and sound was the new standard for 'modern' media (Elliott 11 Jun 2013).

However simple the idea behind film loops may have been in theory, in practice the projectors needed for film loops were undependable. They jammed frequently (Elliott 11 Jun 2013). Furthermore, the images were quite small – approximately twelve inches square - and

could only be seen properly in a completely darkened room, a rarity in most classrooms (Elliott 11 Jun 2013). In the face of growing excitement about educational television (ETV), and with the market-dampening effects of the Standard versus Super 8 battle, film loops did not appear again on the production list of the NFB after the 1971-72 Annual Report. Nonetheless, the ability to repeatedly replay a small dynamic image had been planted in the technological imaginations of media designers and could well be thought of as the forbearer of the animated GIFS so popular on social media platforms.

Overhead Projecturals

Of all the humble media, overhead projecturals are arguably the most empowering in terms of affordances of control, and consequently, the most enduring. Described as a hybrid of a microscope with its internal projection mechanics and a variation of *camera obscura* in terms of projecting an image on a wall, overhead projectors have their beginnings in the use of magic lanterns, which were used to entertain as early as the 17th century (Kidwell 2008 53). Overheads, like other humble media, did not become ubiquitous until after WWII, when amid the post-war influx of schoolchildren teachers often found themselves in makeshift rooms. Using the bare walls as screens, teachers discovered overheads to be an effective substitute for chalkboards, as they could use grease pencils to write on premade transparencies, remediating the act of writing on a chalkboard with several advantages (Kidwell 2008 56). They did not have to worry about students being able to see, as the image space was larger and brighter than the chalkboard. There was a large catalogue of professionally made, curriculum-approved transparencies that could be inexpensively acquired, and teachers could make their own customized transparencies even more easily and cheaply than they could make customized slides. Furthermore, the teacher using the overhead projector could face students at all times, unlike slides or filmstrips which necessitated

positioning the teacher being either behind the students, facing in the same direction, or, sometimes, turning her back periodically to use the chalkboard. Consequently, even when they were able to move into classrooms with chalkboards, many teachers continued to use overheads (Kidwell 2008 60).

Overheads were particularly useful for detailed illustrations, charts, graphs, and maps because details could be made larger and the teacher could highlight patterns and important elements with a grease pencil (fig. 4) (Möller 1970 35). Photographic images, on the other hand, would fare better on slides and filmstrips, where the quality and colour of the image was of paramount importance. Thus, overheads were widely adopted in industrial and military training contexts or in secondary or tertiary level science and math classes, where in depth explanations about detailed processes were needed (Kidwell 2008 55). To exploit these qualities the NFB worked with educators to develop novel uses for classroom overhead projecturals. Charts could be projected onto paper taped walls to enable students to measure data, or predict progression by using markers to trace the images or mark the levels recorded on a chart of graph. Transparencies were also produced in layered sets called projecturals, so that cumulative data could be shown. Starting with a basic transparency, teachers could gradually overlay flaps with slight variations from the original so that relative changes over time could be perceived and discussed. This also worked well for demonstrating a step-by-step process or any concept dependent on temporal sequencing, such as the progress of early colonization of the various regions of North America, which could be shown in chronological order of their occurrence (1965-44 NFB Annual Report).

Beyond their pedagogical efficacy there were several problems with using overhead projecturals in the classroom context. First, even with plastic protection sheets, the pre-made

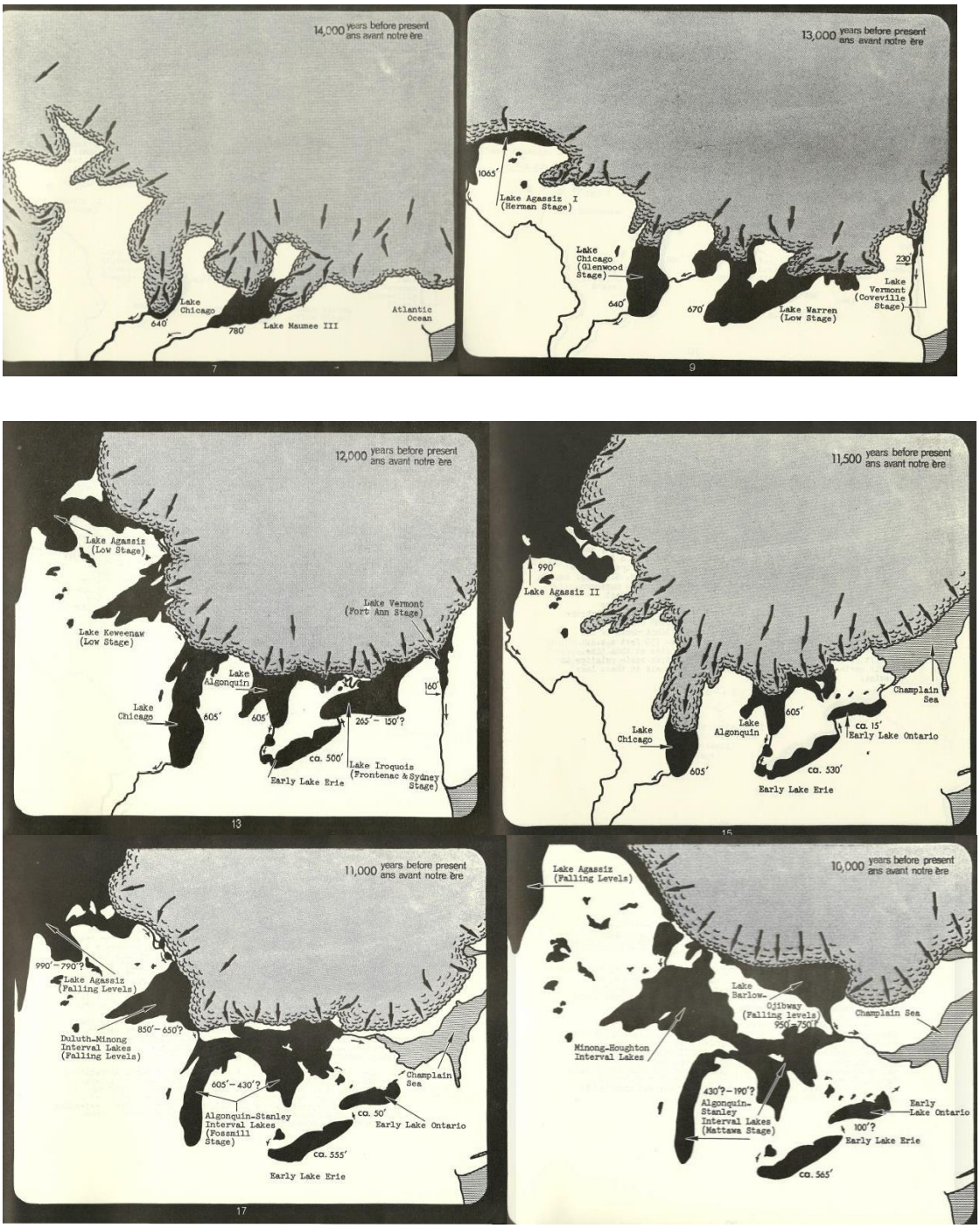

Fig 4

This is an example of an overhead projecturals project produced by Studio G to illustrate the movement of the glaciers over time. Each line drawing was reproduced on a mylar sheet. The teacher would layer the sheets on top of each other as she progressed through the lesson. This effectively simulated the dynamic of film while enabling the teacher to pace the viewing to her liking (*used with permission*).

transparencies were easily scratched or marred with fingerprints (Kidwell 2008 60). After a few uses, they would begin looking ragged, with chunks of ink scratched off. Artifacts from media kits were often 'borrowed' by teachers, never to be returned – a common problem with many of the humble media being that they were light and easy to carry (Elliott 22 Aug 2014). With the emergence of cheap, easy-to-use image transfer technology in the schools, teachers began to show a marked preference for creating their own transparencies (Baron 27 May 2013). The sale of projecturals lasted only a few years - from 1967 to 1969 - although their inclusion in multimedia kits continued until the end of the '70s.

Like filmstrips and slides, overhead projecturals afforded the interactant absolute control over pacing. Teachers could layer the slides one by one as the class progressed, and then "replay" the shifts being illustrated by re-layering them again quickly – similar to paper-based animations that give the illusion of movement by quickly thumbing through still images on each page. The low cost of the media, the stability of the projector design and its application across the curriculum meant that overhead projectors were common in many classrooms. They required little more maintenance than the occasional cost of a light bulb and rolls of mylar (Elliott 4 Oct 2013). The ability of teachers and students to customize content is an important affordance of this media form as well. The creation of overhead projecturals could be as simple as drawing an image with a marker, or complex, as with transferring a photograph. Of all the humble media, overheads are probably the most versatile and reliable, and continue to be popular with both teachers and students even in today's classrooms, at all levels from kindergarten to university. Overheads are, arguably, the precursor to the now-ubiquitous PowerPoint.

Humble Media and the Technological Imagination

As one of the primary producers of education media in Canada during the 1960s and ‘70s, and the only one funded by the federal government, Studio G played an enormous role in developing the technological imaginations of Canadians. Apart from hand-held cameras, the only contact most people had with audio-visual media at that time was in schools and the workplace. Through their intra-actions with these early analog forms of pedagogical media and technologies, teachers, students, creators and manufacturers began to recognize the value of several key affordances that facilitated the highest degrees of engagement and experimentation: namely, the affordances of sequencing, pacing, on-demand access, and control of content. Pedagogical activities facilitated by these affordances have shaped the foundation of our understanding about how pedagogical media could and should be used. All increase the agency of the interactant, and, in so doing, embody key strategies of democratic citizenship (Barry 2001 5).

The impulse to control temporal sequencing, pacing and content are predominant in humble media. These affordances enact the constructivist core of the pedagogical paradigm shift of the time discussed earlier (Piaget 1955, Vygotsky 1978, Bruner 1985). Vygotsky, arguably the founding father of constructivism in North American education, was, along with Sergei Eisenstein, Dziga Vertov and many others, part of the constructivist movement in post-revolutionary Russia – an interesting historical connection outside the scope of this dissertation. Similarities between the pedagogical affordances of sequence control are ample, particularly with Vertov’s aesthetics of close, tight edits in “Man with a Movie Camera (MWMC)" (1929), in which the director’s wife and editor, Elizaveta Svilova is recorded cutting strips of film into ever shorter clips, rearranged in a type of algorithmic order carefully designed by Vertov himself. Sometimes these cuts are single frames – just like a film slide – a moment in time taken out of its

original sequence and reordered to reveal the world through Vertov's perspective and the patterns that would otherwise go unnoticed. His belief in the potential of technology to reconstruct human reality through his kino-eye is congruent with Barad's concept of agential reality. The man, the movie camera, the editor, Russian culture, technological innovation, and the movie-maker's eye all play a part in revealing the *kino-pravda*, or film truth, that would remain unseen without these manipulations.

In effect, MWMC is Vertov's microworld – his own sandbox reconstruction. To wit, Vertov was motivated by a compulsion to capture *kino-pravda* through sequences of increasingly tight edits to reveal his belief that through the camera, the filmmaker could reveal patterns and connections that the human eye could not perceive otherwise – a montage built from the images of reality captured on the frames of his film (Feldman 1998 28, Thomas 30). The camera acts as a kind of dynamic, cognitive prosthetic in the McLuhan sense, enabling the filmmaker to reveal his perspective of truth to his audiences, opening their eyes and their minds to that which they would otherwise be blind (Feldman 1998 33). Vertov's 'vision' of what could be achieved through this intra-action is the product of his technological imagination melded with his Marxist politics formed through his experiences with visual media and his observations of life in post-revolutionary Russia. *Kino-pravda* is, in this sense, a prototype for pedagogic media in which control of content, sequence and pacing are essential affordances of power. MWMC can be understood as pedagogic media, an apparatus through which a more truthful agential reality can be perceived. This reality does not preexist Vertov; it is revolutionary – emerging through mediated entanglements with Vertov, Svilova, the 'Man' - Mikhail Kaufman, Vertov's brother - the camera itself, and the film which was recording the proletariat intra-acting with technology,

creating their own rhythms of their daily lives. For Barad, Vertov documents the agential reality of the proletariat, as embodied through the media, the man and the environment.

Lev Manovich sees Vertov's MWMC as a precursor, if not an actual example of non-linear "new media", digital media layered through a phenomenon Manovich calls "transcoding" (Manovich 2002 45). This term describes the layered duality Manovich sees as inherent in digital media consisting of a "computer layer" meaning the technology with which computers operate (the bits and bytes of binary code and the electronic impulses into which they are translated) and a "cultural layer". The cultural layer sounds as though it ought to refer to the non-technical, human-shaped contexts in which the media exists, but in fact seems, in Manovich's work, to refer to the human modelling of cultural forms such as short stories and encyclopedia, literary genres (comedy and tragedy, for instance) as well as narrative devices such as mimesis and catharsis (Manovich 46). Seth Feldman suggests that Manovich's formulation of transcoding is "a post-modern appropriation, one that links two of the great polar opposites of our time: the analogue and the digital. The digital world has not improved on Vertov's invention – any more than any other postmodern appropriation has improved on the original. … Rather the appropriation demonstrates an essential commonality between then and now" (Feldman 45). This is a very useful distinction in the context of this dissertation, which traces these "commonalities" between analog and digital media in terms of engagement, around which the four waves enfold over each over, and are related to, but not necessarily improvements of each other. Digital technologies in the form of CD-ROMS, for instance, would not have been possible without the technological imaginations of media developers and technicians that were shaped, in part, by analogue media. As a premier producer of educational media during this time, Studio G was

foundationally important to our understanding of what might be possible in the encounter between analogue and digital today.

Similarly, educators' perceptions of digital media as useful and relevant in the educational context were informed, to a large part, from their previous experience with humble media both in terms of what they expected and desired. Digital media owes much to these antecedents, if not in form then in practice. Feldman's assertion that "(t)he past becomes that which can be re-mastered and was never anything else" is perhaps an overstatement of this allegiance but is nonetheless congruent with Barad's agential reality in that they both deny the status of dichotomies – past-present, subject-object – in favour of realities that are continuously being formed though interactions involving material, and discursive apparatuses (Feldman 45, Barad 234). Whereas in Manovich's computer culture, the cultural layer in which human culture models the world, and the computer layer which represents these manifestations, co-exist and influence each other. Each layer pre-exists the other, being "composited" together through digital media, and the dichotomy is preserved (Manovich 46). This dissertation disputes the separation of media from practice, in that any observable trace of media-human interaction is no more than a momentary realization of larger patterns and dynamics of intra-action that have taken place over time and will be subsumed into future moments of engagement – perpetually mastered and remastered.

The first wave of intra-action with pedagogic media produced through Studio G marks one such moment - the first step in the transformation of audiences, both teachers and students, into interactants. Realizing pedagogical media is not only to be consumed but can be created by the people who buy it, breaks down the gap between expert and novice preserved dogmatically in traditional educational contexts where experts produce media and novices consume it. When the

intention of the media is to influence citizens' sense of national identity and affiliation within a democratic context, the apparatus of intra-activity is an important resource for fostering the conditions of citizenship (Barry 127). Being able to control, alter, contribute to, access and disseminate content are affordances commonplace in the contemporary media landscape, but were barely emerging possibilities in the 1960s. Once teachers and students were used to being able to customize their own overheads and slides, using pre-packaged versions produced by educational designers was not the only option, or even the best one in particular situations. Having experienced the freedom of being able to access media when needed, the demand for such access on an ongoing basis eventually led to the closing of regional board-controlled media libraries in favour of new resource libraries within individual schools. Through their interactions with humble media, audiences became media users, and developed expectations of the media they used.

Studio G and the NFB

Despite the trailblazing Studio G was doing in advancing the production and practice of pedagogical media in the Canadian education sector, and the fact that it was a consistent and significant source of revenue for the NFB, the Studio continued to struggle for status on the home front. Even though it was first and foremost a production studio, the Studio's budget was barely enough to cover salaries, with almost nothing left over for production (Elliott 11 Jun 2013). For a project to be approved, there had to be a great educational need, or the Studio would have to obtain full or co-sponsorship from its clients. For this reason, Studio G's reputation as a world-class producer of educational media owed much to Floyd Elliott's prowess as a canny producer able to forge strong relationships with potential clients. Funding for AV projects was supposed to come directly from the Secretary of State, negotiated through the Liaison Officers

appointed to ensure the awarding of audio-visual business from Ottawa was fairly allotted between the NFB, the CBC and private enterprise (Elliott 11 Jun 2013). Aware of the constraints and institutional pressures, Elliott went out of his way to develop a network of strong relationships with project leads and high-level officials in many government ministries, school boards and non-profit agencies. Negotiating over a golf game or a beer, he would help officials brainstorm possibilities for professional quality AV projects that would be produced by Studio G at a fraction of the cost of hiring a private company, and with some careful budgeting, circumvent the need to go through Liaison for funding altogether:

> I made a science out of end of the fiscal year. In February and March, whatever money you had left over, you'd lose it … there's no carry over with federal money. So I always said "look, you give me that money, and we can do this project we've been talking about. I'll take the money now, I'll sign up the writer and the artist and the photographer. I'll give them contracts that have a "50% up-front' portion – these [were] people we [could] trust – and we'll spend the money in the next few weeks. And then in the next year, we'll actually finish the [project] with some new money." [I'd tell the client] "… the only thing I want is the outside costs, my staff is being paid, the electric bill is being paid. … It's going to cost $200-250,000, what I want from you is $79,000 and we'll look after the rest." Now this was a lovely bargain for all of the departments, and they were interested in that. …Liaison threatened to have me neutered several times, if I didn't, at least, tell them where I was going and what I was up to. …Back at the NFB, numerous levels of the Liaison Boards and the Directors would have week-long hissy fits as to 'how the fuck did Elliott get that project through'?

(Elliott 11 Jun 2013)

Clearly, Elliott's *modus operandi* worked, since more than fifty percent of the proposals produced by the multimedia studio were realized in this way, with only a trickle coming through the upper management of the NFB where production money was dedicated to the film and animation studios (Elliott 11 Jun 2013). While Elliott's activities were a source of irritation at the NFB, his contribution to the educational sector was celebrated. In a personal email dated 14 Jun 2016, Elliott further explained:

> No one at the NFB was too concerned about Studio G's unorthodox [strategies] except for political types in the upper administrative levels and the NFB liaison group (who later became a branch of treasury board). They often went out of their way to block our chances of bidding on choice projects and several times complained [to NFB administrators] about my back-door net-working /panhandling activities in Ottawa. They had a point in as much as I rarely asked their permission to officially approach a department as that would have involved a lot of diplomacy and letter writing work and would not have produced any results. Liaison did sometimes bring us projects (that all the private sector groups had rejected as not having secondary markets or distribution potential. Bilingual air traffic control and training handicapped athletes come to mind. Similarly, when one of the projects they allotted to the private sector went seriously awry they would ask/beg us to take the project over, finish and market it; often at our expense as the original sponsor funding had long been exhausted.

Elliott's acumen for skirting the system to fund projects was also practiced by Kathleen Shannon, as documented in Vanstone's book "D is for Daring", for many of the same reasons –

they were both marginalized studios producing work not valued by the NFB hegemony. In both cases, it was human intervention that made room for pertinent content designed to engage citizens, despite the machinations of the Film Board's bureaucracy.

In 1994, The Association for Media and Technology in Education in Canada presented Elliott with the AMTEC Leadership Award in honour of his involvement as a writer, director or producer in more than five hundred educational titles, many of which were award-winning productions that set the bar in the field. With Studio G's reputation for setting the standard for pedagogical multimedia firmly established, an experienced and committed staff of media creators and strong, visionary leadership at the helm, Studio G stood on the brink of the digital age, ideally positioned to forge new directions in the production of new media.

The NFB's first wave of experimentation with audience-controlled media developed the technological imaginations of media creators, educators and students, and this extended intra-action formed the agential reality out of which the NFB's eventual experiments with computer technology would emerge. The affordances of control embodied in these media, had the same roots in constructivism as did the *cinéma vérité* movement in documentary film. It could be argued that if *cinéma vérité* was directly descended from constructivists such as Eisenstein and Vertov, the pedagogical form of constructivism embodied in the most salient affordances of humble media – control of sequence, pace, and to a lesser degree, content – was once removed from this lineage in that creative control was effectively granted to the interactant rather than maintained by the auteur filmmaker. This difference was enough to push the media designers of Studio G to the periphery of the NFB family. However, the affordances realized by humble media formed the design of digital media produced at the NFB.

Studio G was largely responsible for the NFB's continued relevancy in the digital media landscape of the nation during the 1990s, and this relevancy was built on the Studio's experience producing interactive analogue media. Films, however well-crafted, were not modern enough to compete with the lure of the computer. Schools were expected to prepare young people to be relevant in a computerized world. By the time computers were accessible to the general population and could be found in classrooms, educators and students had become accustomed to being able to sequence their own media and to control the pace at which they navigated it. They had come to expect synchronized audio and visual media, but had also experienced the loss of agency they had with 'old-fashioned' slides, filmstrips and overhead projecturals. Teachers and students alike had become adept at using multimedia materials to accompany their oral narratives, which had not yet been contaminated by the plague of PowerPoint denounced by scholars such as Edward Tufte (2003). In short, they had begun to have expectations of how multimedia should and should not be used based on their interactions with humble media, and consequently, envisioned possibilities for what could be possible in terms of media interaction in the future. As new technologies emerged, the insights acquired through this first wave would lay the foundation that would contribute to the media literacy of generations of Canadians.

CHAPTER THREE: SECOND WAVE

THE DIGITAL TURN: NON-LINEARITY AND AGENCY

As it had done with humble media, the NFB affirmed its status as one of the primary Canadian producers of educational media with its production of digital media in the form of CD-ROMs, DVDs and laserdisc technology, which characterized the second wave of media intra-action. It is not an overstatement to assert that educational production generally, and Studio G specifically, brought the computer age to the NFB. This was in large part due to the creative work started in Studio G. Even after its demise, educational media designers that were reassigned from the Studio to other areas of the Board continued to create interactive media projects for young people. These productions ensured the relevancy of the NFB in the digital age, and in so doing forged the path for its filmmakers to move into the digital realm in their wake.

The distinguishing characteristics of the waves of media intra-action put forth in this dissertation refer to reciprocal convergences of media design, media usage and the broader social, political, and economic practices out of which they emerge and in turn influence. As discussed in the last chapter, first wave interactants enjoyed a heightened sense of agency through their use of humble media by having more control the conditions of their media consumption. Humble media responded to and fostered the learner-centred pedagogical priorities that were emerging in the 1960s, as well as enhancing meaning-making activities. In the first wave, the primary interactant was, invariably, the teacher, with the student cast into the role of the observer. In the second wave, the student became the primary interactant and the teacher merely the manipulator of visual material. This was facilitated by the introduction of computer technology, particularly the personal computer, and a fascination with individual

control of media. Beginning in the mid-nineties, middle and upper class children and youth, particularly in urban areas, became active media interactants with access to PCs both at home and in the classroom. The computer provided a customized learning experience which granted interactants a sense of agency over their own learning, outside the constant purview of their teachers and parents. Media designed specially to heighten interactants' agency in the second wave shifted from a novel affordance to an imperative. This chapter traces this shift by focusing on the ways in which computer-based technologies altered the role of the teacher, disrupting previously sacrosanct classroom relationships, while reinforcing learner-centred pedagogies during a period of economic austerity that was experienced in classrooms as well as Studio G and the NFB as a whole.

By the time personal computers (PCs) emerged in the 1980s, teachers in Canada had been integrating multimedia into their teaching practices for approximately twenty years. Reasonably, they expected to be able to control, to greater or lesser degrees, the sequencing of their media, playback pacing, adding customized content, and accessing specific media when needed. These affordances would become transparent and natural to teachers, leaving them to focus on media content rather than technology (Bolter and Grusin 23). Many teachers became adept at seamlessly weaving their lessons around slides, overhead projecturals and filmstrips, using multimedia to fill in details, reinforce concepts and capture the imaginations of their students (Baron 2013). Although humble media varied in form, the dynamics of how they were integrated into the teaching process did not differ radically. The pedagogical differences between using slides and filmstrips – with and without sound – overheads and even film loops had more to do with the choreography of their use than in their purpose. Typically, teachers remained the primary navigators of these media, and largely maintained control over what

students could see and when they could see it. While students sometimes used overheads and slides in class presentations this was not typical.

This would change during the second wave of media intra-action, which focuses on Studio G's experimentation with the affordances of computer-based technologies from the mid-1990s to the rise of the Internet in the early 2000s. These new forms introduced possibilities for media use that disrupted many of the tried and true techniques teachers had developed using humble media. Likewise, NFB designers experienced a sharp learning curve. They had to develop new ways of using the new forms of media emerging with computer technology including laserdiscs, CD-ROMs, DVDs and the Internet. This was a stretch, since none of them considered themselves to be technical people (Elliott 11 Jun 2013).

I include analogue video in the form of VHS designed for non-linear viewing in the second wave - although it is, strictly speaking, more of a bridging technology between remote-controlled analogue media practices established in the first wave and the digital media that is more typical of the second wave. VHS technology radically transformed educational distributors, the NFB amongst them. For Trevor Grigg, who oversaw national promotions in Distribution around the time Studio G was closed, this amounted to new opportunities:

> Folks aren't buying 16 mm prints, they aren't developing these large centralized collections in school boards – it's opened up now to classroom teachers, so our potential user is now not the 750 boards across the country, it's every single teacher. The price of the object goes from $2000 a print with big school budgets to $29.95 and the individual can buy it on their credit card. So when video came in, the whole place was rocked in a very big way.
>
> (Grigg)

With VHS technology, the NFB began a tradition of repurposing media produced in other formats onto video that could be played in classrooms on TVs. The remediation of materials in new formats would become a common means by which the NFB could release "new" productions annually without incurring new production costs beyond the making of a master tape, and subsequent copies. This not only broadened its market considerably, it also recouped an important affordance – control of pacing – lost when filmstrips became audio enhanced. Using remote controls, teachers could easily stop and start VHS tapes without worrying about interrupting sound synchronization. It is true that VHS tapes could jam in the machines if stopped too many times, but it was nonetheless somewhat less problematic to stop a video to ask a question or make a comment than it was to try to pause filmstrips and tape cassettes midway.

Computers Enter the Classroom

The rise of PCs coincided with the theoretical shift towards constructivism in the educational sector, discussed last chapter, in which the thrust of the curriculum shifted to "student-centred learning" intended to foster the curiosities and individual interests of the students in order to develop them into more independent, life-long learners (Papert, Strommen and Lincoln). Humble media embodied constructivist-based learning activities more than had books or film, but the teacher often functioned as a type of avatar for her students, controlling the media on their behalf so the benefits of it were felt more by proxy than direct experience. The computer interface enabled individual students to realize the potential of constructivism directly with little or no adult intervention.

The promise of unlimited access to and consumption of media in the private sphere helped to justify the expansion of the PC market to the general public (Foster 22). Commodore,

at the vanguard of the PC market in 1977, released the 4Kb & 8Kb PET 2001 (Matthews). The educational market for PCs grew quickly, enhanced by strategic pricing on the part of Commodore who, after releasing the VIC-20 in 1981, offered radical discounts, selling computers to educational institutions for only 11% of the original price (Morabito 63). As a result, by 1985 Commodore controlled 67% of the Canadian market and 87% in Ontario (Morabito 62). In 1982, "The Computer" was named Time Magazine's "Machine of the Year" and by 1984, 8.2% of American households owned a PC. By the end of the decade, this amount almost doubled to 13,683,00 households, or 15% (Kominski 7). Lured by the promise of unparalleled access to infinite knowledge, consumers rushed out to buy home computers, many of whom has no idea how to use them (Hook 62).

Predictions concerning how individuals would, could and should interact with the interface were standardized in the field of Human-Computer Interaction (HCI) by the 1980s. Expectations, abilities, tolerances and attention spans of individuals were determined through usability testing in labs (Rogers xi). Even in the contemporary digital marketplace, this extensive body of research focuses on minimizing the frustration user-consumers feel when engaging with an interface in ways that do not meet their expectations. By ensuring media is designed appropriately to address these needs and expectations within a particular degree of competency, HCI standards aim to ensure user-consumers are satisfied, thus fostering their attention and extended usage. However, it is not clear if, or in what ways, the assumptions on which HCI design standards are based are infused with cultural assumptions which may skew their empirically verified assessment of user behaviour. For instance, speak-aloud protocols – a popular type of usability testing in which a user is required to narrate what s/he is thinking as they work through an interface – would be more effective in eliciting feedback from people

comfortable and adept at speaking aloud and might be less effective in eliciting data from people of cultures or with personalities less inclined to orate feelings. Thus, standards based on these results, may not be as applicable to other types of users. Additionally, the needs of consumers do not always align with those of interactants in educational settings. It may be desirable for a company to cater their website to the design expectations of their online consumers by following HCI protocols. However, it is sometimes desirable in a computer-based learning environment to introduce a challenging element to assess the ability of the learner-interactant, or to foster her development. HCI is not normed for the unique aspects of the digital learning environment. For better or worse, the results of HCI studies have dominated production standards in new media design and much of what is considered 'intuitive' interface design has come from the assumptions and standards developed through HCI testing.

Within twenty years of the introduction of the PC in Canada, ninety-nine per cent of Canadian schools provided computer access to students, with roughly one computer per five students. Having reliable Internet connections in classrooms would take even longer due to access issues and safety. Plante and Beattie's study is not necessarily an accurate representation of the ratio of students to computers in all schools as they recorded only 6,700 schools to represent the more than 15,500 across the country. Disturbingly, they utterly failed to include First Nations schools. Indeed, even at the time of writing many, schools, especially those in Indigenous and rural areas, struggle to provide even one computer per class and still cannot provide either computers or access to the web, creating a significant digital divide[16] throughout the country and the consequent economic and social disparities that go along with this disparity

[16] The term 'digital divide' is constituted, according to Pippa Norris, by three types of disparity: global divide – inequalities in access to the Internet between industrialized and developing nations; social divide – between the rich and poor in each nation; and democratic divide – between those who can and cannot use a range of media to engage, mobilize and participate in public life (Norris 273). I use it here primarily in the latter two senses.

(Plante and Beattie 10).

However, there were prodigious budget considerations with the integration of classroom computer technology given that Canada, generally, was reeling from a sequence of economic downturns. A 1995 report on the use of multimedia in history classrooms commissioned by Barbara Janes, Director of English programming at the NFB, documented the tension between the pedagogical goal of preparing students to be "contributing citizens to the Canadian nation state … [with] the skills of "knowledge" work in the 'information' age" on the one hand, in a context of severe budget cuts. Such cuts rendered impossible purchases "as expensive as new computers with CD-ROM capacity for ongoing, interactive and instructional use" (Campbell 16). Schools with CD-ROM capacity tended to anchor it in their libraries to manage information storage and retrieval rather than for individual, interactive learning.

The pedagogical use of computer technology really took off with the development of the CD-ROM, whereas floppy discs were too small to hold larger multimedia files (120 – 240 MB), a standard CD-ROM could hold up to 737 MB ("CD-ROM"). Grolier Publishing became the first publisher of a mass-market software product on CD-ROM when it launched its electronic encyclopedia in 1985, making this iconic resource much more accessible to the average family by dropping the price from upwards of $650 for the book-based version down to $199. It also provided a legitimate reason for the public to purchase computers for home use, significantly increasing market demand for desktop computers (Foster 22). The success of Grolier's Encyclopedia set a new direction for pedagogical publishing that eventually, and inevitably led to the 2012 announcement that the Encyclopedia Britannica would no longer be published in print. Digital media was radically cheaper to produce, much easier to update

quickly, considerably more portable, and took up much less space than paper-based media, especially the size of a set of encyclopedias.

The use of CD-ROMs furnished students with the ability to individualize navigation based on their own learning agendas. But CD-ROMs offered another affordance that was both new and powerful in the media landscape – the search function. In effect, the search function enabled interactants to reconfigure the data of the database collocated by whatever search term they enter, as long as the required items are tagged with corresponding metadata. The search function relates to the affordances of sequencing and navigation in that it enables the interactant to control what materials that individual encounters and when, as opposed to being forced to follow the order prescribed by the media creator, as experienced with film and other sound-synchronized media. This affordance, in effect, merged media viewing with traditional research, but rather than having to physically seek out materials in disparate locations, selected digital files – print, image and audio - would simply appear 'on demand'. The very act of typing a keyword into a dialogue box to pull up an array of relevant materials was, indeed, a wonder at the time.

Lev Manovich, in *The Language of New Media,* describes the computer database as the symbolic cultural form of the computer age. He understands CD-ROMs along with any Internet database as a cultural manifestation of one half of the ontology of computer technology - the data structure, which refers to the unique way in which a data set is organized to facilitate search and retrieval most efficiently. The other half of this ontology is the algorithm, which, he asserts, exists in a symbiotic relationship with data structures (Manovich 2002 223). In new media, by which he means computers, this ontology is understood as a projection onto culture itself. He cites encyclopedias produced on CD-ROMs and computer

games as examples of this claim (Manovich 2002 226). However, this idea presents a somewhat unbalanced articulation of computerized intra-actions. Manovich repeatedly refers to the way the computer 'projects' its ontology into the cultural sphere without acknowledging that the database structure and algorithms are themselves projections of the ontological assumptions made by (human) software developers. If the ontology of computers is, itself, the manifestation of sustained intra-action between humans and both computer hardware and software, as Barad would contend, then Manovich has discounted one half of the dynamic. In so doing, he commits the cardinal sin of technological determinism by attributing the complexity of the cultural sphere to only one influence, that is, the structure of the database. However, his account does draw attention to the cultural significance that the form in which we convey ideas has on the way we think, as suggested by Katherine N. Hayles in her account of technogenesis (Hayles 2012). Hayles asserts that humans create technologies as manifestations of their own technological imaginations, which result from and in turn reconfigure new interactions with technology (Hayles 10). While she does not extend this to the epistemological lengths that Barad does, technogenesis can be understood as an instantiation of intra-action which catalyzes technological innovation. It is the symbiotic relationship between what we can imagine, based on our experiences and desires, along with what we have learned through our interaction with media technologies that motivates technological change. Over time, these changes will re-shape our technological imaginations and desires. Manovich was half right. Database technology does not only project on to culture - it is itself a manifestation of that culture. Likewise, the technologies used in the classroom, digital or analogue, do not reinvent the act of learning, but rather reflect established practices with modifications to improve aspects of those practices. Occasionally, these modifications

are more disruptive than anticipated, and the introduction of the personal computer into the classroom was one of those moments.

The Topos of Interactivity

During the second wave, interactivity would develop into a *topos* of new media as I signaled in Chapter One. This type of interactivity differed from the teacher-controlled interactivity that dominated the first wave of media intra-action. The design of personal computers, with single, small screens - certainly by today's standards – and a mouse intended for only one interactant at a time, seemed to provide the ideal technology with which students could be granted agency over their own learning processes. This aligned with the priorities of educators, government and even parents - to raise a generation of self-actualized, computer literate citizens. Educational software designers emphasized the use of interactive media as a fun way to learn, constituting an enjoyable activity with actual learning a happy byproduct of the process rather than its focus. Enthused one teachers' guide:

> …new or slower readers will be encouraged, through success, to keep learning. More advanced readers will find fresh challenges as they are ready for them. … [S]tudents work at their own pace and gain an exciting sense of new possibilities.… [B]y encouraging players to keep trying until they succeed, children learn the value of perseverance and experimentation while building self-confidence. … [with media] well-suited to individual use. Teachers can provide tailor-made instructions for each student by assigning them different sections of the CD-ROM according to their specific needs. Students can also work unsupervised, simply by exploring and experimenting. …[this] CD is highly interactive with great visual and aural appeal. It encourages creative, non-linear

ways of thinking.

(Umbrella Teacher's Guide 3)

Thus, interactivity was understood as an inherently positive attribute of computer technology. The built-in efficiencies that catered to different types of learners were attractive to teachers trained in the 1970s and afterwards for several reasons. Specifically, students could pace their learning and select their own paths through the media. The concept of individual learning styles had become a hot topic in the educational sector during this period. It raised awareness of the need to ensure that lessons are appropriate for and equally accessible to students who learn in a variety of ways. Out of these concerns grew the notion that some students learn kinesthetically -- that is, by doing, seeing and hearing -- implicating new media possibilities as learning enhancements (Coffield et al, Dunn and Dunn, Presseisen). Likewise, with immigration numbers rising steadily, teachers needed materials to ease the transition of their ESL students. Individualized options of interactive media provided just such support and had the added benefit of operating without demanding a teacher's focused attention. As well, the general accepted belief that learning was effected negatively by larger class sizes was substantiated with empirical evidence from the Tennessee Student/Teacher Achievement Ratio (STAR) project launched at the dawn of the digital era in 1985 (Mosteller 113).

Privileging the needs and expectations of the individual, as realized through interface design on PCs, was congruent with the ideas of individualism that flourished in the 1980s and early '90s and reinforced by two complementary idealisms – the decision-making model and consumerism. During the early 1990s, H. A. Simon, winner of the 1978 Nobel Prize in Economics, was exploring the dynamics of playing chess and bridge to design a model that would identify and map out decision-making and outcomes as a sequence of identifiable and

predictable steps. Decision-making, therefore was understood to be strategic, thoughtful - almost scientific - in its ability to predict or at least understand behaviour. In this same milieu, the *topos* of consumerism was shifting from a more neutral description of the competitive marketplace it enjoyed in the 1960s to something more negatively charged by the early 1990s (Simon 1992). In a materialist society, the right to be master of one's own destiny devolved into what Renata Salecl dubs the 'tyranny of choice', in which incessant opportunities for choice-making creates deep anxieties regarding what choices should be made, magnified by fear of the negative ramifications for making 'bad' choices (Salecl 33). In the face of a plethora of options, consumers become distracted, even overwhelmed with being required to make choices on such an enormous scale, that they have no time for, or interest in the social critique of previous decades. This level of public distraction served both corporate and political interests well (Salecl 33). 'Having choice' became an end in and of itself, rather than a means to an end. The uncritical acceptance of choice-making as inherently good, regardless of how insubstantial the consequence of the choices made, infiltrated the marketplace and the classroom with equal fervor.

Personal computers offered the ultimate portal to limitless choice-making in the privacy of one's own home, providing an illusion of personal control if only on a micro-local scale. Initially, interaction with the interface was understood simply as a point, click (and wait) process of navigation and access that put the power of choice into the hands of viewers-cum-interactants. By the end of the 1990s, bandwidth and RAM would increase to the point where web surfing had become a leisure activity of choice for the consummate 'cyber-*flaneur'*, with CD-ROMs and their bounded universes giving way to the seemingly limitless expanse of the World Wide Web. *Flaneur*, in Manovich's usage of the term, refers to someone who is "no

longer just a pedestrian walking down the street, but not yet Gibson's data cowboy who zooms through pure data armed with data-mining algorithms" (qtd in Feldman 46). The fascination of the unimpeded gaze and access to the profane seemed to have no limits with hyperlinks linking an endless array of sites, all free, save for the cost of a computer with Internet access. This universal *à la carte* access channeled the desire for computer interaction from an activity of productivity in the workplace to one of entertainment in the home. It established the computer and the Internet as iconic media where choice-making was reified as an activity in its own right as people learned to "surf" the web. The ability to point and click produced an almost Pavlovian response, rewarding the interactant with a sense of agency and satisfaction. In short order the term 'point and click' expanded from a mere navigational procedure, to evoking a sense of ease with which interactant desire could be satisfied. The fact that the result of all this 'interactivity' was rarely meaningful or substantial was inconsequential as long as the illusion of control was maintained. A satisfied person, whether child or adult, tends not to make waves for those who are in power, be it parents, teachers, politicians or corporations.

While the Internet age was still in its infancy in the early nineties, the taste for ever-more choice whetted by "*yuppism*", the ultra-consumerist phenomena of the 1980s, and honed further with the promise of a computerized future, ensured the market was primed for audience-controlled media. Choice was the most salient driver of mass media, with technologies like cable television and VHS affording media consumers greater control than ever before over what they accessed and when they consumed it (Advertising Age).

In the educational sector, CD-ROMs and laserdiscs promised to stimulate students and engage them more actively in their own learning processes by giving them greater control over how they experienced pedagogical media (Baron 1989 21). Rather than the pre-determined

narratives of traditional films, and sound-synchronized filmstrips and slides, 'meaning' in these new interactive digital media productions was understood as contingent upon interactant choice. Meaning, in fact, was negotiated through interactant's selections of hyperlinks and was determined as much by how the interactant construed the juxtaposition of texts, images, sound and graphics they encountered as it was by the creator's intention (Kress 2010). The destabilization of structure and meaning that occurred in these new media forms, embodied and reinforced the popular poststructuralist movement of the time where **all** knowledge, truth and meaning was recast as contingent, refuting the authority of the author/text (Barthes 1977). In short, interactive, choice-driven media emerged onto the educational market at a specific historical moment when teachers and students were primed to receive it. This was the result, in part, of both established familiarity with humble media and acceptance of the prevailing *topos* of interactivity. Educational digital media was unavoidably implicated in the zeitgeist of this time, performed through intra-actions with multimedia in complex relationships between the computer industry, government, educators, and consumers in a symbiotic interplay between demand for innovation, access and social, economic and political priorities. Early computer interfaces privileged individual choice over consensus; individual work processes over collaboration - a far cry from the pedagogical idealism of the 1960s.

CD-ROM Production at Studio G

Easy access to affordable resource materials accessible on CD-ROMs was pivotal in making computer technology the preferred form of electronic media for learning, providing immediate access to potentially all the knowledge humans had acquired throughout history with a keystroke. For educational publishers, CD-ROM technology represented a low-cost option for reviving their catalogues by simply repurposing already produced materials in

'new' electronic forms.

The success of the Grolier's CD-ROM caught the attention of Studio G producers, eager to explore this medium. In 1994 and 1995, the Studio released its first two productions on CD-ROM: *Canada's Visual History*, a compilation produced in conjunction with the Museum of Civilization (MoC) and *FlyPast!* a joint project with the National Air Museum. The NFB did not have adequate technology to produce CD-ROMs but, rather, was dependent on outside agencies to partner with them to produce these two projects (Elliott 12 Jul 2015). In the case of the Visual History project, Elliott carefully orchestrated negotiations with the MoC:

> No monies [were] to be exchanged between us and the understanding was that all outside funds needed would come from the museum. We had much opposition from the higher ups inside the board and at the museum's Board of Governors level as to our meddling in provincial education matters. It was a topic dear to nationalist francophones. The decision to do the CD-ROM version was also between myself and the Deputy Director of the Museum of Civilization. They wanted to do it as they had internal programmers and related staff. We observed/monitored the production process and mass produced and marketed the end product.
>
> (Elliott 12 Jul 2015)

In so doing, Elliott sidestepped the Liaison Officer for the Treasury Board entirely, a strategy for which he became notorious, and for which he was frequently reprimanded. Nonetheless, his strategy led to Studio G producing some of the most interesting and innovative media projects in Canada in spite of the federal government's attempts to funnel more and more contracts for sponsored work to the private sector (Evans 252). Beyond those

covered in this research, other notable productions included a film called *Drugs in the Body* that came out of the *Le Dain of Inquiry into the Non-Medical Use of Drugs* (1972), which received a best film Chris Award at the Columbus International Film & Video Festival and a seven-filmstrip multimedia kit *Indians of Canada* (no date) sponsored by the Royal Ontario Museum in which the Board's council of Indigenous consultants vetted the content.

The need to circumvent existing business systems and structures to make room for experimental but potentially valuable innovations is a largely unexamined aspect of technological change, having as much to do with what comes to the market as does consumer demand. In fact, it was out of the deeply entangled interactions between clients, producers and the NFB administrators - all with their own, sometimes competing, priorities – that many projects were born not only in studio G but across the Board. This is perhaps not unusual in any bureaucratic context – innovators tend to be the cowboys who do things a little differently. The now iconic Skunkworks Project at Longheed Martin during WWII, is an earlier example of this phenomena[17]. The only way the engineers could design and build a prototype for a new airplane that could fly below German radar was to set a small, agile team with autonomy to work outside the regular set of protocols. The tactic worked, and after a year of clandestine active in a smelly old circus tent (thus the name of the project) they produced what was required to help the allies defeat the German air force. Elliott's strategy may not have the rubber stamp from NFB administration that the Skunkworks Project did, but it seems unlikely that no one knew how he was generating funding to create sponsored productions that should have gone to tender or at least been offered to private production companies. The sales Studio G's products brought into the NFB were essential to its survival.

[17] The full story can be found on the Longheed Martin website: www.lockheedmartin.ca/us/aeronautics/skunkworks/origin.html

The emergence of commercially available computer-based media coincided with crippling cutbacks experienced in the culture sector in 1995-96 when the federal budget decreased financial support by $25 million, roughly half or the NFB's operating budget (McIntosh 2 May 2014, Vanstone 181). This demanded the technological imaginations of Elliott and his collaborators, seasoned with his political bravado, to make it possible for Studio G to continue to produce digital media for Canadian classrooms:

> … [T]he luddites in high places were ever trying to stymy experimental new media projects that were not going to result in a finished product for a known market. There were quite a few rainmakers and snake oil types about trying to promote their pet projects. Due to the limited funding at the NFB, I tried to take us down the co-sponsored path where other government departments provided large developmental funding and often experienced programmers. We provided production expertise, visuals, content editorial help, technical finishing facilities etc. and marketed the finished product through our field reps, catalogue system and our commercial distributors.
>
> (Elliott 6 Jun 2015)

Elliott understood that the appeal of humble media would dwindle and pressure was on to find ways to reinvigorate the Studio G catalogue. He appreciated the storage capacity of emerging digital media and encouraged his staff to investigate its possibilities for projects that could be realized in the immediate future "before all our tradition[al] small media sales faded away and us with them" (Elliott 14 Jul 2015).

One of the most familiar of these projects was the CD-ROM of Canada's Visual History (CVH) that remediated the eighty-volume book-set of images and articles on Canadian

history. It included a rich trove of resources: 2,400 archival photographs, paintings, drawings, maps, and charts. Through its CD format, interactants could navigate through the content in multiple ways: thematically, selecting specific categories (cities, Native populations, immigration and colonization, arts and crafts, social and political development, industry, conflict and resource exploitation); by volume, corresponding with the print version; by index and through a 'search function' -- now a commonplace affordance but one, at that time, quite novel. The search function was based on three separate single-word terms using Boolean operators. Without having to leave her desk, a student had access to a range of materials equivalent to a well-stocked library. She had only to submit a keyword or click a key and the requested information appeared before her eyes. The combination of navigational control, the introduction of robust search functions and the ability to control the pace of progression meant students could spend less time locating materials, leaving more time for exploring the resources themselves. Furthermore, because the print content of CVH could be copied and pasted into WordPad, the tedium of note-taking was effectively eliminated. From the perspective of the NFB, the CD-ROM version of CVH provided a popular revenue stream of content relevant to the curriculum in every province, for a comparatively low production cost as the content largely preexisted the production of the CD-ROM.

Perspectives in Science

Almost twenty years had passed since the Hall - Dennis report shifted pedagogical practices in Canada towards learner-centred pedagogy. By 1984, the call for reform was on the curriculum itself – more specifically, the curricula for science and technology (Stanfel 1988 173). School administrators and government officials considered the integration of computer technology into the classroom a social and political imperative (Moll, O'Sullivan). The concern

about computer literacy became as important at this time as open-classrooms had been in the ‘60s. The arms race, atomic energy, space exploration, the potential of cable access and the science-fiction-like integration of computer technology to accomplish everyday tasks demanded technologically-savvy citizens willing, even eager, to access this brave new world (Leaning 79, Drake 13, Barry 2001 48). Consequently, there was a ripple of curricular re-visioning that ran through the country: Saskatchewan began moving toward its Green curriculum, Ontario started to develop its common core curriculum, and Quebec and the Atlantic started looking at student-centred curriculum (Baron 2013).

In 1984, the Science Council of Canada published its report “Science for Every Student”, recommending an overhaul of the science curriculum in order to provide students with the tools to understand how science and its resulting technology affect daily life. Until this point, the science curriculum had been designed with the intention of preparing students to become scientists themselves, although, very few ever did (Stanfel 1988 173, Drake 13, Barry 1998 127). Memorizing periodic tables, writing scientific reports, calculating measurements and making hypotheses about phenomena far removed from their daily lives did little more than convince generations of students that they were ‘unscientific’ and glad of it. But in this post-atomic bomb era, it was becoming clear that everyday citizens would require a more nuanced understanding of applied scientific principles. They needed to understand how science and technology worked, as well as grasping ethical implications that emerged from its use in order to make conscientious, informed decisions in a newly modern world.

Despite interactive science centres and world fairs forecasting a technologically-controlled future, it was in the classroom where most people were introduced to, engaged with, and came to understand the STS (Science, Technology, Society) connection (Drake 10). The

new STS-based curriculum aimed to teach students a more profound understanding of the relevancy of science and technology in their everyday lives. This would both broaden and deepen citizens' grasp of the implications of STS than they would gain from simply memorizing and regurgitating seemingly irrelevant facts on tests. While many applauded this new direction in science education, it posed a significant problem for teachers. There were no pedagogical tools with which to teach the new curriculum to their students. Existing textbooks, slides and filmstrips were designed for an approach to science that was too static for the modern classroom (Stanfel 1988 173). This provided an immediate, high-priority market for the creators of pedagogical multimedia products - a need the NFB was well-positioned to meet.

Elliott, by this time Executive Producer of Studio G, along with Joe McDonald, Senior Program Producer of English Productions, were grooming Julie Stanfel, a promising and ambitious filmmaker who had arrived at Studio G in 1982. Stanfel was young - twenty-six years old - and fresh out of university. A visionary, she was excited by the possibilities of the technological innovations in educational media and eager to learn. Although he considered himself something of a luddite in a digital world, Elliott was cautiously appreciative of Stanfel's passion and ideas about how to use digital media to tell stories in more useful ways (Stanfel 20 Apr 2016). Over time, Stanfel would become something of a thorn in Elliott's side. While her innovations were ground-breaking, her resource-intensive production demands coupled with her tendency to go directly to the administrative hierarchy to get her projects approved along with the consequent funding they demanded, rattled Studio G's Executive Producer. Ironically Stanfel's tendency was something she shared with, if not learned from,

Elliott himself.[18] Further, Elliott deemed Stanfel's practice of starting new projects before existing ones wrapped an annoying habit. Of course, Stanfel was hampered by the non-linear nature of these projects, which clashed with the regimented expectations of production budgets (Elliott 30 Dec 2015).

The most notable of Stanfel's projects, which she co-pitched with Joe MacDonald was titled "*Perspectives in Science*" (*Perspectives*). It was designed specifically to address the urgent need for STS support materials (see fig. 4). Stanfel embraced the democratic idealism of the Science Council report and envisioned a series of interactive videos that would "stimulate students to a wider appreciation of the power of science and technology to alter our lives and our environment, at the same time as learning the basic concepts" (Stanfel 172). With the determinism that earmarked her tenure at the NFB, Stanfel relentlessly campaigned for and eventually received political support for the project from the nation-wide Council of the Ministers of Education along with some vague promises made of their part to purchase the finished project. Atypically, the considerable funding for this project came out of Studio's G's annual budget, leaving almost nothing for any of the other projects they had lined up -- a reality that, not surprisingly, caused some friction among the studio's staff (Elliott 6 Jun 2015).

Elliott may have been nonplussed by Stanfel's methods, but could not help but admire her tenacity in envisioning and shepherding innovation to fruition. Sensing the potential value in the project, Elliott threw his considerable support behind her through the production process, at the same time seeking to temper the growing frustration of the rest of his unit in the light of consequent paucity of Board support for multimedia projects. Both Stanfel and

[18] Although neither acknowledge this legacy explicitly, circumventing the status quo was something Stanfel learned from Elliott. When pressed on the costs of her productions, she advocated for herself to the NFB decision makers – regardless of Elliott's feelings on her projects' viability.

Elliott confirm each other's account of this struggle, emphasizing that frustrations were not directed towards Stanfel personally, but with respect to budget constraints the Studio was forced to operate within (Stanfel 27 Apr 2016, Elliott 30 Dec 2015).

The first iteration of the *Perspectives* project was shot on Super-VHS and the dramas were in 16 mm and then transferred to three, hour-long videocassettes, an introductory video and a comprehensive sixty-page teacher's guide. Videocassettes were considered the most effective, economical and successful way to introduce interactive video to the educational marketplace as VCRs were by this time commonplace in many households (Baron 2013). There was also a videodisc version of the first volume to demonstrate the potential of the technology, with the understanding that it would have limited classroom use due to the cost and lack of available technology (Stanfel 8 Aug 2016). This enabled the teacher to fast forward or reverse to desired segments using a remote control -- a cumbersome faux-interactive feature inherited from static-image, humble media (Elliott 14 Jul 2015). The viewer could choose which video segments to watch on a television set, in whatever sequence the viewer decided, according to his or her learning agenda (Baron 2013). This feature provided the teachers with greater control over what part(s) of the video to use, rather the all-or-nothing option typical of moving-image media.

The video components themselves were produced to be 'open-ended' -- that is, the narrative line was brought to a pivotal moment at which point the video would end and students themselves, facilitated by their teachers, were able to consider a range of potential outcomes and analyze their implications in the ensuing discussion. In other words, the intent of the design was to catalyze engagement through discussion rather than delivering information in a prescribed, rather more static, fashion. Indeed, this open-ended methodology

went the distance, engendering an ability to determine 'how the story ends', enacting a powerful metaphor for the value of active citizenship within a democratic society. This subtle but enormously effective repositioning of the student-citizen was seen as particularly advantageous in this context since the intention of the STS curriculum was to prepare students to take a more active role in the integration of science and technology in their everyday lives.

Figure 4: Perspectives in Science was produced in both VHS and laser disc formats. Julie Stanfel was the visionary behind this project, which was years ahead of its time in the educational sector. Laser disc was so far outside of the comfort zone of most teachers, and the budget of most school boards, that it did not revolutionize educational media to the extent envisioned.

Perspectives was user-tested and the feedback was overwhelmingly positive[19]. The results of this testing were highlighted in the marketing for the project: "97.6% of the teachers

[19] According to Stanfel, the Perspectives project was one of the most rigorously tested project in the NFB's history (8 Aug 2016).

who tested *Perspectives on Science* wanted to keep the videos to use immediately with their students" (Perspectives Teacher's Guide). The testers liked the concept and content of the nonlinear presentation -- they appreciated the ability to customize presentations to the unique needs of different classes and the content certainly fit the curriculum. However, the rigor of the testing may not have been particularly strong (Baron 29 Dec 2015). While being able to point and click one's way through a matrix of video segments may have appeared exciting and innovative during demonstrations, when it came implementing the media in actual classrooms, the feedback was not nearly so positive. Baron remembers, "When it was brought into a regular classroom the reception was much less enthusiastic but more because of the mechanical logistics than the content: teachers were much less comfortable with the technology switching from one module to another, and would lose valuable time… and the kids' attention in the process" (Baron 2013). Nonetheless, it was the initial, positive user-testing results that were presented to the Board, and which no doubt contributed in part to Stanfel getting the go-ahead to remediate the *Perspectives* content using laserdisc, embodying the very purpose of the project: to heighten the technological and scientific literacy of Canadians not only in content but in how they experienced the media (Stanfel 8 Aug 2016). The NFB and the collective of Ministers of Education were excited enough by the potential of laserdisc technology to fund the full remediation of *Perspectives*, support that effectively released the genie from the bottle. Over the next few years, Stanfel would produce some of the most innovative, interactive, as well as, some might argue, unusable media ever produced at the NFB. The problem, Baron explained, was that unlike VHS, CD-ROM and DVD technologies, commonly used in the home, not a single teacher had seen laserdiscs before they arrived in the classroom (Baron 2013). The learning curve was significant and made

educators, generally considered a conservative market when it comes to innovation in pedagogical technology, uneasy (Chow 14).

The second iteration of the *Perspectives* project integrated another innovation as it was one of the first major NFB productions to be shot on video using a Betacam, before being edited on the EditDroid, a guinea pig technology that the NFB was testing for LucasFilms.[20] The resulting filmic material was produced as a series of laserdiscs, in many ways a precursor of the 14-inch CD-ROM.[21] These reflective, 12 inch, single-sided discs provided high quality imaging and could be manipulated via remote control and barcodes. And, at least in theory, they would not deteriorate with usage. Although the media and the players were expensive, laserdiscs were an impressive example of interactive media, even by today's standards. A sort of hybrid between a record player and the soon to be released DVDs, laserdiscs could store up to 54,000 full-colour still frames, thirty-six minutes of video or a combination of twenty-six minutes of video recorded at 24,000 frames (Baron 1989 6). The interactant could view the frames either individually, in slow motion, regular speed, or fast-forward, with or without audio synchronization with the video on a television screen. Images could be enhanced with text that could be superimposed on the video as a window of bubble or 'film' overlaying the video image, entirely novel elements at the time. "The user plus the computer controlled the video, audio and computer programs to create an individualized learning experience" (Baron 1989 6). These interactive affordances recouped the user control over sequencing and pacing that had been lost in the shift to audio-enhanced media and video during the first wave. This

[20] Stanfel recollects that "not many editors were willing to work on the "Driod" but Richard Todd and Academy Award winning Edward Le Lorrain agreed to be involved along with Stephen Steinhouse and Mandy Leith on contract for the duration of the project. The Droid was converted to a tape-based non-linear editing system to facilitate the transfer from video to keep costs down" (8 Aug 2016).

[21] There were two exceptions to this, according to Stanfel: one of the dramatic components "A Last Crop of Houses" was shot on 16 mm and one NFB drama, "Deadly Deposits" was shot on 35 mm (8 Aug 2016).

corrective instantiates the iterative nature of technological innovation. It cannot be understood as a linear narrative, even if it is produced on an assembly line.

This iteration of *Perspectives* was, in effect, a hybrid project including many of the interactive affordances previously enacted through multimedia kits, filmstrips and slides. Like filmstrips and slides, laser discs could be paced and sequenced according to the learning agenda of the media interactant - usually the teacher. With the use of bar codes, the transition from one video segment to the next was itself a spectacle. In fact, this precursor to QR codes and remote controlled barcodes constituted brand new technology, utterly unfamiliar to the average person. While there are aspects of the remote control that would evoke recognition though experiences with TVs and VCRs, the mapping of the signal to a QR code would have required a new technological understanding to decode. With a click of the remote control pointed at the code, a classroom teacher acquired wizard-like powers, newly endowed with the ability to navigate at will, in effect creating an idiosyncratic learning experience uniquely designed by the teacher herself. Thus, the media supported her lectures and the questions rather than dominating them. When it was working properly, the transition from segment to segment was seamless, and did not interrupt the lesson, and provided a unique, customized viewing experience.

The *Perspectives* project was packaged in a box of similar dimensions to multimedia kits - a box full of possibilities to be discovered and created - including laser discs, a remote control, and teacher guides in which the bar codes were embedded in a map-like array. Rather than providing 3D-artifacts (rock samples and/or small models, for instance) to complement AV materials, media created in laser-disc form was presented as a type of artifact in and of itself, inviting discovery and exploration. Stanfel worked with Denis Daigenault and Dr.

Jeffrey Crelinsten, a communications consultant in the field of science and technology with the Impact Group, to develop the organizational structure of the project's complex narrative using what she dubbed the "Rashomon approach". This was in reference to the storied Japanese film director Akira Kurosawa's seminal 1950 work, *Rashomon*, in which the same narrative is told and retold from the very different perspectives of each of the four lead characters. In fact, the structure of *Perspectives* was based on an actual decision-making model suggested by Crelinsten and used by scientists, but Stanfel felt the *Rashomon* reference would be far more comprehensible to the Board's filmmakers (Stanfel 20 Apr 2016).

Perspectives explored six topics in which scientific issues were presented as socially relevant concerns. The first series covered Biotechnology, Water and Air, the second focused on Soil, Toxic Waste and Forestry. Each topic could be viewed through a scientific, technological, or a social lens - the three key perspectives examined in the production. Each topic also formed a 'chapter', beginning with a short fifteen-minute open-ended drama. Stanfel learned this technique from Wolf Koenig with whom she worked on 1987's *Wednesday's Children*. Koenig used the technique in 1985's *Discussions in Bioethics* and it struck Stanfel as the ideal method of catalyzing classroom discussion and interest, its value echoed in the community-based screenings of the NFB's Challenge for Change films. The decision-making model, combining discussion, analysis, perspectives and alternatives, was employed to contextualize each of the perspectives, captured in unscripted three-minute documentary clips gleaned from experts in the field of the subject at hand. Thus, anchored in the decisions made by the interactant, the project could be made to be equally suitable to the level of the classroom, from grade seven to ten. Projects were likewise relevant to various aspects of the curriculum in Social Studies, Science and Society, Environmental Studies and

Language Arts.

Interactants clicked on barcodes with a remote control to advance the media to the desired spot. While barcodes must have seemed magical at the time, the remote control was a more familiar object due to VHS technology, thus alleviating some of the anxiety teachers felt when confronted with laser discs. But the remote-controlled navigation that school administers and consultants found compelling, even revolutionary regarding laser discs, was, for many teachers, confounding and more than a little overwhelming. Where did one even begin to unpack the pedagogical value of this new media? Anticipating this reaction, Stanfel had taken great pains to simulate the look of a book experience, dividing visual material into pages and chapters. She even simulated the turning of a page with an animation to navigate the video version.[22]

Anticipating resistance, Elliott brought in a practicing teacher Maureen Baron, herself an early-adopter of pedagogical media, to help transition the project into classrooms. Consequently, Baron created a teacher-focused, sixty-page guide to present the media in a 'user-friendly' approach, rendering material as easy as possible to grasp. The guide was filled with comprehensive usage instructions written in lay language and activity plans that were congruent with the STS curriculum. Baron would have preferred to concentrate more on classroom strategies with the media, especially regarding time lag and the teachers' ability to manipulate the discs in front of their students. However, production and design decisions had already been made by the time she joined the project (Baron 2013). As a result of the

[22] Stanfel recalls that the page turn animation had until that time only been able to flip from left to right so the user was forced to navigate sequentially, in one direction. "Our online engineer pioneered the effect that allowed us to 'turn' a 'page' from right to left, an effect totally taken for granted today" (8 Aug 2016). This increased the navigational flexibility considerably.

challenges Baron faced to make the media appear more user-friendly than it actually was, Elliott realized that they could not simply put the media in the catalogue and expect it to sell. For interactive laserdisc media to be integrated into the classroom as pervasively as humble media had been, decisions about how it would be used needed to be made during the design and production process, rather than after it was too late to make any substantive changes (Baron 2013). Following the successful completion of this delicately maneuvered process, Elliott began to call on Baron regularly for subsequent Studio G projects, as she was now close at hand, on contract to the NFB's Distribution branch as a pedagogical design consultant.

The response to the *Perspectives* project ranged from great enthusiasm to equally great skepticism. Both the NFB and the Council of the Ministers of Education were delighted with the project. The 1988-89 NFB Annual Report gave the Studio G project more print space in its description of the merits of the project than it had received since the Studio's heyday during the '60s. Stanfel was sent to numerous conferences around the world where the project was received enthusiastically. Pioneer LaserVision adopted *Perspectives* as a best example of what could be done with their new laserdisc technology at professional conferences, reinforcing the NFB as the site of cutting edge innovation (Stanfel 20 Apr 2016).

In stereotypical Canadian fashion, reception was less effusive at home. The NFB itself did little to highlight the technical innovations *Perspectives* represented (Stanfel 20 Apr 2016). Schools that could afford to invest in the new technology required by *Perspectives* did so with the encouragement of their administrators, enthused by its interactive structure. Oftentimes, new media innovations like *Perspectives* were proudly presented as a *fait accompli* purchase to

teachers by well-intentioned principals and school board officials. One can only imagine how those staff meetings played out. My fantasy: a group of blank-face teachers gather around an impressive, but utterly foreign-looking laserdisc player, a box of strange-looking discs and a book with page after page of bar codes, as an educational consultant expounds on how this will revolutionize the teaching of science. Collectively, eyebrows rise as the teachers try to imagine making this work in front of their students (see fig. 5). In reality, many experienced teachers were so overwhelmed that they were reluctant to use laserdiscs, despite concerted efforts by fellow teachers to train them (Baron 2013).

Baron, who went on to write her master's thesis on the *Perspectives* project, conducted an interesting counter survey to the NFB's pre-launch effort. This survey asked teachers who used *Perspectives* in their classrooms for their feedback. For Baron:

> 95% of teachers saw *Perspective in Science* being used within a whole class presentation format. They were unable to see their role as anything but a performer-dictator-instructor where they are in charge of the technology and its operation as well as the path and direction of learning. The locus of control of the learning remains in the hands of the teacher. By not relinquishing control of the learning situation, they fail to see themselves as managers of learning resources and fail to see their students as being capable of attaining their learning objectives through their own self-planned sequences and pathways.
>
> (Baron 1989 68 - 69)

Contrary to the sales pitch promising increased agency through student-determined navigation that motivated its purchase in the first place, in most cases Perspectives did not have the anticipated results on student learning simply because students were usually not allowed to

touch the media for fear [they might] damage it (Baron 2013).

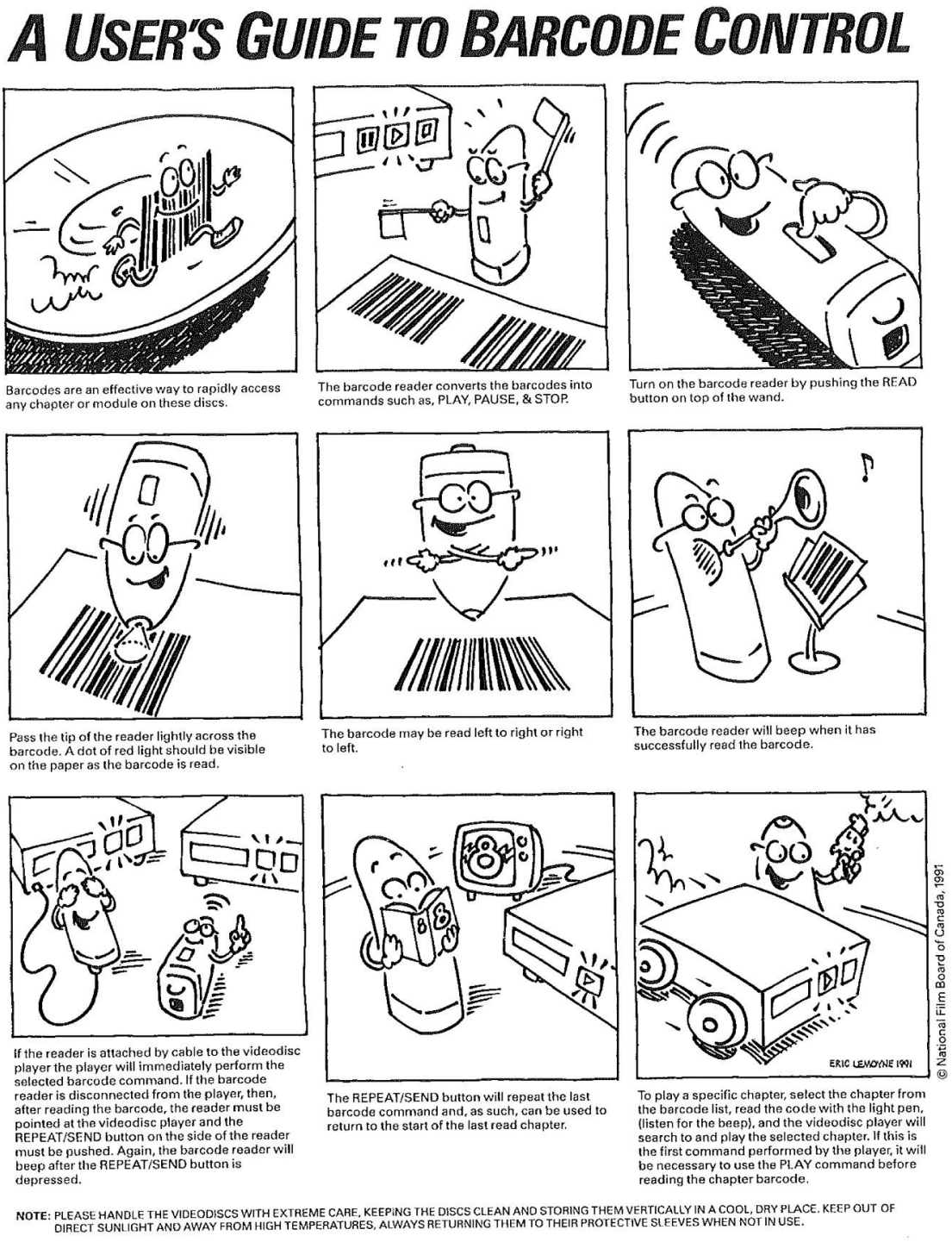

Figure 5: To make the technology feel more accessible, and less intimidating, Studio G produced this playful manual. Its success was not measured.

The teacher determined the sequence of the media and students responded to the teacher's questions throughout. Like so many of the media practices of the second wave, the impact was more on teaching than learning. With one 'kit' a teacher could easily adapt media to multiple subjects and grade levels through the video segments she selected. This was a contested point. Many wondered whether it justified investment in brand new technology, necessitating the need to learn how to use yet one more media type to do something that could already be done much more cheaply and easily using technology that was already available and mastered. Ultimately the investment in the new technology spilled beyond the limits of school budgets. Laserdisc costs were simply not considered justified by their benefits, especially when more efficient and affordable DVD technology was emerging on the media horizon. This, along with continued resistance from teachers tired of administrators telling them how they should be teaching and wearied by the seemingly endless stream of rich media technologies with lots of bells and whistles, of questionable pedagogical value, likely led to the early demise of laserdisc technology in Canadian classrooms.

It could be argued that *Perspectives* suffered from being on the vanguard of computerized interactivity. Frontline educators had not yet accepted the pedagogical value of what are now familiar characteristics of educational media: student-controlled choices, exploratory navigation through media, and user-mediated, even user-contributed narratives. The general fear was that these practices seriously disrupted the authority of the teacher in the learning process (Martin 417). As a result, much of the criticism directed to the *Perspectives* project was, in fact, less about the project *per se* and more about educators' reservations about interactive media on a larger plane.

Stanfel, ever-excited by the possibilities of emerging technologies, became inspired by

the virtual reality motion detection software that was being developed in 1988 by Francis MacDougall and Vincent John Vincent as part of the Vivid Group in Toronto.[23] Stanfel, finishing off the Toxic Waste section of the *Perspectives* project, was becoming interested in the topic of garbage. Noting that 'garbage' was considered unexciting to everyone, with the exception of grade school students, Stanfel determined to explore how to tell stories about garbage in the nascent virtual space. A master collaborator, Stanfel located partners in the States, Canada and Italy to produce an "unprecedented electronic event" to close the 1992 International Council for Educational Media (ICEM) at the University of Florida in Orlando (Stanfel 1993 42). Transmitted on a television screen for spectators in five continents, this hour-long event was called *Virtual Cities*. It was filmed in video, transferred on disc and backed up on an Omega computer. Simultaneously connecting the filming from three different sites required Industry Canada's SMART unit from Shirley's Bay, Ottawa connected Canada's Anik-E satellite with the European Space Agency's Olympus satellite and the US Comsat. It would be the last time Olympus was used before it dropped out of orbit (Stanfel 20 Apr 2016).

The experience of taping the three sessions was as much a spectacle for the twelve student-participants, aged twelve to seventeen, as it was for their audiences. At each site, the students, selected by partner-teachers, were tasked with building an environmentally-friendly city using virtual assets programmed and displayed on a blue screen, a topic right out of the curriculum on environment. When they arrived at a studio students were placed in front of a screen on which a digital animation of a city was projected through a Vivid-developed software called the Mandala-System (Stanfel 20 Apr 2016). As the students constructed the city, video cameras recorded their images and fed these images to the other sites via satellite, superimposing them on a blue screen. This way, all the participants could see themselves and

[23] The Vivid Group is now known as Gesturetek

each other in the same space at the same time as they built the city. Together they had to make decisions -- how to dispose of garbage, where to put landfill, and where to run the water supply through the city. Although they could only see themselves in two-dimensional form, students could see the actions of other participants on the screen. Because they spoke different languages, the ability to speak to each other about their project was not included in the design of the interface.

Stanfel saw the potential of interactive environments as an idealized space for problem solving, managing conflict and seeing the world from other perspectives, and these were the functionalities she built into her projects to promote a better understanding of the various perspectives within a community, or a classroom. “We don't want only to reflect reality, we should shape it. We should not only adapt to the future, but configure it and make a better choice between futures” (Stanfel 1994 242). In both *Perspectives* and *Virtual Cities*, Stanfel designs interactivity as a “virtual commons” -- a place to realize the promise of the public sphere that is as limitless as the imagination. She envisioned the virtual commons as an “educative space” in 1994 when she articulated her vision for the future of educational programming at the NFB in a short paper in which she writes:

> … The 'plug-in school' concept would allow students to switch from individual assignments, to team projects, to distance learning via satellite or cable broadcasts, facilitating the progression toward more flexible learning environments. The school would, very literally, be plugged-in to informal learning centres, corporations and industries, external to its physical structure, and would function as the central input and output mechanism for educational programming, that would provide linkages for students between academic and

career-oriented instruction.

(Stanfel 1994 243)

This grand vision was ahead of its time and would perhaps have been better received by the NFB in its current stage, as they now assert that "new ways of thinking about public space and public purpose will release a dynamic burst of creative energy and innovation" (2013-18 NFB Strategic Plan 33). However, Stanfel's dreams came at the worst possible time for novel, and radically experimental technology -- on the eve of the worst cut-backs in the NFB's history in 1996. With rumours of impending ruination looming ominously, Stanfel's ideas fell on deaf ears. Frustrated with the lack of vision she saw around her, and having tasted the heady possibilities of virtual worlds, Stanfel was unwilling to return to the familiar world of two dimensional technologies. In many ways, Stanfel might well be labelled an *auteur*. Certainly, in Studio G, this aspect of her professional identity never fit comfortably within that culture. Thus, when Stanfel was offered a retirement package in the pre-budget purge in 1994, she took it.

While virtual reality was a far-off possibility for the public, learning to learn on computers was becoming almost as important as what was being learned (Lalonde 35). As multimedia literacy began to be conceived as something that should be taught in schools, educators felt not only responsible for making sure students were well-educated in traditional subjects, but were now expected to produce computer-literate graduates as well - regardless of their own levels of media literacy (Baron 2000). Moreover, a nonlinear approach to knowledge acquisition was beginning to be understood by educational researchers as enabling students to as experience knowledge in an "interlinking, web-like fashion … [that] ... can help

inspire students who might otherwise find conventional media, such as books, too inflexible to meet their individual needs" (Martin 417). Thus, despite a growing cynicism amongst teachers concerning the pedagogical value of 'new media', school administrators continued to reach into their ever-shrinking pockets in an attempt to ensure their students were not left behind in the technological tsunami that followed the invention of the personal computer.

"Has Anybody Seen My Umbrella?

Figure 6: Has Anybody Seen My Umbrella? (1998) is an award-winning CD-ROM-based adaptation of the book of the same name written by CBC personality Max Ferguson. It was produced by Tamara Lynch and directed by Jane Churchill. It demonstrated the potential of interactive media to animate a traditional story for an immersive and complex learning experience.

Apart from its natural application to vast non-fictional archives by virtue of their large storage capacity, the NFB began to experiment with CD-ROMs to remediate fictional literature as well. Here, the advantages were somewhat different from the efficiencies of access/search, branching out to include interactive learning activities that connected reading/writing with exploration/play -- the first time this could be tried in a digital environment. One of the best early examples was *Has Anybody Seen My Umbrella?* (*Umbrella*) produced by Tamara Lynch and directed by Jane Churchill in 1982 (see fig. 6). It was based on a film and book of the same name by Max Ferguson, noted CBC radio personality and satirist. Published first on VHS in 1990, and then designed as an interactive CD-ROM in 1998, *Umbrella* was created to encourage literacy, reading and storytelling in children from grades two and up. The story retells the tale of Cinderella through the perspective of the Prince, who, having dropped out of grade one, is unable to read the name on the glass slipper he finds, mistaking the name 'Cinderella' for 'umbrella'. Students typed their name at the castle entrance, and the program would remember them. The forty pages of text, animations and illustrations could be read normally, or with highlighted words to facilitate word recognition. The CD-ROM included word games at three levels of difficulty, with the ability to write, print and share alternative narratives at five specific points throughout the tale. It was accompanied by a video rendition of the story by Ferguson himself, which could be stopped, started, rewound and fast forwarded as desired. The CD-ROM was shipped in an updated type of media kit complete with resources for teachers as well: a teacher's guide and

ten activity sheets for the classroom. Activities were varied, ranging from word lists, word games, creative writing exercises, musical games to activity cards.

Umbrella was designed simultaneously for two audiences -- students and teachers -- providing a range of affordances for both. In the case of the latter, the onus was on making integration of the media resource more seamless than traditional teaching techniques. CD-ROM technology was as available to the public as it was to educators, so many teachers and students were familiar with CD-ROMs, resulting in a short learning curve involved in mastering it in the classroom (Baron 2013). By anticipating and providing teaching materials designed by teachers for teachers, Lynch ensured the project would enhance classroom activities with a broad range of easily customizable resources. While the media content was designed for students, the kit within the package was designed for teachers. Furthermore, the quality of the content effectively engaged students individually or in small groups, keeping them on task with minimal teacher intervention (Baron 2013).

Like much media produced in CD-ROM format, *Umbrella's* strength was its facility for navigation and pacing. Users did not just consume the media, they controlled their navigation through it using a mouse and exploring the various sites and activities along the way. Users were likewise able to manage the pace of their process, doubling back and replaying favourite sections at will. Thus, CDs would come to embody user expectations developed during the first wave of media engagement. Additionally, by inputting their names into the interface to access various sections rather than simply pointing and clicking anonymously, students essentially wrote themselves into the experience. This element would become more robust in a subsequent website based on the Prince in the story discussed below. The quality of the visuals and narrative in *Umbrella*, its contemporary refashioning of a timeless fairy tale and the ability for

the media to be co-opted and customized across the curriculum in a broad range of unspecified ways led to its resounding success. *Umbrella* was recognized with an honourable mention at the Columbus International Film and Video Festival and spawned two innovative Internet-based spin-off projects *The Prince & I* and *Pigs in Spring.* Even now, Umbrella can still be found in libraries and resource centres across Canada.

While the production of *Umbrella* in CD-ROM form provided many advantages, it caused several serious problems at the same time. Although the cost of CD-ROMs was low enough that even schools with very small budgets could now afford resources that would have been inaccessible in print or film, *Umbrella* was one of the most expensive CD-ROMs the NFB ever produced coming in at approximately $250 per package (Lynch Dec 2015). *Umbrella* producer Tamara Lynch explained the price point this way:

> I have a recollection that the original budget was around $250,000 or less and this would have been high for Studio G. We tended to somewhat deliberately understate what projects would cost otherwise we would have never got them into production. I am afraid I was as bad as anybody else in this regard, if not worse. Apart from perhaps Julie, I always seemed to end up with the most ambitious projects. A famous NFB filmmaker, the late John Spotton once even more famously said that at the NFB it was better to 'ask for forgiveness than approval' - the caveat being that it had better be good by the time you had emptied the treasury. *Umbrella* cost somewhere in the region of $1.2 million."
>
> (Lynch 31 Jan 2015)

The NFB received $100,000 towards the production of *Umbrella* from the Literacy

Secretariat, but to offset other costs they had to rely on sales, which were lower than anticipated. The inflation in production costs was largely due to an abnormally long production process. It was the only CD the NFB produced entirely in-house, and producers were determined to do it right. Apart from professional pride, there was a real concern that the NFB would be unable to provide technical support if there were bugs or glitches, so creators carried out extensive beta testing before launching. Unfortunately, by the time it was finally released, CDs were in the process of being overtaken by DVDs. They "missed the boat" in terms of technical innovation, which also negatively impacted sales (Lynch 31 Jan 2015).

Additionally, being able to access a computer to play the media was another problem. Despite a concerted effort to get computers into the classroom on the part of governments, industry and parent councils, only schools in affluent, urban areas could be assured of having multiple computers in every classroom. Most classrooms in the country at the end of the 1990s boasted a miserly single computer per twenty to thirty students (Solomon 2016). Some could only provide access through their school resource centres. Most schools in rural and aboriginal communities had no computer access at all.

The most significant of the *Umbrella* spin-off projects was *The Prince & I* (*Prince*) directed by André Lauzon, produced by Pierre Lapointe with Isobel Marks as executive producer in 1996, followed by a French version launching in the fall of 1997. Both Lynch and Baron were brought in at the beginning of this project, with Baron advising on what characters should look like, what would appeal to this audience, the level of language and vocabulary and how it would fit into the curriculum (Baron 2013). Practicing teachers were used for focus groups to ensure its appropriateness to elementary school children. Although it was based on *Umbrella*, Lapointe envisioned a project beyond a simple replication of the interactive book

online, aiming to empower children throughout the story. Many of the same people who worked on *Perspectives*, in which interactivity had been focused on the needs of the teacher, also worked on *Prince* and were interested in shifting their focus to students. *Prince* became the first NFB production in which interactivity was aimed towards the user/child.

This focus facilitated students' immersion in the story and heightened their sense of being a part of the story. A user could write to the *Prince* and get positive feedback about their progress. This participation heightened language skills and created positive associations with learning (Baron & Lapointe 2012). Children could create their own webpages embedded with their names and photographs, opening a Pandora's Box of new privacy issues including protection of children, parental permission, and exposure to inappropriate material on other websites, still plaguing web-based sites designed for children.

Logistical issues raised questions concerning who would write back and how records would be kept given that this was not a revenue-generating project. These issues were extensively addressed and discussed with stakeholders, but in these early days of the Internet such concerns were not enough to derail the project. Hosted on the NFB's Kids site, *Prince* attracted 104,000 visitors in the first fiscal year, with many of them registering as "Friends of the Prince" (1997-98 NFB annual report 9).

French speaking and French Immersion students accounted for triple the amount of traffic since there were almost no materials in French online at the time[24]. Unlike *Umbrella*, *Prince* was designed as much for the general public -- parents and children -- as it was for teachers and students in the classroom. Because it was hosted on the NFB site, usage of *Prince* was free and children were able to access it from home as well as at school during the

[24] Pierre Lapointe took over from long time French Producer Colette Blanchard and while they adapted many of the English products they also did many French originals for the Quebec market. The English products were for many years distributed by McIntyre Media and the French ones by Bourdon.

two to three years it was available online.

The *Prince & I* demonstrated to the NFB that the Internet could be used as something more than a marketing and distribution device -- it could also be used as a medium for creative production and direct interaction with the audience. Online media, along with CD-ROMs and DVDs, facilitated accessibility, but also facilitated the ability to upload content. Although in these early projects the degree to which a user might contribute was rudimentary by today's standards -- not much more than entering a name or answering a question. This nonetheless introduced the potential, both technical and in terms of user experience, for the user to have greater control over the order and the meaning of narrative produced in digital media. Members of the electronic literature community were the first to push this affordance into creative practice with vanguard publications such as Judy Mallory's "Uncle Roger" (1986-87), John McDaid's "Uncle Buddy's Phantom Funhouse" (1993), Shelley Jackson's "Patchwork Girl" (1995), and Bill Bly's "We Descend" (1997).

Conclusion

Whether through CDs, DVDs, or the Internet, the mid to late nineties was a time of fascination with the potential of interactive media to enhance user empowerment and participation in the creative process (Carpentier 61). Consequently, the focus of much of the research and development at this time was on the development of and improvement to techniques of interactivity in the field of educational media and to a much greater extent the entertainment industry (in the form of video games) in which the sales numbers and profit margins could sustain the amount of investment in technology and expertise required. The position of the user was altered so that the "pitiless divorce" between owner/customer -- author/reader bemoaned by Barthes began to be reconciled, at least at an interactive level

through the interface (Barthes 4). Likewise, the design focus on the media that began to emerge in the second wave expanded from focusing primarily on interactivity to include interobjectivity - Bruno Latour's term, referring here to how classroom discourse is shaped by material objects in the classroom and the activity networks they facilitate (Latour 1996, Kalthoff and Roehl 451). While most educational media in the second wave was based in video and other digital media, projects were designed for 'use', not simply for viewing. It is through this interplay between teaching and learning practices and with technologies and media created to be explored, then curated idiosyncratically by interactants, that knowledge could be transmitted and understanding internalized. This was, in effect, an intra-active phenomenon that arose not by chance, but by design.

The ability to break through the proscenium arch of the computer interface through interactivity, simultaneously embodied the tension between democratic participation in the sense of determining one's direction through the media, and of consumer expectations where on demand media could be customized to the individual consumer's idiosyncratic desires as expressed through their choices. Even though the technology was clunky, suffered badly from lag and compatibility issues, and was beyond the ability of most people to troubleshoot, let alone create. The heady excitement of being able to interact with media in real time seems to have been powerful enough, and potentially profitable enough to warrant the enormous investment that further research and development in digital media demanded.

It is through the accumulation of experience with interactive media that users develop media literacy (what they are able to do), consumer expectations (what they should be able to do), and their technological imaginations (what they could be able to do if only…). This experience spawns both new understandings of meaning-making possibilities, but also creates

market demand for products with which to realize what they now have the desire to do, as evidenced by the abundance of social media platforms which all do slightly different things to cater to a seemingly insatiable demand to post and share media. According to transdisciplinary scholar Dr. Wendy Martin:

> …certain innovative technological practices can be the result of a transformation in the actors' perception of what an educational experience should be. …a successful technology as the product of social groups deeming it as such, collaborative educational technology programs will only succeed if the relevant social groups perceive the kind of learning that takes place in those environments as desirable.
>
> (Martin 414)

Studio G was one of the most significant leaders of this dynamic in Canada. By taking the time to develop relationships with their users (teachers) and to learn about their experiences, frustrations, expectations and successes with the media they produced, the producers and directors were ideally positioned to respond to these needs, as well as create media that offered new ways to learn and teach. In this way, the NFB not only provided state of the art pedagogical content for Canadian classrooms, it helped to negotiate pedagogical practices at a time when curricula across the country were shifting and the most significant technological change in generations was being introduced into the classroom. For many teachers, the second wave of media engagement was fundamentally disruptive despite its benefits. It forced them to change their teaching techniques and altered power dynamics in the classroom. While humble media was consumed collectively, with whole classrooms or small groups of students watching the same image simultaneously, computer screens were designed

for individual users to interact with the interfaces. This significantly changed how media was viewed, bringing with it new ideas of how it might be used in classrooms. While these students were 'playing with the computer' the teacher managed the rest of the class. Students were often furnished with instructions provided by their teachers, but they maintained the latitude to explore the media as they wished when the teacher was engaged with other students. Learning how to use new media is not only a mechanical process of following certain procedures; it is a process of incorporating usage into existing cultural practices, while sometimes altering those practices to incorporate the benefits offered by new media.

The computer interface enabled each student to shape their learning experiences in terms of their individual preferences and fostered 'non-linear thinking' (Martin 334-335, Laurillard et al. np). In a media environment dominated by analog media that was inherently linear in structure, the non-linearity of pedagogical digital media produced at the NFB provided an important introduction to the use of media designed for non-linear use. Students and teachers had been using analogue media forms such as books and slides, even filmstrips, in non-linear ways since they were first available before the second world war. Film however, was an exception because stopping and starting traditional film damaged both the media and the projector.

Before CD-ROM technology, the teacher would develop and oversee all activities to ensure they reinforced the curriculum, and to tailor them to the specific needs of particular students, a daunting task in a typical class of thirty students or more. By necessity, the teacher controlled and paced the mediated activities such as watching a filmstrip or slideshow with students following her lead. Interactive media like CD- ROMs disrupted traditional relationships between teachers and students. No longer was the teacher the sole arbiter of

knowledge with the student able to negotiate the interface on their own terms. The freedom to explore the world of knowledge at will, was seen as enacting the ideals of democracy and critical pedagogy by fostering the sense of agency, which had hitherto been accessible only through institutional libraries and encyclopedia.

Interacting with media is not intuitive -- it is something that needs to be learned efficiently and strategically. For teachers, it is not merely a matter of learning to use the technology. They must learn how to problem solve inevitable breakdowns, often on-the-fly and under the surveillance of a classroom of students, a process that happened regularly and had a steep learning curve. It also includes mastering how to use technology seamlessly to enhance a lesson, not to divert attention away from it.

For some students, classroom-grade computers may appear abysmally slow or out of date compared to the computers and Internet access they enjoyed at home. For other students, a classroom computer may be the only one they have ever used. Compared to their more privileged peers, these students may already have self-identified as being technologically inept, leading them to approach a computer interface with trepidation, not unlike many of their teachers. Despite the trepidation of teachers and the varying attitudes of students, media designed for computer technology had arrived in the classroom like a not all-together welcomed guest, and, despite the snubs of its teacher-hosts, was destined to move in permanently as computers slowly began to infiltrate the classrooms of even the most recalcitrant educators.

By the mid-nineties, the NFB was riding the crest of the digital wave in terms of the production of educational media, and its reputation had been recognized both nationally and internationally within the education sector. But the federal government was facing a debt crisis

and funding was slowing to a trickle. Consequently, school budgets were tightening, and the NFB was facing another round of cut-backs. The writing had been on the wall, but still, when the NFB closed Studio G in 1996, for many long-term employees in the studio, it was a deeply traumatic moment. From this point forward, with the exception of a few innovative digital projects produced by other studios, the production of dedicated, educational media at the NFB ended. Its legacy, however, continued to ripple through the NFB as media designers turned to the Internet as a new creative medium in its own right.

CHAPTER FOUR

THIRD WAVE - FOR, BY, WITH CHILDREN AND YOUTH

> In the annals of the National Film Board, 1995-1996 will be considered a water-shed year. We responded to the monetary strictures and re-ordering of priorities by involving staff at all levels in a comprehensive process of review and streamlining. We addressed the need to bring new people and ideas into our programming stream, to upgrade and digitally integrate our film-based operations and to enhance the effectiveness of our distribution systems. We reviewed all our internal processes, and made choices which would streamline our administrative infrastructure by 50 percent. In all, the NFB has now been restructured to meet the millennium and is, as a result, bringing a renewed focus to our core mandate, the production and distribution of audiovisual productions.
>
> (1995-1996 NFB Annual Report 10)

If the first wave of engagement with multimedia at the NFB foregrounded the ability of users to customize the sequencing and pacing of their media usage through humble media, and the second wave emphasized the agency of interactants through navigational choice-making by engaging with new forms of interactive digital media, the third wave can be best understood in terms of its focus on individualized, on-demand content realized on a potentially mass scale first through DVDs and then the Internet. This was the focus of the ACI program, which essentially replaced Studio G, and resulted in some of the highest sales of products available for educational purposes to date, in spite of the fact that the Film Board was no

longer producing new educational media (Grigg).

Shifting Realities at the NFB

In 1984, Commissioner François Macerola had an advisor draw up a report making the case that since education was the responsibility of the provinces, the production of AV material for education should be the role of the private sector, not of the NFB (Elliott 11 Jun 2013). This was in spite of a national survey Elliott had commissioned to demonstrate that the provinces were disinclined to take on the production of professional-quality education media if Studio G was closed. The response to the survey was unequivocal. The economy had turned, and if school boards could not purchase ready-made materials at the rates that the NFB offered as a not-for-profit government agency, then the provinces would be no longer able to provide these materials in their schools.

> Virtually all of those interviewed (39 out of 40) [educational media administrators] indicated that they would be unable to match the NFB's production in the area of Canadian Studies from existing private sector or provincial government sources. Respondents cited production costs, market size, production values and quality requirements and specific requirements of US market as reasons for the failure of others to make as much of a contribution to Canadian Studies as the NFB.
>
> (Daigneault 12)

Elliott followed up this report with a detailed internal memo to Barbara Janes, Director General of English Programing trying to position Studio G's relevancy in the coming changes.

> As important as it is to maintain our funding, it is equally important that we deliberately strive to be more noticeable and perceived as a vigorous and useful national and regional institution, that large numbers of Canadians make use of,

> appreciate, and wouldn't want to lose … Above all, we must take a closer look at our program and promotion. Now is not the time for grandiose or self-indulgent activities nor is it a good time to be hiding our light under a bushel.
>
> (Elliott 1990 6)

Elliott and Daigneault's efforts helped to keep the Studio afloat into the 1990s until the now infamous 1995-96 budget cuts, which 'streamlined' the NFB infrastructure by $25 million, resulting in the loss of 180 employees (McIntosh 2 May 2014). These cuts forced the NFB to restructure the institution entirely, a process that would utterly devastate many experienced directors and producers, and one that would ultimately alter the internal culture of the NFB forever as the proportion of freelance staff increased while the full-time staff took retirement packages and left – willingly or not (CBC 2012).

With the unflagging resilience that had come to characterize the NFB's reaction to government cutbacks, the Board essentially performed what was by now an all too familiar ritual, reminiscent of hari-kari as it hacked and slashed through its internal workings. New Commissioner Sandra Macdonald declared publically that the Board's priority was to maintain the existing level of film, video and multimedia production, with all other costs not focused in preserving these priorities to be cut by fifty per cent (NFB Annual Report 1995-96 14). On the surface this appeared to be a regrettable, but essentially benign decision. In practice, this decision protected the vested interests of what were largely white, male documentarians and animators who had positioned themselves as the *raison d'être* of the NFB. This reprioritization justified the rearrangement of film production by programming stream rather than by studio, which exorcised Studios G and D from the organizational structure of the Film Board. Apparently, the preservation of production levels did not extend to those productions that

focused on women and education.

Studio G's internationally recognized brain-trust of expertise in educational media production acquired over three decades of producing cutting-edge, user-controlled pedagogical media continued to trickle through the film board along with refugees from the now defunct Studio D. In this way, the heart and soul of those units remained productive at the NFB, and would reemerge from time to time in future productions. Rather than being left with the heart-wrenching job of having to lay off those who refused to take the retirement packages that he knew would be his lot after the cutbacks had been announced, Elliott himself retired in 1994 (Elliott 2013). In the end, the actual number of layoffs was softened with many of Studio G employees accepting early retirement packages. Most of the remaining staff were distributed to other production units (Elliott Oct 2013). Keith Packwood, the technical genius of Studio G, put all its archived Studio G productions onto a Filemaker Pro database on a PC before he left in 1994 (Packwood). Tim Latchem, line-producer on the *Perspectives* series, producer of one of its modules with Stanfel, and later new media specialist in ACI, was, to his deep dismay, let go with a package (Lynch 2016). Lynch and Lapointe were reallocated to other production units (Lynch 2016). Before he left, Elliott created a comprehensive, labeled inventory of all the Studio G archives in the ultimately futile hope that the archive would remain intact for future posterity. While the value of this huge slice of NFB institutional memory was never appreciated, one can only hope that as the Board prepares for major relocations in both Montreal and Toronto, that these archives are preserved, and properly protected.

The irony in the timing of the Studio G's *coup de grace* would be made apparent to Macdonald by Trevor Grigg, the head of national promotions in the distributing department, in a pivotal presentation to Macdonald and her executives. Grigg was one of the few people at

the Board who welcomed accountability, or more specifically, the need for strategic program planning with specific measurable goals, now required by the Liberal government under Chrétien in the wake of the 1995 budget cuts (Grigg). A strategic thinker with strong number-sense, qualities that typically had been lacking in the NFB's upper administration, Grigg pinpointed the institution's weakness in the NFB's approach to programming (Grigg). He demonstrated that when the NFB axed the lowly, and decidedly unglamorous Studio G, under the guise of cost-cutting, they had inadvertently ended production of their most important, sustained revenue stream. A fact that was, apparently, unknown to anyone in the room but Grigg (Grigg).

At the start of the new millennium, the media landscape was leaning heavily towards specialty cable, a double-edged sword for the NFB. With exasperation, Grigg explained, "You do a Teletoon deal, you get $200,000 in revenue. For the Film Board, this is fantastic – [we had] never seen a sale of that size, and we were doing a number of them! The thing was, once you sold the catalogue to those guys, that's no recurring revenue now" (Grigg). He began to crunch the numbers, and realized that the NFB was making a strategic error in concentrating on the cable TV market, a concern he brought to the attention of the Commissioner and senior directors:

> …[F]or a few years everyone was talking 'television, television' and I was looking at the numbers and was saying 'mm-mm - non-theatrical'. And a lot of what I was saying at the same time was 'this is not sexy - your mother's not going to see the poster in the theatre, but by God, there are thousands and thousands of children being raised on this stuff and there is a profound impact that is very hard to measure'. It was news to all of them that education represented the core of our business and I was a little bit

> flabbergasted that they didn't know that. They were kind of embarrassed that they didn't know that. And eventually the head of Distribution lost their job because the Commissioner didn't know that. So there was a lack of knowledge, a lack of awareness, lack of just business intelligence as to where the revenues were coming from. …We start to realize how revenues break down across markets - included there is the importance of the Canadian education market.
>
> (Grigg)

In effect, using the argument of "long-tail" economics[25], Grigg revealed the tactical error of the NFB's devotion to the glamour of film and the sparkling, but unsustainable, promise of cable television. Almost immediately it became clear that the closure of Studio G was short sighted. During the 1995 budget cut negotiations, the NFB had bargained for the right to keep revenues they earned rather than handing them over to general government coffers. For the first time, there was incentive to generate revenue. More revenue meant more money for more projects - making this loss of Studio G all the more poignant (Grigg). To add insult to injury, the success of Studio G's computer-based productions like *Canada's Visual History, Umbrella,* and *Perspectives in Science*, were now being recognized with a series of awards and accolades, but there was no home studio to receive them (NFB Annual Reports 1995-2000).

The dream of the mass reach and profit that broadcast media promised was ill-informed, and failed to recognize that on the open market, NFB content would be uncompetitive – it was too specialized. As media scholar Wade Rowland laments, "whatever the platform, the unfortunate fact remains that it is simply unprofitable to produce Canadian content in a

[25] The term, coined by Chris Anderson, writer of Wired magazine, refers to a shift from a large number of "hits' at one time, to the distribution of hits in smaller markets over time. The accumulation of value from the latter can be greater than the former but not recognized by traditional measurements of success (Anderson).

market awash in cheap American programming options" (67). Rowland goes on to build a case for public broadcasting in Canada as a panacea for the underproduction of high quality relevant programming (27). Not every type of programming is well suited to television broadcast because the expense of the infrastructure, even of public broadcasters, demands large audiences in order to be viable (85). The flip-side of being one of the most diverse populations in world is that Canada suffers from the lack of a single, large, media audience – it is, essentially, a collection of niche markets, which in the case of educational audiences is further splintered by provincial mandates controlling the curriculum. This is the opposite of what is required by a profitable broadcaster. NFB educational productions were ideally suited to their niche markets that clustered around topical issues and were very successful in these markets, e.g. educational, feminist, social justice, aboriginal, environmental, etc., but not by the measurements of success being used in the film industry at the time. The value of the educational market to NFB coffers, for instance, could be best measured by sustained sales over time rather than by blockbuster hits that peaked and faded quickly. In other words, sustained sales to specialty audiences provided the slow burn that provided the fuel for the sparkling films that would win Oscars and occasionally sold to a broadcaster.

The Digital Turn at the NFB

In her inaugural Annual Report in 1994-95, Macdonald attempted to reassure audiences and filmmakers that the Film Board would not only survive the impending cuts, but would use new media to reinvigorate the NFB.

> In this period of change and restructuring in which the NFB has been engaged for some time now, you will be pleased to note that the institution is as active and dynamic as ever, and that its productions are still achieving recognition at home

> and abroad. Given the rapid advances in audiovisual production, the advent of the information highway and the multiplication of broadcast outlets, the NFB is adapting how it produces and distributes its films and other audiovisual products to take advantage of the new technologies. (9)

In effect, the cuts forced the wider NFB to do what Studio G had been doing for years – use new media technologies to produce affordable, more easily distributed media. The potential for computer-based technology to minimize production costs while maximizing audience access promised a sort of deliverance to the Board through which they could minimize impact on film production within the parameters of their much-reduced budget. Within this context, programming for youth and children still had a role to play at the Film Board, and the expertise of the remaining Studio G producers was called on for this purpose.

Isobel Marks replaced Elliott in 1995, to oversee the final dismantling of Studio G. Her mandate was to oversee the redistribution of Studio G staff with a hybrid unit that would be known as "Animation, Children, Interactive" (ACI) in part to extend on the progress made by Studio G in digital media production (Verall). In effect, 'Education' was demoted, no more enjoying the primary production focus it held in Studio G. Now it was essentially nothing more than a distribution strategy as the focus shifted to the more generic audience 'children'.

The rise of the Internet introduced not only a ubiquitous distribution mechanism by which the public could access NFB productions directly, it also suggested new creative possibilities to the refugees from Studio G and D who had been moved to ACI, before they did elsewhere in the Board. They brought with them a culture of curiosity and experimentation that led to the Board's first forays into Internet-based educational media. In hindsight, these early experiments might be considered the unacknowledged antecedents of the acclaimed NFB/

Interactive web-based productions, which reinvigorated the NFB's cultural output and relevancy in the 21st century.

The most successful releases developed for educational audiences during the late 1990s came from what at first glance might seem the least likely of areas -- Distribution and Marketing (Grigg). After Studio G's closure, the only way for teachers and school boards to liaise with the NFB was through the Distribution department, a familiar route through which they purchased NFB products. Market demand for educational media in the classroom did not end with Studio G, so it was to the NFB's distributors that teachers turned with their suggestions and requests for media to support what seemed to be a constantly changing curriculum (Grigg). In retrospect, this was both logical and inevitable. If funding for NFB production was now hitched directly to revenue it generated, the obvious consequence was that audiences now mattered more than ever before. What is more, Distribution and Marketing had to cover their own costs, further fueling their desire to establish a robust revenue stream for what was apparently now a very finite inventory (Grigg NFB "1990-1999").

English language marketing was at this time divided into three core audience groups -- women, education and community -- the last of which encapsulated anything that was not included in the first two (Verall). It was run by twenty to twenty-five individuals throughout the country who conducted professional development workshops for teachers and fostered relationships with all levels of educators, keeping them informed of new releases and collecting feedback regarding gaps in multimedia support (Verall). Like Elliott, NFB staff members in English language marketing communicated directly with educators who were writing new curricula throughout the provincial Ministries of Education to anticipate what support media would be needed in coming years. Such intel would allow then to determine

marketing strategies and ensure the line-up of appropriate media to respond to the upcoming needs.

Media & Society, the first project to emerge from this approach, focused on media literacy and was initially launched on videocassette in 1993. Later, in a serendipitous convergence of form embodying content, it was also released in laserdisc format, reinforcing the media literacy changes in the Ontario curriculum by requiring users to acquire a new media literacy to learn about media literacy. Representatives from Distributing and Marketing reached out to Education Ministry officials, who were in the process of writing up the new media literacy curriculum (Grigg). Through these conversations, they learned of a burgeoning urgent need for support materials dealing with media literacy in the near future. With this recognizance, the NFB gained an exclusive scoop with respect to the nature of the soon to be released curriculum. By Grigg's account, Marketing effectively bypassed the production studio altogether:

> [We] started to go through the film collection and isolate productions that had direct relevance to media literacy. … [They] compiled them on a set of [approximately three] videos initially …with a very extensive user guide, [and] worked with teachers and consultants to write "Media & Society" - all based on video masters. This was the first explicitly media literacy production done by the marketing group rather than production.
>
> (Grigg)

This was followed up by a second compilation focused on media literacy called *Constructing Reality: Exploring Media Issues in Documentary Film* (1993), which included six films ranging in length from seventy-two to one hundred fourteen minutes. By repurposing video masters from the vaults, the NFB could produce materials with virtually no production

costs and a comparatively small investment in editing, media transfer, graphic design and the writing of a comprehensive teachers' guide. These productions led to the NFB's best-selling titles being Marketing & Distribution productions. These could be sold at a much higher profit margin, producing revenues that could finance films that otherwise might have never seen the light of day (NFB.com "Our Collection").

Coinciding with the rise of DVDs, which was predicated upon and also fanned the home PC market, was the gradual emergence of the Internet in homes and schools across the country. While not providing an equitable pattern of access for the NFB, the Internet nonetheless held the potential to reach audiences in numbers comparable to, if not greater than, those of television and cable. In 1995, only three out of ten Canadian households had a personal computer, but by 2000 that number rose to nearly nine out of ten students (Sweeny 1, Willms and Corbet np). At the same time, the emergence of DVDs effectively dropped the price of owning a film to below fifteen dollars, expanding the NFB consumer base to hundreds of thousands of individuals, above and beyond 'the regulars'-- theatres, organizations, school boards and government-funded agencies (Grigg).

With its institutional priority now positioned squarely on audience access, the NFB launched the Canadian Content Online Program. Thus began the long, arduous, and expensive process of digitizing its collection encompassing ten thousand titles, with the goal of making the entire NFB catalog available on demand to any Canadian with computer and Internet access (NFB.ca "2000-2009"). From the beginning, the project was fraught with seemingly endless copyright issues, effectively precluding many productions from being made available online (CBC "NFB's Films Available Over the Internet"). By 2007 only six hundred and seventy films had been fully digitized (NFB.ca "History"). By 2017, it is estimated that one

hundred per cent of the NFB's "active"[26] collection will be digitized. This strategy to increase access through the development of a publicly accessible digital archive is one of the most extensive projects of this kind in Canada, and through it, the NFB established itself as a leader in transfer technology (NFB.ca "Report on Plans and Priorities 2015 - 2016").

The third wave of multimedia engagement emerged out of the dynamic intra-action of a fluctuating economy, digital innovation, access to the Internet and a consequent urgency for more sophisticated levels of media literacy. This, along with the ever-present technological curiosity and creativity of people both within and outside of the NFB, created the conditions for the affordance of on-demand media access to skyrocket.

As with each of the previously discussed affordances, on-demand access was not 'invented' in the third wave. The desire to access media when needed had been a concern since the days of humble media. The cost of media had implications for whether or not teachers could anticipate access to what was needed for a particular lesson. Likewise, the size and weight of projectors or computers influenced what media could be accessed when and where. Consequently, the need for on-demand access was not well-served in either of the first two waves. This problem ameliorated with the emergence of DVDs which were lightweight and relatively inexpensive.

The relationship between teachers and NFB distributers was a qualitatively different type of relationship than the one existing between Studio G producers and teachers. The focus of Distribution was on growing the base of the educational market: "the Distribution side of the business is always the interface to the public, when the public expresses a need, we try to

[26] While the digitization process has been hampered by copyright issues, it is striking how few of the Studio D&G titles have been digitized at the writing of this dissertation (2017). It is almost impossible to access most of their catalogues. One cannot but wonder if the same old boy's network that led to sacrificing the two studios to save mainstream production of documentary and animation may not still be at play.

respond to it to the degree that we have material we can adjust or adapt to address the need" (Grigg). But this is fundamentally a description of a relationship between a customer and a vendor rather than between educational professionals.

By contrast, recall that the focus of Studio G had been on the production of leading-edge multimedia for the classroom through a collegial process that respected the unique expertise of both teachers and producers. "We would take something that was half finished out to a classroom and let the teacher teach with it, and see how the kids reacted to it, and get feedback from the teacher of how things went and what should be fixed, but we kept this at arm's length - we weren't going to let them co-opt the project" (Elliott 11 Jun 2013). This approach had provided Studio G staff with the creative autonomy to experiment with innovative media for a receptive audience -- production decisions seemed to be driven as much, if not more, by the predilection of producers as it was by the requests of teachers. The privileging of the creator's vision, befitting an institution defined by artists, is what drove the film and animation studios. But in the face of a seemingly endless stream of cutbacks throughout the first decade of the new millennium, this auteur-approach to production was recast as "individual agendas dictating the production priorities" -- a problem that could only be 'corrected' with a cohesive programming strategy in which "audiences mattered" (Grigg).

In this new regime, what was left of educational production continued under the purview of Distribution in two forms. The first was the writing of Teacher's Guides that could be used to help teachers integrate NFB films into their lesson plans regardless of whether or not they had been produced for classroom use. Teachers were sometimes hired on a freelance basis to write these guides, but often NFB Distribution staff would simply write the guides themselves based on the structure of previously written guides (Collins 2014). The second form of

programming for the educational market was the previously described DVD compilations that were usually produced in response to demand for specific curricular support materials. These were sold in boxed sets with a teacher's guide and materials for classroom activities, all carefully selected and themed to align with particular parts of the curriculum. What Elliott had done on the sly to ascertain the needs of a particular classroom would become a key success indicator within Distribution (2009-2012 NFB Action Plan 6). Thus, educational programming finally became what it had always been imagined to be by the rest of the NFB -- an AV service department.

While the shift to audience-as-consumer was not confined to the educational market, it was, of course, becoming the strategic focus of the entire NFB, eventually articulated explicitly in the 2008/09 – 2012/13 Strategic Plan:

> As more Canadians engage with the digital world, they will expect a full range of offerings, including audiovisual programming. Interactivity, creative control, ability to watch programs anywhere and at any time are becoming the drivers of viewer choice. Canadians want, need and have a right to expect Canadian content on these new platforms. They have a right to expect original media-rich content that responds to the determinants of those platforms. They have a right to expect it in both official languages and wherever possible in Aboriginal languages as well.
>
> (12)

The language in this statement effectively conflates the discourse of citizenship with that of blatant consumerism, with the promise of access and agency as the imperatives fusing the two together. This marks an important ideological shift in the mandate of the NFB from the

production of media designed to facilitate and strengthen the decision-making capabilities of interactant-citizens, to media designed to satisfy the choice-making desires of user-consumers. This shift was most apparent when Jacques Bensimon was named Commissioner in 2001. In her final annual report, then Commissioner Macdonald reinforced the democratic idealism of the NFB that had been fostered through the Challenge for Change and Studio D programs, "The NFB has never been in favour of the status quo. Far from resting on our laurels, we are constantly thinking about the best ways to produce and distribute documentaries that will influence public debate, and animation that will appeal to the collective imagination" (NFB Annual Report 1999-2000 8). Two years later, Bensimon's inaugural annual report marked the beginning of the Board's shift toward an explicitly capitalist agenda saturated with the discourse of the marketplace. In the introduction, Bensimon described the NFB's purpose, "The Board has accentuated the need for relevance in programming and is confident that its productions will stoke equity in the NFB brand and intensify our kinetic connection with audiences … But to be meaningful, the NFB brand must be recognizable to groups that represent a multitude of cultural identities" (NFB Annual Report 2001-2002 12-13). The NFB was now not only an institute of public pedagogy but also a 'brand' in the media marketplace. It was being forced to branch out now that its protective veil of government funding was no longer adequate to provide the means to produce media outside market demand. This would challenge NFB producers of the old school now faced with considering their audiences in production decisions for the first time. But for the designers of educational media, now distributed throughout the Film Board, this was nothing new.

Animation – Children – Interactive and the Internet

As described in the third chapter, the *Perspectives of Science* project and the *Virtual*

Cities event were innovative, experimental and designed with the explicit intention of teaching students to make discerning, strategic decisions about complex issues through their engagement with interactive media interfaces. The content, structure and design of these interactions were the result of intense consultation, user-testing and deliberation between Studio G producers, educators and subject-matter experts (Stanfel 2016 27). Particularly with the *Perspectives* project, users enjoyed multi-faceted navigational, timing and access options that created a dynamic learning experience. Opportunities for reflection and deliberation were built into the interactive design of the media, rather than being tagged on afterwards as a separate activity. In this sense, there is a degree of similarity between the media-enriched experiences of *Perspectives* and *Virtual Cities* and those of humble media. Teachers used slides, projecturals and filmstrips to catalyze classroom conversation throughout the viewing process rather than separating the viewing of media from the discussion of it. In the contemporary moment, the integration of multimedia into spontaneous meaning making activities is regularly enacted in the usage of mobile media technologies such as Twitter, Instagram and Snapchat and in presentation technologies like Prezi and PowerPoint. With the ubiquity of creative media at one's fingertips, the ability to share one's narratives in any form instantaneously, seems to conflate the act of media creation with the act of distribution. In this sense, the Internet begins to evolve into something akin to a creative media form in its own right. In the heady days of the early Internet, its potential seemed immense (Eriksen). For NFB administrators, the allure of the Internet was for its potential in distribution and marketing. But for the ACI producers, the web offered a compelling new media landscape to be traversed.

NFB head of English Programming Barbara Janes initially offered Svend-Erik Eriksen, head of Animation in Vancouver, the position of running the ACI program for the whole

country. However, as Eriksen did not want to leave Vancouver, Janes split the program in to two branches: ACI-East in Toronto, Montreal and Halifax, led by Isobel Marks, and ACI-West in Winnipeg, Edmonton and Vancouver headed by Eriksen. As Marks prepared for retirement, she began to groom David Verrall, the head of English Animation in Montreal, to take over ACI-East (Eriksen).

ACI introduced "children" as a new programming focus to replace the educational mandate of Studio G, anticipating the infiltration of computer technologies in households, which could potentially broaden the media market for young audiences well beyond school boards and teachers. By collocating children ("who"), in the ACI label alongside animation ("what"), and interactivity ("how"), media technologies beyond film were insinuated into the scope of productions that would emerge from this unusual conglomerate. In theory, at least, ACI was the heir-apparent to Studio-G's legacy of multimedia production. Tamara Lynch and Pierre Lapointe were transferred from Studio G to ACI-East, where they finished tying up some of the projects that had been in production when the studio was closed. More significantly, they brought with them their production expertise and vision of new possibilities building on the groundwork laid by Studio G. It was Verrall who suggested the name ACI as a brand-name for this new creative space. He later described the name to Tom Perlmutter (who replaced Janes in 2001) as having three goals: the first "to celebrate and make real user-centricity at the NFB", the second "to reorganize so that the NFB could integrate new thinking and capacity for involvement in a fundamentally changing media and communications world" and the third, "to develop a working model in which all participants would share pride and ownership in all NFB activities, each operating from her or his point of expertise" (Verrall). With these goals, Verrall effectively positioned ACI as strategically integral to the NFB's internal and external recovery from the

cuts.

According to Michael Fukushima, who in 2017 is the Executive Producer of English Animation, but in 1996 was an animator in the ACI-West unit:

> The mandate really was to take these three areas/genres/techniques, however you want to describe them, that were explicitly not documentary and amalgamate them and create a critical mass that would take advantage of technology production processes and just ways of thinking that were different from documentary at the time.
>
> (Fukushima)

For Verrall, who had been head of the Animation Studio before Janes made him the implementation leader of ACI-East, the change was not just structural, it was also ideological. Unlike the previous studio-based organizational structure, ACI was envisioned as an integrated community where all projects would look at how the aspects of animation, children or interactivity could be interwoven within a coherent community rather than in production silos. Verrall evoked the topos of interactivity in the name of the unit to foreground the team's realization that the Internet would be soon evolving into an "interesting place" with levels of interactivity and community that were unimaginable in the nineties (Verrall).

Verrall, a self-identified 'organic' thinker -- which he identifies as someone who makes space for elements that are unpredictable and potentially capricious to surface in the creative process -- was the champion of interactivity in the post-Studio G NFB. He approached Janes with his embryonic vision of the potential for interactivity on the web. He was convincing enough to receive internal funding to begin exploring this through a think-tank called the Internet Unit, or internally, the web-dev team, comprised of likeminded ACI staff including

himself, Svend-Erik Eriksen, Ines Hardtke, Tim Latchem (before he was laid off) and Susan Nosov, who served as project manager. Hardtke was animation chair for Siggraph in 1998 and a digital media visionary. Many of these people had spent time in either Studio G or D and brought with them the zeal for participatory media making and the democratic idealism of those studios. The web-dev team seconded some of the existing digital imaging team that was created to move animation production from analog to digital to help them figure out the transition into this new Internet space. Its manifesto was a document written by Hardtke and some of the web-dev team entitled Clicks and Mortar, in which she exhorted:

> Let's define a "meta-net" as a network positioned between and in parts of an Intranet, Xtranet and Internet. It is a network that is accessible "internally", "publicly" but not "generally" (there are some inclusion criteria). A meta-net is a portal (a way to reach others within some same focus) but/and is also an entity on its own; a place for all of these "others" to meet and interact. It is a community that transcends its own defining boundaries and bridges its parts. Elements of this are all of the parts of current Web activity and include forums, discussions, workshops, virtual theatres, information, research facilities, data-mining, job boards … whatever an interactive, organic, creative, far-reaching "metanet" needs to and will be!
>
> Imagine actively creating and hooking up…
>
> a filmmaking meta-net
>
> with
>
> a producers meta-net
>
> with
>
> a distributors meta-net

with

a festivals meta-net

with

a broadcasters meta-net

with

a research & development meta-net

with

a development & applications meta-net

with

an educators meta-net

with

the general public.

(Hardtke, Hyde, Latchen & Nosov 1999)

Like the producers of Studio G, the ACI staff were more designers than artists. Apart from Hardtke and Latchem most of the ACI team were not media creators. That is, they would conceive of ideas in consultation with media creators but not create the media themselves. This delegation of media creation differentiated the designers of ACI from the auteur filmmakers and animators in the other units who were masters in their art forms. The distinction between design and art that characterized Studio G's status at the NFB was, in effect, passed on to ACI.

The implementation of the ACI program was very different in the East (based in Montreal) than in the West (based in Vancouver). According to Eriksen, there has always been a significant, historically-grounded cultural difference between Eastern and Western Canada in terms of filmmaking and these had both material origins and material consequences. In

Montreal and Toronto, there was more money available to filmmakers, for example. In Quebec, preparation for Expo ’67 and its consequent success motivated investment in a large number of permanent staff at the Montreal location – an extraordinary state of affairs in the film industry where freelance, project-based contracts were the norm. The ACI-East studios, located in Montreal, were seen as a ‘one-stop-shop’ for making films because they had the expertise, equipment and staff to produce all stages from script to finished film in-house. Eriksen suggests that this led to a sense of ownership, in the auteur sense, over the space and the production process in general. In contrast, Western Canada had several small NFB studios run almost entirely by freelancers who saw themselves as being a resource for a community of which they were a part (Eriksen). One of the most significant of these was the education community with which the NFB had been closely involved in productions since the 1970s. In fact, it is Eriksen’s assertion that their approach of working integrally and collegially with educators to make media specifically designed for classroom use was pioneered in the West and moved from there to the Eastern units of the NFB. This sense of communal interest was even part of the internal zeitgeist of the NFB in the West as evidenced by the fact that staff from Distribution and Marketing were included in production planning meetings -- a very different way of doing things from the East, where production units and Distribution and Marketing did not come together until the end of the post-production process. Since most of the staff in the West were freelancers who were used to saying goodbye to each other at the end of each production, the sense of loss and disenfranchisement experienced in the East was not felt nearly so traumatically in the West. For this reason, bringing together new people for productions that integrated the hybrid ACI program did not feel especially different than what they were used to in the past (Eriksen).

For the handful of Studio G staff who were transferred to the ACI-East program,

including Lynch and Lapointe, the experience was considerably more difficult. The production culture and practices of the Children/Interactive and the Animation aspects of the unit were almost antithetical to one another, and these differences were made painfully apparent by their amalgamation. The Animation studio was even more auteur-focused than the film studios, epitomized by the almost god-like status of Norman McLaren, to whom Grierson gave what amounted to a carte blanche to do what he would. Perhaps as a consequence, the Animation studio was plagued by in-fighting and competition -- nothing like the culture of Studio G where cooperation and mutual respect were the norm (Lynch 2016). At Studio G, any staff member with an idea could pitch it in a bid to get an investigative budget, and often other staff -- directors, administrators and producers -- would offer suggestions to help strengthen the concept of a colleague's project (Lynch 2016). When Marks left and Verrall took over, his approach to determining which projects were approved was sometimes frustrating to those used to having the encouragement and support they enjoyed under Elliott. Verrall's father, Robert Verrall, a long-time producer, director and administrator at the NFB, had also been a talented animator, and one of the first brought in to work under McLaren. Unsurprisingly then, the younger Verrall knew the animators well, and understood the animation process thoroughly. Although Verrall had a strong technical bent, and championed experimentation with web-based interactivity, it seemed to Lynch and Lapointe that animators received investigative budget approval much more easily than they did. They often found their proposals for "Children Interactive" programming falling by the wayside after being unable to ignite the minimal interest or funding required to bring them to life (Baron & Lapointe).

Internet as a Creative Space

Despite the lack of funding, cultural differences and the challenges of working with

emerging new technologies during the early 2000s, under Verrall's leadership the NFB produced several extraordinarily sophisticated Internet projects through both ACI and Animation Jeunesse, the NFB animation studio in Montreal that creatively blended interactivity and animation for a child and youth-focused audience. It was actually the 1996 *Prince & I* project that Fukushima identified as laying the foundation for the Internet projects that followed. As previously described, *The Prince & I* was the first Internet extension of the CD-ROM project *Has Anyone Seen My Umbrella?* that "allowed the film board to say, 'we can take that metaphor of production and dissemination and translate it to this limited thing called the Internet that currently exists.' So it was that thinking that took us from filmstrips, to CD-ROMs, to our initial Internet explorings" (Fukushima). The development of technological imagination connecting experience with humble media to the Internet is an important insight that is very rarely recognized or at least acknowledged in the Film Board today, and central to the argument of this dissertation.

While the media may have shifted in form, the characteristics of interactivity that were inherited with each form changed very little. Filmstrips enabled the user to control the pacing of how they progressed through the media, leaving space for the teacher and her students to discuss the content as it unfolded, applying it to their own contexts, thus customizing their experience of the media. With CD-ROMS and DVDs the ability to choose one's own navigational pathway through the media was layered upon the ability to control one's pace through the media. This facilitated an even greater sense of agency in the choices that were offered by the media. The Internet promised to offer both these affordances, with the added bonus of being able to access content without the intermediary insertion of a disc or filmstrip, simply by turning on a computer which could be connected to the Internet with a click of a

button. Furthermore, the Internet enabled interactants to upload content and share that content far beyond the parameters of the classroom. The Internet could be thus both a creative medium and powerful distribution device ideal for interactive learning and community building activities.

Verrall understood this and had on his team a number of people who "predicted that interactivity and hard media was going to be limited and that the Internet and the web ultimately was going to evolve as the interesting place on levels of interactivity and community that were unimaginable" (Verrall). His "cleverness', he maintains, was in his agreement with them, which lead to Janes willingness to provide exploratory funding for web-based production. Verrall was anxious to catalyze this endorsement with a big-ticket project that would cement the value of ACI generally, and demonstrate the value of the Internet for engaging audiences more particularly (Verrall). To this end the *History of Canada* (*HoC*) interactive website was conceived. According to Fukushima, the purpose of what would be the NFB's first big foray into Internet production was to engage a younger demographic -- a group who perceived the NFB to be archaic. This younger audience -- high-school-aged teens to thirty-year-olds -- was understood to be generally technologically adept, and thus the use of interactivity and the Internet was seen as a strategic imperative to attract them (Fukushima). This was a stark contrast to the challenge Studio G faced in producing multimedia for decidedly technically non-adept teachers. The low level of media literacy forced Studio G designers to develop resources to support teachers' use of the media. But in the case of the NFB's early Internet projects, the bar had already been set by multi-billion dollar gaming companies. Their challenge was to create experiences that felt like a game but were really a lesson within budgets that were radically lower than those of gaming companies (Kirriemuir

and Mcfarlane 4). The discrepancy between the vision for *HoC* and what could be created would eventually derail the project before it launched.

Kevin Kee, a PhD candidate in History, was brought on board to write for the *HoC* project, joining a staff of approximately fifteen, and five-million dollars was diverted from the NFB budget to finance it (Verrall). There was a lot of hype in the press about the upcoming project, and a lot of tension between the French and English perspectives, which plagued the project from day one. The use of project funds was questioned publicly on the front page of *Le Devoir*, to the embarrassment of the NFB, casting a shadow over the whole project. Furthermore, apart from the in-fighting and politics, it was not coming together technically the way Verrall had envisioned:

> … my feeling at the time was that it was not what we would call 'interactive' enough, that it was going to be a presentation module and you were going to have some navigation possibility but it would be a little bit like a CD, and that we hadn't yet invented where the engagement of a user meant that they would feel a part of the active experience as opposed to observers of the experience. … it was my conviction, solely my conviction, but I will take responsibility for raising this flag that the result we were going to generate was going to be conventional, was going to be on the web but it was going to be conventional and according to me anyways, not satisfactory to the level of inventiveness and innovation that characterized the Film Board.
>
> (Verrall)

With this assessment, Verrall advised Janes to pull the plug on the project. Janes did so, paying out the remaining contracts and repurposing what elements that could be saved into

other projects. The NFB was now gun-shy of big-ticket Internet projects, and traditional film-making was reaffirmed as the core of its purpose, a stance reinforced when Bensimon was appointed NFB Commissioner. According to Eriksen, Bensimon "was not from the digital world, he was not from technology, so he put a stop to everything. And it took years for things to get back into some semblance of interactivity." During that time, the NFB went from being a forerunner in the field of interactive educational media to playing catch up[27].

Kee, still on contract from the *HoC* project, had read Janet Murray's iconic "Hamlet on the Holodeck" in 1997 and was taken with her vision of the Internet as a space with its own rhizomatic aesthetic. He began writing research documents for Verrall and others in the ACI team trying to generate an understanding of the unique affordances of the Internet as a medium, rather than simply as a tool. As the *HoC* project wound down, Kee successfully pitched an innovative web-based production created through the ACI-East initiative called *The Cyber-Terrorism Crisis* (*CTC*) - a shell of which could still be found online[28] at the time of writing. Produced by Fukushima in 2002, the CTC was a web-based 'choose-your-own-adventure' type website developed for upper-elementary, high-school, and even undergraduate history and sociology studies. The graphic design and music accompanying the site appealed to 'hip' audiences -- namely teens and young adults. For Kee, it was an attempt to create for the web specifically:

> … we need to stop treating it [the web] like film. We need to stop treating it like text. We need to think about what it can do. What I see is a kind of playful environment so let's think about this more in a game-ic way, which is what *The*

[27] According to Verrall, "I think it is fair to say that Tom [Perlmutter,] heard from Jacques [Bensimon] that ACI East had been a bit big for its britches. He [Bensimon] was not a fan of the Internet restructuring proposals. He favoured a more modest implementation …" (19 Jul 2016).

[28] Accessed 19 Jun 2016 <www3.onf.ca/enclasse/wma/warmeasures/html/hmain_e.htm>

> *Cyber-Terrorism Crisis* was all about – it was essentially like a hypertext game with Flash – lots and lots of Flash - because that was the cool thing and Flash was the best way of making video work in a compelling way. And then we could do original video and not worry about copyright.
>
> (Kee)

Fukushima, the son of a Japanese-Canadian who had been sent to the internment camps in British Columbia during WWII, had a particular interest in that aspect of Canadian history. He wanted to draw parallels between the 2002 invocation of the War Measures Act to deal with cyber-terrorism, its implementation during WWII and Trudeau's invocation of the Act in Quebec in 1972. This form of interactivity pulled the user into the narrative, as a co-constructor of the plot, but also as an interlocutor in it. Visitors could explore the narrative from the perspective of various stakeholders -- government officials, everyday citizens, even hackers -- and in so doing critically analyze the complexities that impacted them during these times of crisis.

> [As] the students went through, they were presented with scenarios, and they had to make choices within the scenarios and those choices led them in different directions, they either led them towards greater suppressant and internment jailing, things like that and show them the two historical incidences of when this happened or they took more benevolent paths and were presented with alternative histories that could've happened.
>
> (Fukushima)

Visitors were frequently encouraged to 'vote' at pivotal points in the narrative to make their feelings about what they heard known. In this way, the democratic imperative to vote-to-

be heard was fostered, with the intent, I suggest, that it would be enacted away from the interface as well. This project appears to be the first instance of the NFB using interactive design to reinforce a particular ideological perspective -- in this case, democracy. The ability to decide whose perspectives to listen to and how to vote was granted to the visitor, the rhetoric of the site, the way it appeared to be 'hacked together' and the patriarchal tone of the people in power -- supported and in fact performed Fukushima's laudable denunciation of the repeated use of the War Measures Act to deny particular citizens their rights without recourse or evidence. The relationship between the rhetoric and ideological bias of design and narrative is an important aspect of interactive design that has not been adequately addressed in the literature, particularly in relation to projects that are geared towards children and youth. The *CTC* project garnered a lot of notice, and in 2002 it was selected for the Hot Docs festival, where it was well received and won an honourable mention at the International New Media Awards.

A year later, Pierre Lapointe produced a spin-off of *The Prince & I* called *Save the Pig*[29] (2003) directed by André Lauzon. It was a three-level, web-based word game aimed at nine-to-twelve-year-olds that challenged them to find as many words as possible within a given time frame to save the pig from its inevitable fate. Although simplistic by today's standards, it was an early experiment in using the Internet to engage young audiences, who were by this time immersed into the gaming world of Nintendo and Game Boy. They did not want to sit still and passively consume media -- they wanted to have fun with it in ways that offered multiple choices (Kirriemuir and McFarlane 3-4). With the NFB focus on engaging audiences in a more reciprocal manner, interactive learning games and websites provided a potentially powerful way of doing this with younger audiences.

[29] This production appears as *Pigs in Spring* in some of the documentation.

The ACI group focused on the Internet's ability to provide a space, a destination point that was in and of itself a gateway to creating community for like-minded online visitors with shared interests -- a sort of remediation of the Challenge for Change concept. To this end they conceived of three portals -- one for documentary film, one for animation and one for children. In the end, the portal for children, called NFB Kids Destination (NFB Kids) was the only one that lasted, and even that for only a few years. Then-Commissioner Bensimon came from the perspective of filmmaking, and was not particularly enthused by the Internet, and thus the portal was closed (Fukushima).

While it lasted, NFB Kids was a novel, creative space with fourteen entertaining and educational activities and games that were developed in Java, Macromedia Flash and Shockwave (Gauthier 9). With several of the ACI staff having previous experience working with the Challenge for Change program and the feminist-focused Studio D, the ideal was to create a dialogic space by, for and with kids[30] in which children were not only visitors but collaborators, and maybe eventually organizers of the space themselves (Gauthier 7). To this end, there were a range of opportunities for visitors to engage with the NFB about their experience of the site -- to make suggestions about changes and additions using comment windows and fun-themed surveys. Unfortunately, the expectations of what they would elicit from children were not realized in the responses, which tended to be too brief or superficial to generate dialogue, and eventually the site was redesigned as a static portal to the interactive activities (Hardtke).

One of the most extensive of the NFB Kids assets was *The Mission/La Mission*, a

[30] In an email dated 19 Jul 2016, Hardtke says the descriptor "for-by-with" was used to encapsulate the intent of NFB Kids: "The "for" part could have been anything really as long as… it was "made" for kids." As for the "by" part, she asserts that the NFB "… actually wanted their productions/creations/realizations [to be in the centre of the mandate] …". She sees the "with" part as being enacted through facilitation.

collection of interactive projects that, like *The Prince & I*, was a spin-off of a previous production entitled *Space Please! Science Please!* was a collection of twenty-six one-minute long animations, irreverently exploring different scientific concepts such as The Atom, Lightning, Explosives, Gravity and Dirt on Soap. *The Mission/La Mission* was produced by Michèle Bélanger and Marc Bertrand in the French Animation studio, Animation Jeunesse. Although the playful introductions to scientific concepts presented in *Science Please!* were critiqued by educators as being too superficial and biased[31], the producers believed these interactive components would increase the amount of time visitors spent on the site (Bertrand 7 Jun 2016). The landing page of *The Mission/La Mission* site was a loft apartment where two young people would be charged with discovering the whereabouts of 'hotspots' -- specially coded links that would launch a game or interactive animation corresponding to most of the topics included in *Science Please!* Every other month another interactive concept would be added until eighteen of the original concepts had been covered. Each hot spot was thematically designed to suggest the concept being explored. For example, by using the cursor to activate a light bulb in the room the user would launch a description of how Edison made the lightbulb (Bertrand 7 Jun 2016). The segment on lightning began with a young Frankenstein who needed to catch the lightning bolt to animate his monster. The interactions were set up in a game-like fashion, and if the user missed catching the lightning bolt a couple of times, they would be transported to a place to see an animation of how lightning bolts developed and how grounding worked, which would suggest a solution to the problem of successfully capturing a lightning bolt. The user was then returned to the game to enact that

[31] Barbara McMillian, a professor of science education, wrote a scathing review of *Science Please!* shortly after it was released, condemning the inadequacy of the 1-minute segments to explain even rudimentary scientific details, and the tendency to use demographic stereotypes, such as 'fat' people, for humorous purposes.

principle, enabling them to continue to play. Sometimes the scientific information was provided at the beginning as it was necessary to start the game, and other times it emerged in the middle as a problem-solving resource, as with the Lightning episode.

Another of the *Mission* segments called *Fire!* had users start a virtual fire by selecting the correct amount and arrangement of wood (twigs, sticks and logs) oxygen (via the breath of an elephant) and flame (provided by banging two rocks together). The aim was to complete the task within two minutes to prevent the 'proto-himana' from freezing, as measured by a thermometer. This game was proceeded by an online lesson about how combustion required fuel, oxygen and heat with a quiz to test the user's understanding (Gauthier 10-11).

The Mission/La Mission site was very popular, and at its height had 125,000 visitors a month (more than Radio-Canada at the time, which boasted a large site including TV shows reformatted for web-viewing) with the average length of each visit being twenty minutes – an impressive length of time given the brevity of each experience (Bertrand 27 Jun 2016). Each game was tested in a classroom. What Bertrand and his team were aiming for was not that this was the site the teacher would want to open first thing Monday morning, but rather that the students themselves would choose to open Friday afternoons because it was so much fun (Bertrand 27 Jun 2016). Although the use of games for learning was well-established prior to this by Studio G and the ACI-West educational producers, this was the NFB's most extensive use of the game-motif using web-based digital media to date. The quality of *The Mission/La Mission* over the years it was available (from 2003 to 2006) was recognized with multiple Boomerang awards for innovation in web-based media.

In terms of the affordances of interaction, *The Mission/La Mission* was strongest in terms of navigation, pacing and on-demand access. Users were given a sense of navigational

control, framed as exploration and discovery. They were able to determine where they went when, except when something unexpected happened that required them the re-evaluate their strategy. As an Internet project, the only potential issues were the ability to connect to the Internet and the access to a computer that could run Flash -- there were no barriers to the site itself. But there were no opportunities for a visitor to contribute content to the activities in *The Mission.* At this very early stage in Internet development, the ability to contribute content was cumbersome and required a lot of maintenance. It is possible that Bertrand, who was eventually forced to take down the *Prince & I* website simply because it took too much time and resources to continually moderate and upload materials children contributed, did not want to see that same task overwhelm *The Mission/La Mission* site as well, so avoided this affordance to extend its online life (Bertrand 7 Jun. 2016).

Among several other projects, Bertrand's French Animation studio also developed a particularly memorable website called *Ultrabug Cliposcope* in 2002. This was an online animation editing game conceived of by director/screenwriter Martin Barry. Barry got the idea for *Ultrabug* from his own Genie award-winning 1989 film *Juke-Bar*, an animated film about cockroaches dancing in a jukebox which was actually an elaborate extermination trap. For this project, Barry resurrected one of the cockroaches from Juke-Bar, an interstellar super-cockroach named *Ultrabug*. Based on the EzToons game engine developed by the Québec City firm of Sabarkan, *Ultrabug* encouraged children to create their own animated film-clips through an interactive library of animated film segments, words and accessories drawn from the *Juke-Bar* storyline. Using a mouse to point and click their selections, children could control their characters' movements, select their clothing and sets, zoom in and out, insert words, and by placing the assets on the timeline provided, replay their animations, which

could be sent to other people via e-mail.

Along with *CTC* and *The Prince & I, Ultrabug* was one of the earliest Internet projects designed to facilitate all four affordances of engagement: control of navigation, pacing and access along with the user's ability to modify content. That the 'user' here was a child was all the more extraordinary as the innovation properties of the Internet beyond navigation and access had not yet been fully realized. Social media was barely on the horizon and in terms of interactivity, DVDs were still the gold standard. That a child could 'dialogue' with the Internet in a creative context was a watershed landmark in the NFB's experimentation with interactive media that harkened back to the *Prince and I* project, which itself extended the possibilities introduced by *Has Anybody Seen My Umbrella?*. As a result, both *The Mission/La Mission* and *Ultrabug* tied for the MIM d'or award at the Marché International du Multimédia de Montréal in 2003. Unfortunately, the two projects were both eventually taken down. In the case of *Ultrabug*, the game engine used by Sabarkan could not keep up with the different browsers of the time, exacerbated by the fact that it was all Flash-based. The continual infusions of funds required to make seemingly endless changes required as the technology shifted was not sustainable for the NFB (Bertrand 7 Jun 2016).

Animation Jeunesse and the ACI unit were, like the documentary unit, considered to be production units. They thought of the Internet as an experimental media form, like any other form of multimedia. In a production unit, once the project is completed, it is passed over to Marketing and Distribution, and the creative team is redistributed to other productions. Their connection with the production is over. With Internet-based media the need for ongoing maintenance of a website once it was launched had not initially been anticipated. Because the NFB had outsourced the work to Sarbakan, they were unable to do the maintenance

themselves as they lacked the necessary access, equipment and expertise. The web-dev team took care of the website as well as they could for a short while, but they were busy developing projectors for showing video on the Internet and planning the documentary, animation and NFB Kids portals (Bertrand 7 Jun 2016).

In this way, the NFB eventually came to realize a fundamental epistemological fact of interactive media that Bertrand himself had realized when he had to take down the *Prince & I* -- online projects are never really finished. Moreover, as long as there are users on the site, the narrative, in effect, is constantly being developed. Who takes care of these never-ending projects? How do you get approval for an open budget line? How do you predict the contingencies in a burgeoning technology where changes are happening at a breakneck speed? While these questions went unanswered, the institutional enthusiasm for Internet based media began to wane, especially with the arrival of Bensimon who was concerned by the prospect of making a substantial investment in an unstable, and largely unknown infrastructure like the Internet, and felt it was simply not prudent to pursue such radical changes. This position was reinforced by unilateral anxiety about the repercussions of developing an extensive online presence from the production, and Distribution and Marketing communities who were concerned that this would redirect resources from documentary and animation film-making in particular. The rest of the organization was simply not ready to embrace the brave new world of online technology yet (Verrall).

But this is not the end of the story. As they worked on the NFB portal, it occurred to the web-dev team that something similar might work for teachers too, resulting in the development of a project called Media-Sphere. Media-Sphere was the first 'educational' website geared towards educators, evoking the intimacy of watching a filmstrip or slideshow

on a projector designed for individual viewing. It contained a searchable preview section - a precursor of the NFB screening room -- where teachers could view short samples of films under the seventy-second limit allowed by copyright law at the time. This enabled teachers to determine whether a film would be a good fit for their needs. The film clips could be searched by genre, format, or content type, or by major category (education, geography or music for example) using Real Player, and provided textual abstracts of each film, study guides to accompany them and a link providing a direct path to the NFB store. This was the marketing function that fit within the understanding of the web under Bensimon.

Media-Sphere also included material repurposed from the *History of Canada* project, housed under the title *Contemporary Canada* and in a "Tips" section, the latter of which was primarily for teachers, containing study guide information, tips on how films could be used in classrooms, and a means for teachers to discuss their usage of the NFB material in their own classrooms -- envisioned as a type of professional, user-driven blog. This last element never really took on the vibrancy that the team was hoping to achieve, an outcome that was reminiscent of the Challenge for Change legacy. The vision of an online community of engaged educators may have been a bit too far ahead of its time. This may have been because the media was not quite able to deliver what the technical imaginations of the ACI team envisioned. It may also have been because users were not yet fluent in the discourse of social media, and so were not sure how to contribute to the dialogue. Or perhaps it was simply because the push for participation was coming from the NFB and not from teachers themselves. Regardless of the reasons for its demise, this attempted project did plant the seeds that would be re-fertilized under the NFB/Education program, to be discussed in the following chapter. While the dialogic aspect of Media-Sphere did not work as planned, the digitization of

the NFB archive that the site aimed to provide access to, not only furthered the NFB's reach to its audience across the country and the world, it also brought live audiences back to the NFB.

Bringing people to the NFB was a primary motivation for bringing a media centre to Toronto. Based on the success of the NFB's experimental Cinérobothèque -- a one hundred and twenty seat theatre in Montreal with individual viewing stations on which thousands of NFB videos could be viewed on-demand -- the NFB decided to take advantage of their new digital archive by opening a sister venue, Mediatheque, in Toronto in 2002. The Mediatheque was a "state-of-the-art storefront offering the public an interactive window onto Canadian culture and cinema" (NFB.ca "2000-2009"). Located in the heart of downtown Toronto, the Mediatheque[32] stood across the street from the giant Paramount theatre, where it was imagined it would draw the attention of curious cinema patrons. The Mediatheque boasted a seventy-nine-seat theatre and individual digital touch screen viewing stations (a full five years before the launch of the iPhone touch screen) for on-demand viewing of NFB shorts and feature films, as well as a conference room and a multifunctional space for animation workshops for the public and other activities. It was like each person had their own customized cinema, evoking the delight of students viewing filmstrips in handheld projectors back in the days of humble media.

When the NFB began work on the Mediatheque, a flurry of job postings was advertised and Kristine Collins, a twenty-two-year-old who had just graduated from university, applied to every one of them. Despite her youth and lack of experience, she apparently made a very good impression and was hired as supervisor of the Mediatheque -- a daunting challenge, but one that she and her new colleagues embraced enthusiastically. Managed by Peggy Fothergill, the group worked feverishly to build the centre -- along with all the administrative infrastructure -- from scratch. Their mission was to realize NFB's Commissioner Bensimon's vision of sharing the

[32] A French term meaning essentially, a 'multimedia library' - LaRousse Online Dictionary.

treasure that was the NFB archive with the public in the days before high speed Internet would make playback of a feature length film a seamless experience. They put much thought into the design and functionality of the centre, and ensured that the space looked spectacular for its opening. They predicted it would be the hottest spot in the district, and anticipated a booming reception. Patrons could sit at individual viewing stations with a high definition monitor to stream potentially anything from the NFB archive directly from the 7 TB hard drive. Fothergill described the user experience: "The person who sits in the chair controls the sound, they control the film they watch, they control how fast they watch the film and they can watch a movie on a higher quality screen [than they could at home]" (Fothergill). In effect, the station embodied the affordances of the first three waves of engagement -- navigation, pacing and on-demand access -- all in equal measure. Expectations were high when the doors finally opened in November 2002.

It quickly became apparent their expectations were overly optimistic. "About a week after opening it was like 'holy jeez, nobody's coming in' – like *no one* is interested. We are across the street from the Paramount, like this is crazy!" (Collins). Collins and her group put their heads together -- clearly the public did not grasp, nor, apparently, have any desire for this innovative way of accessing this state-of-the-art facility. Maybe it was simply a mismatch between function and context. If one were going to travel all the way downtown to the NFB, why would they want to sit by themselves to view a film on a screen much the size of their own home computer when they could be in the comfort of their own homes doing the same thing? The results of a survey conducted by the Canadian Internet Project (CIP) showed that by 2003 eighty-five per cent of Canadians had a home computer and sixty-one per cent of Canadians had been online for five years or more. Perhaps their location relative to the

Paramount, which they had considered a benefit, was in fact drawing audiences who were interested in Hollywood blockbusters but not particularly drawn to the material produced by the NFB.

The Cinérobothèque was booming in Montreal despite the fact that it offered essentially the same experience as the Mediatheque. However, it was situated within walking distance of L'Université du Québec à Montréal (UQAM) and several CEGEPs, and therefore benefited from a steady stream of students who were avid patrons of serious cinema. As well, the arts are deeply embedded into the culture of Montreal, and the NFB is a lynchpin of that milieu. The theatre was consistently booked and the laserdisc viewing stations were very popular. Whatever the problem was, Collins and her team were given an ultimatum by the Director-General of Communications and Outreach, Laurie Jones: "you have got to get butts in these seats or you are closing, and you are all going to lose your jobs" (Collins). They had worked too hard on building the facility to let it disappear without a fight, so Collins and her team began to strategize on ways to breathe life into their beleaguered project.

They took another look at the Cinérobothèque, which had complemented their programming with public workshops on how to draw on film and puppet 3D animation. Collins was herself passionate about media literacy, and thought the Mediatheque could be used as a programmatic hub of media literacy training across the country, drawing on the best practices of what was being done on an ad hoc basis at festivals and in schools to develop the NFB's reputation as a national source of training and expertise in this area. She contacted Barry Duncan, media literacy champion and co-founder of the Association for Media Literacy for advice:

> …we were looking at the Ontario curriculum, looking at what the outcomes

> were, working with Barry and Neil Anderson and Carolyn Wilson who actually wrote the media literacy curriculum for Ontario, and lobbied the government to adopt the curriculum. So we worked directly with them to make sure what we were doing in workshops made perfect sense for teachers so they had no reason not to bring their schools down here for workshops.
>
> (Collins)

It was the educational market that the NFB had depended upon for so many years that came to the rescue -- not for altruistic reasons, but because there was a desperate shortage of high-quality support for teaching students not just on how to analyze media, but to produce it. Most teachers had neither the skills nor the resources to do this in the classroom, so when Mediatheque began to offer workshops in media production explicitly connected to the curriculum, they came in droves. They began with a relatively focused series of workshops in stop-motion animation, drawing on film and sound production. Building on that success, they then took on greater challenges, like creating a day-long documentary-production workshop during which students planned, produced, and completed a documentary, a specialized ESL workshop, and workshops designed to train teachers on how to use and integrate multimedia production into the classroom. Unlike the theatre and viewing stations, the success of the workshops was immediate. After the initial promotional mail-out, the workshops were completely sold out year after year from the first day of school to the end of June. The only limitation was space. Averaging about 30,000 students a year, the workshops became a revenue source for the NFB, above and beyond covering the costs of funding the program. Collins was thrilled:

> The democratization of media was the underlying goal - give them the tools so

> they can go out and create. There is an assumption that because young people have technology they are automatically creating these amazing pieces of work, which is not necessarily true – right? Storytelling skills are different that just having access. So it just grew, and grew, and grew.
>
> (Collins 2014)

Collins rightly understood the differences between having access to media, learning how to make the media work, and being able to use it to communicate strategically. Her insight evokes the experiences of teachers in the '60s who struggled as they attempted to not only learn the mechanics of using filmstrip and slide-based media when they could access it, but also had to change their usual teaching practices to integrate media into their lessons effectively. For decades, the NFB had been holding workshops for teachers to help them to become more comfortable using multimedia, but this was done simply as a market development strategy, as teachers were unlikely to pressure their principals and school boards to purchase technologies and new media forms that they were uncomfortable using themselves. The need and desire to be trained in how to produce original media themselves had not been present. But digital media was different -- personal computers and the Internet made access to multimedia so pervasive that it introduced a new way of communicating. Adults and children new to computers had a steep learning curve ahead of them as they began the long, and culturally important process of becoming media producers and well as consumers and the NFB, at Collins' urging, was a primary resource for training Canadians how to communicate effectively across media forms.

In the meantime, the rest of the Mediatheque was slowly growing its own small but devoted group of cinephiles who appreciated the intimate and immersive access to the NFB

archive it provided. Both the Montreal and Toronto locations were enjoying over 100,000 visitors a year by 2006. Historically, these were respectable numbers, but in a digital world they were less significant. Since opening in 2009 the online screening room at NFB.ca had generated forty-one million views (Taylor). The number of people using the two film centres was even more problematic when a cost-benefit analysis revealed their cost relative to their reach (Grigg). This, in the context of yet another budget cut of $6.7 million (a figure that is modest compared to previous cuts but nonetheless significant enough to require more streamlining of priorities) led to the loss of seventy-three more jobs and the decision to close both the Mediatheque and the Cinérobothèque in September of 2012. This decision was met with protests in the streets of Montreal, and was heartbreaking for staff at the NFB. According to Grigg, there is much that cannot be measured by numbers:

> … it was a hard decision that hurt the bunch of us – there was a profound attachment to that activity, and a real value that was tangible that we had trouble translating to a measurable metric. That was a full experience. You had people coming into a space, meeting a bunch of people, seeing many, many films, learning a lot about the Film Board's role. It was a very deep relationship we had with a small, but committed user base. It got caught up in a numbers game that said 'it's a no-brainer, these things are too expensive.'
>
> (Grigg)

The aspects of Mediatheque and Cinérobothèque devoted to accessing and appreciating film (e.g. the theatre and viewing stations) formed what was essentially an immersive, interactive portal to the NFB archive -- a fine example of public pedagogy. It was this that was lost in 2012 -- no theatre-based program could draw audiences in on the scale made possible

first by cable television and then the Internet. The NFB was never successful in getting its own cable network, and so the Internet was its last great hope for remaining relevant in a brutally competitive media market. Although the theatre and viewing stations had been closed, the workshops, by virtue of their enormous success, remained and found new life as the star of their own program: NFB/ Education. Collins was going to get the chance to realize her vision of a national multimedia literacy program. It was a grand vision, and it reached the most remote corners of the country, as will be discussed further in the next chapter.

With the popularity of the Internet, consumer need for on-demand access to desired content effectively eclipsed the other affordances. The capabilities of digital media to facilitate navigation and pacing were by this point taken for granted, but were still considered selling points in the marketing language of NFB educational catalogues. Although the ability of student-users to produce media themselves was well established through the stop-animation workshops at Mediatheque and Cinérobothèque, this was a practice largely realized exclusively in those locations, and did not become a prominent affordance of digital media for those without training in media design.

The idea of using technology to create community and dialogue between the NFB and Canadians was also explored through CitizenShift web spaces, which launched in 2004 (NFB Info-Source). It was the corollary of Parole citoyenne, the French site launched a year earlier that inspired the English version[33]. Although it was neither produced by ACI nor by any of the educational staff at the NFB, it was awarded with the Sony AMTEC (The Association for Media and Technology in Education in Canada) award in 2006 for "achievement in the field of educational technology, demonstrating outstanding ability in the use or creative development of

[33] Although the two sites were housed on the same platform, they were not merely translations of each other. Rather, they attempted to focus on issues of greatest concern to their respective audiences (Kearns).

educational media in K-12 and post-secondary education"[34]. In terms of intent, CitizenShift was perceived, at least by AMTEC, as being an exemplary use of technology for educational, not just documentary, purposes. With the mandate "to serve as social facilitators and disseminators of people's voices", the sites provided opportunities for viewers to respond to blog posts, participate in podcasts, post and view photos, and dig deeper into issues of concern through hyperlinks. Topics that were covered included those meant to attract younger participants including Youth at Risk, Racial Justice and the Environment. The 2006-07 NFB Annual Report applauded CitizenShift and Parole citoyenne for engaging 154,000 and 147,000 visitors respectively. While these numbers are paltry compared with the participation rates enjoyed by social media sites at the time of writing (2016), the two sites were pioneers in the area of social media, which was just beginning to emerge at this time (2005-06 NFB Annual Report 18)[35].

None of the media produced for CitizenShift was created by NFB staff, which, for Patricia Kearns, the Executive Producer of CitizenShift for several years, was a benefit. "It was really interesting because it was giving a platform to citizens across the country who wanted to simply tell a story with their photographs, their sound tapes, or their little videos". In this sense, CitizenShift epitomized the realization of democratic online community-building that had been imagined by the web-dev team of ACI. In practice this worked no better than had the attempts of ACI with Kid Zone. Although the NFB staff of CitizenShift who ran the program shared a vision for creating a type of national public sphere, they were ultimately disappointed with the results. "The thing that didn't work as well as we had really hoped was that we wanted people to speak together, to talk to each other. Some forums sometimes just don't take off and that was

[34] <web.archive.org/web/20070916031407/http://www.amtec.ca/site/association/awards/sony.shtml> Accessed 17 Jul 2016

[35] <http://ydme.ca/citizenshift-parole-citoyenne/> Accessed 17 Jul 2016.

one of the problems. We would feed the forums with different questions and we would try and get the conversation going, but it was never successful" (Kearns). CitizenShift was eventually transferred to the non-profit organization L'institut du Nouveau Monde in September 2009.

The problem seemed to echo that of NFB Kids site -- the intended users simply did not actively engage with the online community. This might have been because the media literacy of the majority of the population may not have been developed enough to motivate active participation in the creation of media. There was no follow-up study to determine what the issues were. While there were undoubtedly many people -- both adults and youth -- who were excited by and experimenting with multimedia in the early 2000s this was not pervasive then, nor now for that matter. Today, most people can now manage at least a short comment to an online discussion, but being able to create audio or visual media requires a more complex array of media expertise that is not as common, especially in the early 2000s. The stereotype of the tech savvy teen has been uncritically accepted by the media and by many media producers. There are and always have been early media adopters, but they, by definition, are outliers. The ability and desire to actively participate in online communities did not seem to converge effectively with either the ACI or the CitizenShift websites, as much as their designers wished then to do so.

Conclusion

The insight from the failure of the NFB's early online experiments to catch on as envisioned is that engagement that is focused on media participation seems to be dependent on more than media affordances. The famous evocation from *Field of Dreams* (Robinson 1989) "if you build it, they will come", does not seem to apply in these cases. The intrinsic desire to participate must also exist as it takes a lot of effort to learn how to use any form of

creative media technology with a degree of mastery. Media literacy scholar James Paul Gee claims that students learn best in situations where they are highly motivated to be engaged in social practices that are important to them (Gee 70). The case might be made that this holds true for active engagement in online communities as well, but certainly there must be more to catalyze such communities. Robust online communities should be understood in terms of complex agential realities rather than objective realities. They emerge organically from the intra-actions of participants, interface design, media affordances and literacies, social, cultural and economic influences, in unpredictable and idiosyncratic ways. Some of the elements may be fostered by media design, but even the most innovative site will not spark activity without many other factors at play. Any level of participation more substantial than a short comment or a 'like', as on Facebook, necessitates at least some personal investment in the topic of discussion.

It may be that the NFB's early attempts to create interactive online spaces may have been too broad in their scope -- trying to be too many things to too many people -- and ended up not catalyzing a passion or interest in users that might have sparked sustained, active participation. Alternatively, maybe they were successful in the same sense that Mediathque and Cinérobothèque were, in satisfying the desires of a small but devout group of people to engage with topically relevant media. But while quality wins awards, quantity attracts funding. The NFB had yet to appreciate the strategic importance of many high-quality, but small niche markets on the Internet. The fact that the NFB, as a government-subsidized organization, is protected to a degree from the lowest-common denominator whims of mass market audiences, it is not utterly exempt from market demand, and with the election of a fiscally conservative government in 2006, these pressures were exacerbated.

The vision of using media as a catalyst for social change through community participation is one of the NFB's most critical, if idealistic, contributions to Canadian culture. NFB Kids and CitizenShift's use of the Internet as media to foster community is an excellent example of niche programming which is the Board's strength and on which its reputation for innovation is grounded with programs such as Challenge for Change, Studio D and, of course, Studio G. Its early forays into Internet-based production provided an important, if under-appreciated, foment out of which its awarding winning NFB/Interactive program would develop.

The characteristics that I have offered as defining the third wave of media production -- namely, the ability to contribute and share content layered on top of the expectation to access media on-demand, and have agency over the pace and navigation of media -- emerged out of the intra-action of the Internet within the dynamic Canadian milieu. In no small way, they were influenced by multiple global recessions, a Conservative government whose budgetary priorities systematically eviscerated the arts and culture sector in Canada, the entry of the first generation of digital natives into the educational system, and the pervasive preference for digitized multimedia over paper-based print in the new millennium and the Internet (Sweeny 3).

Throughout the third wave, producers experimented with both online and face-to-face modes of developing active relationships with audiences as television and theatre experiences struggled in the complex and competitive Canadian media environment. Although audiences may have been slow to embrace the NFB's strides towards the creation of a digital public sphere in the first decade of the 21st century, and as they became more tech-savvy, their technological imaginations created a market for on-demand media that entertained as well as educated and could hold their shrinking attention spans (Hayles 14). Children and youth,

particularly of the middle and upper classes in urban centres, were at the epicentre of this consumer base. It is therefore not surprising that the area of greatest creative activity in terms of educational media to emerge after the closing of Mediatheque and Cinérobothèque focused on the strategic use of interactivity to engage students, and their teachers, in a dedicated program called NFB/Education. The workshops developed at Mediatheque and Cinérobothèque found a new home in this program and 'educational specialists' took the NFB on the road to the furthest reaches of the country. This practice builds upon the legacy of Studio G and is the focus of the next chapter. Indeed, as the third wave merges into the fourth, the waves of intra-action once more fold over each other, and the dynamics of the first three waves are reiterated, in ever-changing forms, remediating affordances, building on the teachings and insights acquired over the past fifty years, over and over again.

In the fourth wave, the Internet takes front row centre as the primary distribution and access point of the NFB. Although the NFB's vision remains firmly focused on the audience during the fourth wave, the sudden departure of its Commissioner and digital champion Tom Perlmutter in 2013, followed by another budget cut, relatively modest by historical standards but nonetheless significant for such a lean organization, leads to new challenges and changes in strategy. Interactive documentary matures and producers begin to produce media for other technologies such as smart phones and iPods. Producers have a repertoire of options for the design and delivery of many kinds of narratives, from traditional filmmaking (now almost always on video), animation, and since the launch of Cizek's *High Rise* project, interactive documentaries. The focus of the National Film Board of Canada, it seems, is becoming quite possibly more centrally organized around digital multimedia than focused on film, accessed through different types of technologies, and by more active user/audiences than at any other

point in its history. As the fourth wave of media intra-action at the NFB engulfs the patterns produced by the previous waves, the focus returns to where it began in the time of humble media -- on the teachers and their students.

CHAPTER FIVE

FOURTH WAVE - CREATING MEDIATED EXPERIENCES: BY, FOR, WITH TEACHERS AND STUDENTS

The idealism of participation that became associated in the popular imagination with Challenge for Challenge (CfC) and Studio D, is deeply embedded in the creative zeitgeist of the NFB. Fulfilling the dream of participatory filmmaking envisioned by CfC pioneer Colin Low, which he pioneered through what has become known as the Fogo Process[36], participatory media-making seems to have been a siren call to every generation of NFB producers and directors since the 1960s up to and including Kat Cizek in the late 2000s through NFB's Filmmaker in Residence program (Baker et al 425). This, in spite of the fact that the Fogo Process could not be easily replicated by other filmmakers afterwards (Wiesner 98-99). The Internet seemed to beckon NFB designers to probe its potential for creating a sense of community with NFB audiences in the digital age. One such early attempt by Studio G producer André Lauzon resulted in the creation of an online community of children on *The Prince & I* (1996) website, which was a short-lived transmediation of Lynch's *Has Anybody Seen My Umbrella?* (1990 – VHS, 1998 – CD). Subsequently, Kee, Fukushima and Bertrand among others devised a series of online interactive games hosted on the NFB Kid's web portal. In this way, the belief in the community-building power of participatory media creation

[36] "The Fogo Process" references Low's method of interviewing his subjects and then showing these to the community to generate discussion. These were eventually shown to government officials, who were themselves filmed as they watched. This process of participatory filmmaking, eventually led to a change in government policy (Quarry, Baker et al, Winston 2008, Evans, Druick).

lived on after Studios D & G and the CfC program were closed, though the specific mechanism of achieving that quality of participation changed. The fourth wave, under consideration in this chapter, traces the shift from an emphasis on the creation of community through high-touch, face-to-face workshops with teachers and students to develop their media literacy competencies by building participatory media using new tools, to returning once again to generate an active, professional online community of teachers and resources for teaching.

> The NFB's attempts to attract the child/youth market seemed to have stalled, so with the closing of Mediatheque and Cinérobothèque in 2012, the Board turned to its old workhorse -- the educational market -- where, compared to the general media market, it was a much bigger fish in a smaller pond. Without a dedicated education production studio to create new media for educators, NFB administrators ramped up its strategy to reuse, renew and recycle media from its archive, as well as repositioning media created through its documentary and animation studios for the classroom. The development of teacher guides and new technologies to enable teachers to more easily access a portion of a feature length film would help teachers scaffold materials not produced with educational audiences in mind into the classroom. Here, that strategy will be interrogated more deeply with respect to its relationship to the longstanding NFB dream of participatory media, to argue further for continuity between Studio G's early practices and participatory media in the current moment.

Remediating Media Participation

As previously discussed, the idealism of CfC & Studio D cross-pollinated throughout the NFB as staff involved in those programs were redistributed to other studios, thus illustrating one of the advantages of having permanent staff rather than freelancers, as organizations are better able to accumulate a substantive brain-trust of production knowledge rather than risk

losing it at the end of each project. The relative accessibility of personal computers and the Internet in the new millennium seemed be tailor-made for scaling Low's vision across the country, if not the world. Yet, apart from CitizenShift, it was the educational designers, rather than the documentary filmmakers, who made the most significant forays into exploring the community-building potential of the Internet at the NFB in the first years of the new millennium, until Kat Cizek's Filmmaker-in-Residence program launched in 2007.

The phrase 'by-for-with' became the lexical bridge between the participatory processes of Low's time and the affordances of online interactive media (Hardtke 19 Jul 2016). Interestingly, this rephrase seems to portend three rules of open source code suggested by Tapscott and Williams in 2008, "nobody owns it, everybody uses it, and anybody can improve it" (86). In this sense, the web-dev team at the NFB was situated on the vanguard of this movement, linking it effectively with the idealized practices of participatory filmmaking. In the latter case, participation is understood as a social dynamic between people working toward a common goal -- people participate with other people, but they interact with the technologies they use during the participatory process (Wiesner 77). During the CfC and Studio D era, the intention was to collaborate with others towards social justice and community building projects, where the methodological innovation was to invite subjects to participate in the production process for mutually beneficial purposes in ways determined by directors (O'Flynn 2014).

The NFB Kids portal was the most successful of these early Internet experiments, and was conceived of by NFB staff, several of whom had immigrated from Studio D and CfC. In effect, they sought to push the methodology of CfC one step further by not only creating a dialogic space for kids on the web, but also by enabling children and youth to participate in

building the site itself. With the rise of the Internet, the web-dev team hoped to enable children and youth to proactively co-opt the space, and build it up for their own purposes, with the guidance of the NFB staff, but with greater creative autonomy than CfC participants had over the media they helped to create (Hardtke). This vision of creating spaces and technologies to support user-controlled mediated experiences through a diverse range of media both online and face-to-face, constitutes the fourth wave.

Participation as Interactivity

In educational contexts, interactive media can be a tool for stimulating active participation, and as such, using this media to increase student engagement quickly became a pedagogical imperative (Jülich 125). However, as we have seen throughout this dissertation, the introduction of new media practices often disrupts the status quo of the contexts in which they are used. As sociologist Andrew Barry suggests, the socio-technical arrangement of devices, practices and people determines who can participate, how they participate and to what end (Barry 2001 11). But Barry's use of the term 'arrangement' connotes a static, even predetermined placement of elements relative to each other, which is not what we have seen emerge through the various waves of media engagement at the NFB. Rather, what has been described in this research is the dynamic, reciprocal, intra-action of people, technologies and media-making practices that together open up new spaces for participation through media engagement. Inevitably, these dynamics resituate the power relationships within the classroom as students have increasing agency over what they access and how they use it, altering time-honoured relationships between experts and novices (Gaudenzi 2014 129).[37] Keeping in mind

[37] This point is discussed by digital documentary scholar Sandra Gaudenzi in the context of interactive documentary (i-doc) but it applies equally well to interactive educational media which might be thought of as a first cousin of i-docs, genealogically speaking.

that the content of media in educational contexts introduces students to much of what they understand their world to be, young interactants are not simply accepting that world as presented, they are interacting with it, creating their own agential realities -- the ultimate constructivist vision.

As museum archives and culturally significant artifacts are digitized and made available online, institutional websites often include participatory options through a crowd-sourcing option enabling those with personal connections to the archive to contribute family stories, photographs and video and/or audio files, upon which the public can then view and comment. These strategies of participation through media interaction create a sense of shared community with the institution itself being the locus of this community. In brick and mortar cultural institutions such as museums and archives, walls and doors might be understood as controlling access to the contents of a space, whereas the collaborative culture of the Internet can invite participation, with varying degrees of autonomy, within a site's contents[38]. In the early days of the Internet at the NFB, public access to the institution's films was only the starting point -- fostering public collaboration with online media was to become a natural extension of CfC. The NFB Kids portal was conceived of as a national locus of equitable collaboration between young people and the NFB using online digital media -- participation and interaction, each reinforcing the other (Hardtke, et al).

Portable cameras, humble media, computers and the Internet are imbued with social signifiers of interaction (Norman 2013). That is, they have physical cues that invite the user to

[38] The Mukurtu Project (2007) is an excellent example of this. It began with Warumungu community members in Australia collaborating with Kim Christen and Craig Dietrich to produce the Mukurtu Wumpurrarni-kari Archive giving community members an online site to share stories, knowledge, and cultural materials in a culturally sensitive way. This site has been extended to the Murkutu content management system, an open-source archiving resource for other communities globally.

navigate, sequence, pause or speed up their progress and access media so it can be incorporated into social activities beyond viewing. Here, 'social signifier' is used in the sense suggested by Donald Norman, referring to the perceptible signals the designer uses to indicate what can be done with an object -- media technology in this context -- whether or not that usage was intended by the creator (Norman 2013 np). For instance, filmstrips were designed for analog viewing in a forward-moving sequence, but could be moved forward, backward or paused as needed for conversational purposes. The buttons and labels on the projector would signify this to a user, making them aware not only of the media's primary intent, that is, to view the media, but also of the potential for ancillary uses. Over time, the ancillary uses associated with a particular type of media may be seen to be 'natural' or 'the way things are done'. For instance, the usage of overhead projectors to project custom-made 'overheads' are now much more commonly used than pre-printed ones although originally, pre-printed overheads were what were provided for educators. This is one of the most notable differences between media created primarily to be viewed from start to finish without interruption (as is the case with traditional films) and media created for educational purposes, which is designed to supplement other, often social activities. The latter are equipped with built-in social signifiers to encourage interaction with the media so it can be controlled to facilitate explanation, questions, and other pedagogical purposes.

It is these socially determined purposes that connect Studio D and CfC media with Studio G and media created for explicitly for educational purposes -- with a significant difference: the role of the viewer in both the production, and the consumption of the media (2013-18 NFB Strategic Plan 21). In the case of the participatory filmmaking practices pioneered at the NFB, media was created for, rather than by, the audience. In some cases, their audiences were also

the subjects of their films with whom they were created, who also may have filmed segments themselves. But this was all done under the vigilant control of a director and producer, in the pursuit of actualizing their auteur vision. As well, these audiences typically viewed the media in a single, uninterrupted screening in a theatre, or theatre-like space.

With the rise of media created for the Internet, social signifiers of interaction included not only those determined and explicitly promoted by directors and NFB designers, but also those developed by the designers of the browsers and computers being used by NFB audience. Beyond navigation, pacing and access of media, these audiences were provided with signifiers to create and /or modify content themselves to a degree not known since overheads and film slides.

This was the ideal -- the digital evolution of CfC, at least in theory. In practice, the low level of media literacy of many users was a significant barrier that could not be ignored, nor could issues of access to hardware and software with the capacity to change content. Further, it became apparent that all mediated experiences take place in structured contexts, which may support or derail the vision of media producers. Thus, my narrative of the fourth wave of multimedia engagement at the NFB now turns to the swell of mediated experiences designed by NFB producers by-for-with students and educators who had, for the most part, nascent media skills and a technological moment that included only incomplete access to the dream of viewers becoming creators themselves. All this, while NFB producers were trying to avoid crashing into the breakwall of NFB administrators and government officials seemingly determined to dampen this wave before it could overtake other, competing priorities that were perceived as more central to the purpose of the NFB, and therefore deserving of the meagre resources left to the NFB post-1995 -- a story to which we now turn.

Media Literacy at the NFB

After the closing of Mediatheque and Cinérobothèque in 2012, Kristine Collins became Director of Institutional and Educational Markets as well as Accessibility and Digital Enterprises and focused her attention on three priorities targeting educational markets. The first was the in-house workshop program which had survived the cuts due to their undeniable popularity coupled with the fact that they had generated enough revenue to cover the cost of administration and materials through user fees (Collins 2014). The second was the writing of robust educational support materials in the form of study guides and curriculum-related resources that would provide teachers with guidelines on how to use films that were not created for classroom use, to animate the curriculum[39]. The third area that Collins developed was, in essence, a reiteration of the MediaSphere portal in a new and more interactive form called CAMPUS (Collins 2014). Collectively these components made up the NFB/Education program, effectively putting the educational market back in the spotlight. This would be solidified by Commissioner Tom Perlmutter in his 2013-18 Strategic Plan:

> As a public organization, we have a strong and ongoing commitment to the educational sector. Our students are digital natives who surf the world; all the more essential that they have access to a strong and diverse Canadian perspective on the world, delivered in ways that are meaningful to them. (17)

Collins applauded this unequivocal endorsement of educational programming, but was aware that for digital media to be meaningful it needed to be accessible, not only in terms of distribution, but in terms of media literacy. Whereas Studio G had concentrated its efforts on improving the media literacy of teachers to encourage sales and ensure the pedagogical value

[39] Study guides are the same as the teacher's guides the NFB had previously produced.

of its productions, for Collins, media literacy was the democratic right of all citizens, young and old. She envisioned the NFB at the epicentre of this new curricular focus (2014). Perlmutter understood that interactivity, creative control and on-demand media were now expected by NFB audiences, and that to remain competitive and relevant in this new media landscape, they needed to learn how to embrace and advance these new media (2013-18 NFB Strategic Plan 12). Under Perlmutter, educational programming enjoyed a renaissance, and under Collins, it blossomed into a national, multidimensional program that brought media literacy workshops and resources to Canadian students and teachers from coast to coast. In this sense, Collins' program re-animated the spirit of Studio G in the digital era.

The user/audience was integral to all aspects of NFB/Education, but nowhere more evidently than in the workshop program. For Collins,

> The hands-on media literacy workshops we developed and delivered at the NFB were incredibly impactful because they introduced the idea of Canadian identity and effective storytelling at a young age. With pervasive technologies, we often make the assumption that young people know how to use everything and assume they do not require guidance, this is simply untrue. In our workshops, we supported young people to find their voice and effectively tell their story – these stories could be goofy, personal or in many cases, designed to tackle tough social issues. Our workshops tapped into the sophisticated minds of young people and supported them to express themselves using various technologies, and most importantly sound approaches to learning.
>
> (Collins 13 Jun 2016)

Collins commitment to media literacy harkened back to Studio G's effort in this area, but essentially flipped the emphasis, as Studio G focused on the media literacy of teachers

more than students in order to ensure strong, sustainable market demand for their media. This shift was a means to an end that strategically aligned educational programming with NFB traditions and the focus of current Commissioner Tom Permutter's strategic plan:

> The digital transformation is altering in fundamental ways how audiences are consuming and interacting with audiovisual media. The characteristics of the digital era are interactivity, mobility, control of time, user-generated material and a general democratization of media… Young audiences are digitally savvy, and have access to a wealth of content from around the world. What they need is compelling Canadian content delivered in the ways that they are used to consuming and using content.
>
> (Strategic Plan 2008/09 – 2012/13 6, 24).

Collins realized that this assumption about kids being "digitally savvy" was wildly optimistic and not in fact the reality for many Canadian children. She saw an opportunity for the NFB to fulfill an important social and political function -- to train children and youth -- and by extension their parents and teachers to do more than critically watch media but to produce it themselves (Collins 2014).

> My underling goal in anything that I was part of developing was to enhance media literacy skills in the interest of having young people realize that they can create their own media, they can participate. The democratization of media was the underlying goal - give them the tools so they can go out and create. There is an assumption that because young people have technology they are automatically creating these amazing pieces of work, which is not necessarily true – right? Storytelling skills are different that just having access.
>
> (Collins 2014)

This marked the second way in which Collins' conception of media literacy both built upon and differed from that of Studio G. Here the goal was to enable students to produce original content rather than mastering the procedures of media technologies -- developing creators rather than users. She was building upon a Studio G affordance in which teachers had been given the materials with which to create their own slides *and* their own content that brought together the analogue and the digital, but where creative practice was never more important than pedagogical purpose. She was also picking up where NFB/Kids left off -- leveraging the urgency for media literacy resources in the classroom to provide the impetus that NFB/Kids had lacked.

The Rise and Fall of the Media Literacy Workshop Program

Highly interactive media literacy workshops for students and to a lesser degree, teachers, continued to be offered in both Toronto and Montreal, bringing the two workshop programs run through Cinérobothèque and Mediatheque together under the same umbrella. There were ideological differences between the two programs that needed to be negotiated in this amalgamation. In Montreal, Estelle Lagueux, Collins' French counterpart, wanted a technologically robust, magical, professional-quality experience, something that could only be experienced at the NFB. However, in Toronto, Collins lobbied for a low-tech approach grounded in media literacy theory, focusing on the media creation process and the pedagogy behind the technology. She wanted the experience to be sustainable, so it had to be transferable to the classroom and something that teachers could integrate competently into their lesson plans after the workshop ended. In Toronto, then, the workshop activities reflected what teachers could realistically manage independently without being overwhelmed (Sicondolfo 2013). In the end, they agreed that they had not one 'educational' audience, but

two -- students and teachers -- who had different needs and expectations. Accordingly, they developed media literacy workshops designed to help teachers develop familiarity and comfort with interactive media in the classroom using free technologies developed at the NFB that were low-tech and easy to use on a tablet or iPad.

The "magical technologies" like stop-motion animation and filmmaking that were far removed from the typical classroom experience were refined for student-participants, grades five and up, who were insatiably curious and not as intimidated by the prospect of using multimedia to tell stories. Workshops for students included Stop-Motion Animation, Norman McLaren Animation, Seeing Sounds, Drawing on Film, Doc Talk, Documentary Production, Digital Storytelling, and Pixillation. They were two and a half to five hours long and were delivered to up to sixty elementary, secondary and college-aged students. Workshops designed for teachers promised:

> [E]ducation specialists guide teachers through the use of NFB productions in the classroom, offering practical advice on selecting films that enrich their classroom programs, and on creating personal thematic reading lists. Participants also learn how to get the most out of NFB resources, which include lesson plans, teachers' guides, and more.
>
> ("Workshops" NFB.ca)

The workshops could be customized, offering the same length and capacity as the student workshops and could cover such topics as explaining how to use the CAMPUS portal (discussed below) and how to incorporate animation projects in the classroom.

It was no small task faced by Collins and her team. They aimed to connect with teachers at a collegial level by making the technology as transparent as possible to them while, in effect

doing the opposite for their students whom they aimed to rouse with hyper-mediated experiences designed to astonish. To facilitate her strategy, Collins was successful in negotiating funding to rehire many of the staff that she had been forced to lay off when Cinérobothèque and Mediatheque were closed. Collins cleverly rebranded her newly constituted team as 'educational specialists' and was successful in securing a higher pay scale in recognition of the team's expertise as media educators. These were people who had facilitated the workshop programs at Cinérobothèque and Mediatheque, and were very familiar with the level of media literacy typical amongst students and teachers. This move also helped to re-position the workshop program as a "professional-quality experience", not simply a public service (Collins 2014). Collins and Lagueux invested in new equipment and with their educational specialists, created workshop-specific activity tables. They also redeveloped the workshops to ensure that they balanced the need to support curriculum objectives with providing a fun and visually exciting experience so students could learn to use and produce media within a single workshop, which ranged from half to full-day sessions. The key was 'sustainability':

> We're a public organization – I think it's our responsibility to provide the education community with the tools necessary to use the resources we are producing – the films and interactive projects. It's our job to make sure they can actually use them in a constructive way for the long term. Why else are we producing them?
>
> (Collins 2014)

Positioning the audience as learners of media literacy skills, whether teachers or students, was key to creating mediated experiences that would continue to be practiced after the initial workshop. This was taught as a collaborative practice, where student-producers

participated with each other and interacted with media. Rather than the NFB reflecting their interpretation of Canada to Canadians, it was then, expanding its role to teach Canadians how to tell and share their *own* stories. In this sense, the NFB was realizing the constructivist ideals of the 1960s, and evoking the ideals of the participatory media practices of that time.

With roughly half a dozen educational specialists overseen by two team leaders in Toronto and Montreal and a common technical coordinator, the NFB/Education program was able to bring the workshops to every province across the country (Sicondolfo 2013). Individual educational specialists focused on the curricula of specific provinces, and worked with educational consultants to do what they could to find convergences. Not every aspect of the workshops was in alignment with provincial curricula, but the attempt was made to make them as relevant as possible. The educational specialists had very robust touring schedules, conducting workshops in multiple cities and towns in even remote areas of the country where the NFB had previously had no presence. These were extremely well received and, indeed, could never satisfy demand, which demonstrated that they were filling an important niche in the educational market (Cottingham 2014).

As with Cinérobothèque and Mediatheque, the workshop program created a strong bond between the NFB and the communities it served. From the perspective of Michelle Solomon, a Toronto-based teacher who frequently brought her classes to the workshop program, having face-to-face experiences with facilitators, highly skilled educators in their own right, was invaluable in guiding students and teachers alike through the learning curve of creating mediated narratives. However, the focus of the experience was not so much on the stories they told, but on the fact that the participants, aided by facilitators, learned how to use media to tell any story they wished (Solomon). With this newly acquired media literacy, participants could

expand their potential roles from subjects and audiences to producers and directors. This level of self-determination reinforced the ideal of both democracy and capitalism by placing all four affordances of engagement -- navigational choice, pacing, access and customized content -- within the scope of individual choice.

The NFB was a pioneer in the development of mobile tools designed for students to create their own media production inexpensively and without very much technical knowledge. Some 33,000 students a year in every province and territory across Canada were learning how to create media using applications such as *StopMo* -- a free, stop-motion animation program for the iPad. The results of their efforts are charming and show what can be done with a minimal amount of training and computer access[40]. *StopMo*, sold in over thirty countries, is featured as an Editor's Choice pick for Canada on the Apple store (NFB StopMo Studio). Another free program that the NFB developed for the iPad is the McLaren's Workshop application that enables users to create animations using techniques developed by the iconic NFB animator (NFB.ca 20 Mar 2015). In both cases the finished products can be shared with others through e-mail or posted on social media. At the time of writing, the NFB has created thirteen applications designed for iPads and in some cases, Google Play. Of these, however, only two are included on the NFB/Education site and identified as 'educational' and 'for classroom use' -- NFB StopMo and an interactive graphic novel titled *The Loxleys and the War of 1812*. Excluded is McLaren's Workshop in spite of it winning the Best of 2013 in Engaging Educational Apps by Apple Canada. The reason for this likely has to do with the restrictions on media used in the classroom. In fact, McLaren's work was intended for an adult audience. Any

[40] <http://artstarts.com/stories/the-nfb-at-artstarts>,<http://blog.nfb.ca/blog/2013/03/12/nfb-education-visits-byrne-creek-secondary-school/> Accessed 5 Aug. 2016.

attempt to modify his aesthetic for young audiences would not have been acceptable. It would be tantamount to putting a fig leaf back on Michelangelo's David.

These apps provide a full spectrum of the affordances of engagement, and opened up a new type of media development at the NFB -- media designed to be created with, not merely watched by students. One can imagine how delighted Möller would have been with the degree of interactivity and autonomy these apps grant to students. They can, with very little guidance, create their own media for school projects or for pleasure using classroom iPads, even in remote areas such as Nunavat. In fact, the educational market in these areas where cable channels are limited and shipping expenses prohibitive, are often more technologically savvy than the urban markets and the teachers more open to using mobile technologies and the apps produced by the NFB (Sicondolfo 2013).

Educational specialists were encouraged by what they saw happening in the workshops. Teachers found them to be both stimulating and powerful additions to their curricula and students themselves experienced media more actively than many had ever done so before (Solomon). It was therefore an unexpected shock when the NFB announced the closure of the workshop program in June of 2015. In December 2014, the Director-General of Accessibility and Digital Enterprises, Deborah Drisdell was let go. Drisdell had been a strong supporter of Collins and her team, so her loss was felt by Collins particularly (Collins 2016). Without their champion, the unit had no one to advocate on its behalf, which, in retrospect, may have been connected to Drisdell's dismissal. The response from the educational community was that of dismay. The teachers who could access the workshops had come to depend on them to help integrate experiential learning into their lessons plans (Collins 2016).

The Association of Media Literacy (AML) circulated a petition[41] protesting the loss of the workshop program to Claude Joli-Coeur, named Commissioner after Perlmutter's sudden, premature departure at the end of 2013 and, likewise, to Heritage Minister The Honourable Shelly Glover. The petition evoked impassioned protests from educators across the country but with only one hundred signatures in total, it is not surprising that the AML did not receive responses from either the NFB or the government (Solomon).

For Collins, who was left with the heartbreaking task of letting go most of her staff, there was little keeping her at the NFB. She chose to leave as well (Collins 2016). Once again, the pendulum had swung and educational programming was apparently deemed expendable. As a point of contrast, the 2011-12 Annual Report, the last authored by Perlmutter, mentioned 'education' twenty-six times. By 2014-15, Joli-Couer's first full year as Commissioner, references to 'education' had dropped to nine, three of which were in reference to external awards. Education was now off the radar under the new regime as the NFB shifted its priorities towards documentary and animation production.

A small group of NFB employees were left with the rather daunting task of remediating workshops online with a miserly twenty thousand-dollar budget which incensed Collins. Referring to NFB administrators, she says "you spend a million bucks on an interactive production and you're going to give us 20K and expect us to create something of the same caliber as an interactive production that is somehow going to be used in schools' – that's not going to happen – I've been saying that forever" (2016).

[41] The petition can be found online as of 5 Aug 2016:<change.org/p/claude- joli-coeur- reinstate-the-education-specialists?recruiter=false&utm_source=petition-s_show_components_action_panel_wrapper&utm_medium=copylink>

Under the new regime, online workshops were considered the equivalent of new "educational production", according to James Roberts, Director of Distribution. Distribution is where activities focused on "educational and institutional markets" have resided since the Studio G days (Roberts 2016). By categorizing educational workshops as "production" the NFB is able to appear to be still committed to the sector despite switching to an almost singular focus on distribution.

Michelle Solomon, the teacher who started the AML petition, voiced the opinion of many teachers at that time that the loss of the workshop program was not something that could be adequately replaced with online workshops. Echoing the argument that Elliott's survey of teachers and school boards in the mid-1990s tried to make, for-profit organizations that produced educational media would not be able to provide workshops at a rate comparable to that of a government-funded program (Solomon). For many teachers and their students, it was the face-to-face contact with educational specialists that transformed their learning how to integrate and produce multimedia from a procedural process to a community-building one.

There are several possible motivations for cutting the program. In 2012, the NFB suffered another ten per cent cut to its budget. This, coming in tandem with plans to relocate the Montreal and Toronto offices, coupled with a reluctance to take money out of documentary and animation production, might have contributed to the NFB's reconsidering the necessity of its educational program. Furthermore, despite its popularity, the workshop program was expensive. The cost of sending facilitators across the country was formidable, even though every attempt was made to be frugal, and therefore was not scalable or even sustainable as an outreach program. While the workshops supported the spirit of CfC and provided a unique and necessary educational resource, they fell outside the political core of the NFB, which, in spite of

everything, continued to be understood as filmmaking (Collins 2016). There was simply not enough support for outlier programs like the educational workshop program under the new Commissioner Joli-Couer's leadership.

The NFB/Education Program

One aspect of the NFB/Education program, directly linked historically to the days of Studio G, is the workshop program. This was an important element of a larger program focused on the education market dubbed NFB/Education. Beyond facilitating workshops, this program oversaw the development of teacher's guides, and tried to foster relationships with filmmakers in documentary and animation production. Most filmmakers neither knew, nor cared about the unique conditions required of media that could be distributed through the schools regarding content, language and length, yet the educational market was the one market where filmmakers could sell at a scale that would realize a level of profit that was rare in NFB films that were sold online and through theatres (Collins 2014). NFB/Education staff took it upon themselves to inform filmmakers of what production considerations would be necessary to make their work attractive to the educational market and to try to explain the strategic advantages doing so. This was, unsurprisingly, an uphill battle, given the auteur culture of NFB filmmakers.

Collins had reclaimed the production of teacher study guides from Marketing to Distribution when she started in the unit, arguing that educational specialists had the expertise gained through working with students and teachers. In so doing, she successfully negotiated to have the budgets for producing teachers guides in Marketing over to her Distribution department, to pay for her educational specialists to produce them (Collins 2014). These guides were pivotal in introducing films produced for the general public to the classroom, thus extending the use of the original films to applications not conceived of by the films' creators.

This follows the tradition of the *Media & Society* CD project, of remixing material not specifically designed for educational audiences to fit the unique needs of classrooms. The guides provided educators with informational resources related to the content and ideas of how to curate specific segments of films considered "educational-general" i.e. not curricular, into their lesson plans (Roberts). In essence, they provided the pedagogical scaffolding needed to assure teachers of the educational application of a broader range of the NFB archive. Collin's strategy of shifting the production of the guides from Marketing to Distribution reframed them from elaborate sales materials to a form of educational support in the same vein of media literacy support as the workshops.

In an attempt to generate interest in the actual production of digital media that would be naturally appropriate for the classroom, Collins and Tey Cottingham, an educational marketing specialist, conducted presentations for filmmakers to provide guidelines on producing films appropriate for the education market. The guidelines recommended, among others, no nudity, shorter film segments, and specific, curricular themes, since many of the filmmakers were now freelancers with scant familiarity or knowledge of these basic essentials of educational media. "Tom Perlmutter really started to advocate for support for education. We've just built this huge team and we're slowly building the rapport with production" (Cottingham). In spite of Perlmutter's support, generating enthusiasm for working with the education specialists during production to increase a film's usability by teachers was an uphill battle.

It is still the case that films suitable for classroom viewing need to be tailored in terms of content and language. Most teachers are unable to take up a whole class watching a film, so offering two to ten minute segments is advantageous. These films were not being matched to specific curriculum, for example Grade Six / Social Studies / Unit Three. Rather, the films

provided background information to make a teacher feel comfortable in teaching the topics covered in the films that might fall outside their expertise (Collins 2014). This was particularly important in films of extraordinary quality, relevant to curricular themes but containing potentially sensitive material such as *Boxing Girls of Kabul* (Dir. Ariel J. Nasar, 2011) profiling three young Afghan women training to become world-class boxers, or *My Prairie Home* (Dir. Chelsea McMullan, 2013) a documentary-musical about indie singer Rae Spoon exploring themes of abuse, fundamental religion, and gender identity. In a multicultural country like Canada where students represent a broad swathe of culture and religions, such topics can be challenging for teachers to integrate into their lessons seamlessly:

> I know some teachers would show it (*Boxing Girls of Kabul*) because they are super dynamic and they manage those conversations and navigate them well, but there are so many that just wouldn't feel comfortable because they can't embark in a discussion about what's going on in Afghanistan and the politics of women in that country. They aren't going to stand up there and speak with their students without that information.
>
> (Collins 2014)

Collins, Claudia Sicondolfo, a team leader for the educational specialists and other members of the NFB/Education team assessed the educational potential of upcoming films and would choose six or seven particularly promising ones to provide support materials for, ranging in scope from providing links for background information to a list of discussion questions, or in some cases, a full study guide (Sicondolfo 2013). Without pedagogical support materials like the NFB study guides, many teachers felt ill-equipped to facilitate discussion or respond to questions about potentially sensitive topics:

> [T]hey've got this great content, but you still have to learn how to use it in the classroom. Young teachers have grown up with media, but to use it in a meaningful way… we are really building context around our films so they can be used in a safe, appropriate way so for teachers who want to use our films its ready-made and valuable to them. It's not going to be a scary experience, it's going to meaningful, and we supported them. But because we don't create for curriculum and some of the films are tough, but they are important films, but you have to help people to use them in a way that isn't scary for teachers or students.
>
> (Cottingham)

The educational specialists thus, through the guides, were integral to the intra-action between the film's narrative, classroom discussion and student understanding of the social relevancy of the ideas presented in the films. They were not only teaching teachers how to teach the film, they also had an important role in the interpretation of the film for both teachers and students. For teacher-audiences, a host of factors influenced their approach to any given film: the relevancy of the content to their lessons; the ethnic and cultural backgrounds of their students and parents; as well as concerns about their own beliefs, feelings and knowledge concerning the subject matter. Student-audiences likely would have had a different but related set of concerns regarding the films they watched: how closely the film related to their personal interest or lack thereof in the subject-matter; recognizing what aspects of the film they would be graded on, and hopefully, how the film might broaden or challenge their understanding of themselves or the world in which they live. Layered atop these considerations were the guides, functioning as a type of pedagogical prosthetic, amplifying the relevancy and applicability of a film beyond what either the teacher or student might have achieved without it. Unfortunately,

there does not appear to be much, if any, literature analyzing how study guides influence student/teacher understanding of films, but this would be a valuable line of inquiry.

Svend-Erik Erikson, who headed the ACI group in Vancouver, considers the ways in which a film is meaningfully integrated into a student's learning as an extension of the film itself, not a peripheral activity:

> That was a kind of interactivity that we really thought was an important part of the film, in other words when a film is finished, when it's mixed and it's colour timed and all that kind of stuff, it's not really finished, it's not finished until it's shown and it's not even finished when it's shown it's finished when you've finally kind of digested it. That digestive process is kind of like when you ask a kid 'okay, we're talking about your responsibilities as a citizen. What does it actually mean to you?' and then you get the kids talking in a group with the teacher and everything and you get something happening which is pretty powerful sometimes.
>
> (Erikson)

The framing of study guides as an interactive extension of static media is an interesting one, and one that makes an important connection between this section and my central claims. Erikson essentially positions these guides as a technology, as they undoubtedly are, in which social signifiers are provided so that potential and perhaps not immediately recognizable ways to engage with a film are made apparent by separating the interactive apparatus from the media. In contrast with DVD or laserdisc technology where the interactive apparatus is embedded in the design of the media, through hyperlinks and the ability to control navigation, sequencing and search functions, educational study guides present interactive activities to be facilitated by the teacher before, during and/or after viewing media. Paradoxically, when this happens, the

users have many more choices of how to engage with the media than with media marketed as 'interactive' in which the interactive apparatus is limited to actions predetermined by the creator. In the former, the writer of the guide, often in collaboration with experienced teachers, offers a range of resources and ideas for classroom participation intended to inspire rather than dictate interactive options beyond those offered in the guide. How teachers choose to use the media to engage their students is completely up to them, thus the power relationships of the classroom are not disrupted. In the latter case, the interaction is a design feature of the media and is constrained by the construction of the interface so that narrative coherence can be maintained regardless of the users' choices. As the affordances of engagement are usually controlled by individual students, the teacher has less control over what students are doing with the media or how they are using it, recalling my early observations about Studio G. But this is potentially even more problematic when the media is being accessed online, where parental controls can be altered and undesirable sites accessed.

From a marketing perspective, study guides also had the effect of creating a sense of community between the NFB and its educational market -- a support system that declared "you're not in this alone" and encouraged teachers who were not early adopters of technology to experiment with and integrate it into their classrooms. Teacher education programs rarely make it mandatory to learn about using educational media effectively, although professional development activities do occasionally try to address this gap (Baron 2013). Teacher-consultants helped with the construction of the guides to ensure they reflected the content themes and language of the education community (Sicondolfo 2013). This reinforced the role of educational specialists not only as service providers, but as professional colleagues. Whereas the workshop program was limited in its impact because of the financial and logistical problem

of providing equitable access to all parts of a country the size of Canada, the study guides are easily accessible through the NFB website. As a bonus, they are concise and focused enough to be applied without specialized training or support. The tension between creating meaningful face-to-face experiences and providing on-demand access to a broader user-base has been a core, unresolved issue for the NFB since CfC. While the Internet tantalizes with the promise of providing a 'both-and' solution to this challenge, it remains an elusive goal for the Film Board, but one it seems intent on pursuing:

> We have also made a commitment to put audiences at the centre of our work and to continue developing our digital platforms. From its earliest days, the NFB has enjoyed a rich and enduring relationship with its audiences, but now needs to increase its efforts to boost its presence in the different communities, in the creative sectors and with the general public. This is essential if the NFB is to represent all Canadians and reflect every region of the country.
>
> (2014-15 NFB Annual Report 9)

The desire to strengthen the sense of a collegial community online led to the development of a new educational portal called CAMPUS, which Collins oversaw as part of her mandate when she took over the NFB/Education program around 2012-13 (Collins 2014). This is a subscription site that enables teachers to view four thousand titles (at the time of writing), two thousand of which are available only to CAMPUS subscribers. The site also contains a valuable bank of teaching tools and study guides, some dating as far back as the Studio G days, most of which still have strong, applicable content, although some aspects appear rather antiquated relative to the newer guides. A CAMPUS subscription offers teachers the ability to create and share chapters and playlists in advance, effectively isolating the specific segments of

films relevant to a lesson. The segments are formatted so they may be viewed singly, instead of taking up an entire class period to watch the whole film, leaving time for the 'digestion' stage that Eriksen promoted. In British Columbia and Saskatchewan, the provincial ministries paid for access to CAMPUS for all teachers and elsewhere individual school boards can opt to buy a subscription for their teachers. Recently, the Ontario Software Acquisition Program Advisory Committee (OASAPAC), which oversees the licensing of classroom software in Ontario, opted out of the subscription plan entirely. Individual schools and teachers can subscribe for $29.95 annually (at the time of writing), which keeps it within a manageable price range, but begs the question of whether educators should have to pay personally for classroom resources from a federally funded institution. The reluctance of Ministries of Education to opt into the subscription plan and OASAPAC deciding to discontinue its subscription may be connected with a process issue Collins could not sidestep:

> Usage of CAMPUS in Ontario is a bit disappointing – users don't know they have access, where, from or how to log in. NFB is not allowed to contact the school boards directly. Consequently, the Film Board can't give the Ministry statistics because they don't know who the users are. [Instead] the NFB called every school board in Ontario, and got all their IP addresses, and measured by IP address.
>
> (Collins 2014)

Collins discovered they had roughly nine thousand active users across Canada, which was lower than they had anticipated. For Collins, a success is a teacher using the account twice a year, which means they are using one to two films – enough to justify the purchase. The difficulty many teachers had logging into the site was a major deterrent as well (Sicondolfo 2013). Some use it much more than this benchmark, but others less. Most teachers use the site

simply to access films although some are creating their own playlists – segments of films related to a particular lesson theme (Collins 2014). In September 2014, CAMPUS was made available to the United States, which will presumably increase the user base significantly. In 2015, the NFB increased the French and English offerings on CAMPUS by 41% for a total of 1637 films (NFB Performance Report 2015-16 19). The strategy here seems to be that more content will generate more users, following the same "build it and they will come" philosophy that had failed to produce the anticipated results with the NFB/Kids program.

If there is one lesson that the NFB has repeatedly failed to learn from CfC, Studio D and Studio G is that access alone is not enough. For a more successful outcome, the Film Board must foster relationships with audiences, especially when the audience must perform an action in order to access the media. The personal relationships developed with social animators and educational specialists have a critical role in scaffolding media interactively with user/audiences. The peripheral costs of these people however, seems to have been interpreted by NFB administrators as exorbitant given the size of the audiences they can reach.

One of the innovative teaching tools included through the CAMPUS portal is something Collins called "learning bundles". These are dynamic, online teacher study guides that provide specific, informational context for a particular film, yet are broad enough to be applied elsewhere in the curriculum. This flexibility sidesteps the problem of busy teachers having an over-abundance of new material to absorb (Collins 2014).

> Right now, we have films and teacher's guides but there's a disconnect between watching the films and accessing the guides. We are designing all of our new guides this way. We are paring them into pieces, and tagging them, and creating these thematic bundles. We could search a theme like 'Bullying' + 'Grade Six' and from that you'll get

> films, chapters, articles, maybe stuff from libraries and archives, the Canadian Space Agency, whatever relates to that idea. Then you can export it in a way that is interesting to you, so you can put it into some kind of presentation format.
>
> (Collins 2014)

The learning bundles are designed specifically for web access, and are searchable by theme, subject and age level so that teachers can select on demand exactly what they need when they need it, including films, clips (both from the film and from outtakes), guides, articles, images, and even sound recordings[42]. Collins pictured this resource as a sort of choose-your-own-adventure interactive interface that provided access not only to material they created for the site, but also from the NFB Archives and external organizations. Unfortunately, the end of the workshop program meant that many of the staff involved in developing learning bundles were reassigned or simply left the NFB. Consequently, although the bundles can be accessed, they are far from complete and the search index is a pallid version of Collins' vision -- one of the casualties of losing her leadership of the program (Collins 2016). The bundles and the CAMPUS portal more generally were Collins' most significant legacy, but her aim went beyond the creation of a portal that could potentially draw revenue to the NFB: "CAMPUS is one experience, but everything else around it, and all the work that goes into it, is the education sector and that's what's most important – CAMPUS is a product of that" (Collins 2014). In other words CAMPUS, the bundles, the workshops, and the study guides together create an intra-active assemblage of experiences to train and support teachers and students to participate in and with the NFB.

[42] At the time of writing, thematic playlists were available for films, related to: food systems, water, science and technology, the cultural divide - learning through empathy (with both elementary and secondary/post- secondary grade levels), as well as anti-racism, war and peace, and the holocaust.

Another strategy aimed at addressing the tension between quality and accessibility that has plagued the NFB/Education department is the "virtual classroom" program. This provides real-time access to a presentation by a 'celebrity' sub-matter expert, followed by questions submitted by students in Canadian classrooms prior to the event and vetted by NFB staff. This program has the potential to provide all Canadian students with the ability to engage with a virtual 'guest speaker' or panel of speakers with varying viewpoints on a topic. Lasting between thirty and forty minutes, the sessions fit easily within a typical class length. The online sessions are enriched with targeted study guides and require only Internet access and a webcam to participate. Previous speakers include astronaut Chris Hadfield (both in French and English), David Suzuki with Olympic kayaker Adam van Koeverden, and documentary filmmaker and social activist Alanis Obomsawin. Using the same real-time, online format, professional development presentations on relevant pedagogical topics are also provided. While scheduling of one-time only presentations restricts inclusion of all schools across a country the size of Canada, virtual engagement increases the potential reach and impact within the limitations of the speakers' schedules (Sicondolfo 2013). By uniquely combining interactive and participatory functions, the virtual classrooms enable the NFB to broker an experience that would have been prohibitively expensive if provided through a for-profit company.

In 2013-2014, the NFB partnered with the Canadian Space Agency to develop a free, interactive, online project entitled NFB Space School -- an interdisciplinary, interactive learning experience to arouse awareness and interest in the space program and Hadfield's contributions to it. This was the first interactive online project developed through the NFB/Education program specifically for the educational market (Sicondolfo 2013). The project

was produced by Paul McNeill, the first NFB filmmaker who demonstrated a commitment to creating productions for education (Cottingham 2014). After launching Space School on the NFB/Interactive site, feedback from teachers prompted designers to add to the content by creating three different modules that focused specifically on astro-geology, health and Hadfield's journey. Each module included a compilation of twenty to twenty-five short films about its specific subject designed for sixth graders. The modules are now housed on CAMPUS and are complemented with three extensive multimedia learning bundles (Koizumi).

After Space School, McNeill collaborated with Dalhousie University on Ocean School, which is in production at the time of writing. Launching in April 2014, this Space School attracted approximately 26,000 students from more than 265 Canadian schools the day it launched (2013-14 NFB Annual Report 12). While these numbers are laudable, when one considers that there were more than 128,600 grade six students in Ontario alone that year, the numbers are less impressive[43]. In the fall of 2015, the video material was supplemented with deeply detailed study guides which, unusually, link directly to curriculum in provinces across the country in both languages. Extensive archived images and online resources were also provided. Video clips and all supplemental materials are still accessible as a 'value-added' feature of the NFB/Education portal.

The NFB/Education site houses these core elements: study guides, CAMPUS, the virtual classrooms and the workshop program, all of which have the shared purpose of supporting engagement with educational media over which the user has active control, to a degree not seen at the NFB since the days of Studio G. In the case of the workshop program, this needs little explanation, as they were designed specifically to teach both students and teachers how to

[43] Ontario Ministry of Education, Education Facts 2015: <edu.gov.on.ca/eng/ educationFacts.html> accessed 28 Aug. 2016.

produce media by interacting with it. In the case of the study guides, CAMPUS and the virtual classrooms, the instructional role of the educational specialist is now realized almost exclusively through Internet-based communication rather than face-to-face facilitation. While Collins envisioned the NFB/Education portal as being able to provide an interactive space where teachers can share their own expertise with their colleagues through a blog or other messaging format, this has not yet manifested. The Education blog, written by the education team or by guest writers, many of whom are teachers, highlights topics of interest to teachers regarding NFB resources and generates some input from teachers, but functions more like a newsletter than a conversational forum. With both NFB/Education and NFB/Kids, the vision of creating an active community of users collaborating in the tradition of CfC has simply not taken root, despite repeated attempts to provide opportunities to encourage its growth. Whether teachers lack the time to interact online with the NFB during a regular school day, or are unwilling to do so on their personal time, there is no clear indication why they are not drawn to this site. Perhaps the dynamism of social media is something that has to be generated by participants for their own reasons rather than being provided by an external agency. What the magical ingredients are for constructing an active, sustainable online community remain a mystery. Unlocking the key to this puzzle will be a high priority for all institutions of public pedagogy this century.

With Collins' departure and the loss of the workshop program, the future of educational activities is being re-conceptualized once again. The attention to media literacy continues to permeate and motivate much of what the unit does fundamentally, and may even be heightened with stronger curricular ties with partner school boards. Currently, the education unit of the NFB is involved in an exceptional five-year partnership between the NFB and the Marguerite-

Bourgeoys School Board in Montreal. Five online courses in media production are being developed for high school students, each spread out over one school year[44] (Roberts).

The Marguerite-Bourgeoys School Board was very enthusiastic about the in-house workshops but wanted to be able to provide an opportunity for students to deeply understand both the construction and production of digital media. This is not only an innovative and forward thinking opportunity for the school board and their students, the project has the added advantage of providing funding to enable the NFB to develop a solid base of content on which to base their own online workshops. The NFB will work with teachers in the classroom when they integrate the online modules as part of the core curriculum to include such subjects as math, science and visual art. At the time of writing, the modules for the first three high school levels have been launched, the fourth projected for September 2016 (Roberts). Interestingly, this is a blended learning experience integrating online components with a customized in-class experience, facilitated jointly by the teacher and an educational specialist. The first three modules of the pilot project have been shown to teachers from across Canada at professional development events who have expressed strong interest in being able to access such a program. As well, starting in 2017, the NFB/Education program is researching a tiered service model, ranging from a few basic online offerings that will likely be free, to a more customized option attached to some sort of business model, all the way up to a personalized in-the-classroom experience (such as that being developed with the Marguerite-Bourgeoys School Board), which would be negotiated at the board-level (Roberts).

[44] In Quebec, high school takes five years to complete. This partnership will enable students to continue to build on and develop their media literacies each year of their high school education.

A small number of the educational facilitators who have the expertise and strong pedagogical background to provide this sort of intense, customized in-class experience are still with the NFB and have formed a group called Teaching and Learning under Lagueux[45]. They are hoping to develop a train-the-trainer model where NFB educational specialists will go into schools to train teachers to train their colleagues. This closely mimics Floyd Elliot's role in the 1960s when he was recruited by the Film Board. Rather than flying NFB facilitators out from Montreal or Toronto to other parts of Canada however, the NFB is relying on a de-centralized model that would draw on local expertise, hiring people as needed rather than keeping a larger staff of facilitators (Roberts). This has the advantage of agility and cost savings, as well as investing in the expertise of the communities they serve.

Likewise, the CAMPUS program is being re-evaluated. Due for a major overhaul, the NFB is currently considering what form it might take moving forward. One thing is clear, it is critical that there are online spaces that engage students directly (Roberts). Until now, CAMPUS has been exclusively a teacher's resource. Although some teachers provided a password to their students so they could develop playlists and look through the bundles, its structure left students dependent on their teachers' awareness of the portal and comfort with digital media. The objectives of NFB/Kids were well founded, and perhaps once it is embedded into the educational experience the new iteration will gain a user base that it has not yet achieved without that sort of external motivation.

The bundles will be kept as well, but most likely not in their current form. The aim is now to diversify the content to amass more material and include more individual, lesson-based

[45] The Teaching & Learning technical advisor, the Community Manager and the Sales Manager for Education are housed in Toronto.

elements that can be used for a single class, rather than leaving it up to the teacher to wade through all the materials (Roberts). This marks a significant shift in direction towards the development of material explicitly tied to the curriculum, rather than curricular support materials as has been the case with only a few exceptions to date. This has been made easier in the US version of the CAMPUS portal due to the common-core curriculum used there, as opposed to the Canadian portal that features twelve iterations of every topic and grade level. Based on the success of the American site, the NFB seems ready to attempt this in the Canadian context.

Apart from the Teaching and Learning group and Sales, the Education unit also houses what is known as a 'content development' team. This group writes study guides in consultation with teachers and curriculum specialists across the country. Together, these three units currently comprise roughly fifteen employees. The group's vision is to support a broad range of user-controlled media both online and in person. In other words, NFB/Education supports the audience/user by supporting their ability to access NFB media and to create and share media online.

Unfortunately, to date, Joli-Couer's tenure has been devastating for online educational programming. When he arrived in 2013, the Board's non-theatrical online audience for the year was reported as 11,469,703 in the annual Performance Report including CAMPUS (np). In the 2014-15 report, CAMPUS numbers were pulled out of nontheatrical, coming in at 7,159,693 with 3,003,005 coming from other institution sources (health and social services, public libraries, etc.). This left some 4,156, 688 lost views unaccounted for, but presumably a good proportion of these were educational. CAMPUS viewership dropped down further to 5,037,078 the following year (2015-16 Performance Report 44). Considering the international reputation

the NFB held for decades as a premier educational production studio, this loss is a sad one indeed. One can only hope the launch of the online workshops halts this alarming trend. Clearly access is not enough to generate online audiences.

It is the focus on the Internet that characterizes the fourth wave of media engagement at the NFB. In its historical context, NFB/Education is using the Internet as a dialogic space, resonating with the praxis of the CfC program but modifying it by enabling users, understood as colleagues or community members rather than simply 'markets' to generate and sustain online relationships with each other and with the NFB itself. The NFB is, thus, positioned at the core of not only what students learn, but how they learn. The Education unit rightly see itself as a sort of incubator for media innovation, where risks can be taken and lessons can be learned, protected from market forces by virtue of being a federally-funded institution. As producer/director Kevin McMahon notes pithily, "the NFB is to showbiz what helium is to a party balloon" (Strategic Plan 2013-18 13). Working on the periphery of a cutthroat media marketplace, the NFB is able to raise the bar of what is possible above the lowest common denominator of the mass market to the more nuanced expectations of many specialized audiences.

It was during the fourth wave that the potential of interactivity began to infiltrate other production areas at the NFB, instigating a rise of interactive projects that traditionally would have been produced as films. As producers began to experiment with interactive photo essays, the affordances of personal navigation and pacing proved to be particularly compelling. Exploring the potential of these affordances to resurrect the idealism of CfC became the focus of the Filmmaker-in-Residence program, in which Kat Cizek leveraged non-linear story-telling techniques with CfC participatory filmmaking. The success of her work opened the door for the

production of experimental interactive documentary projects such as *Welcome to Pine Point* (Shoebridge & Simons, 2011), *Bear 71* (Allison and Mendes, 2012) and *Circa 48* (Douglas, 2014) (Dao). In *Pine Point*, users could explore content while following a linear narrative. In *Bear 71*, linear audio was layered on top of a non-linear visual experience in an environment evocative of a gaming world. By the time *Circa 1948* was produced, Loc Dao, the creative digital lead on all three projects, employed a nonlinear story and a complete nonlinear experience. The story was pieced together according to elements the user came across or selected (Dao). At the time of writing (Fall 2016), with dozens of interactive projects freely available on the NFB site, and the first experiments in virtual reality (VR) technologies under its belt, the NFB seems to be reflecting and coming to terms with what its designers have learned about interactivity generally, and what affordances VR and future technologies might offer in terms of audience engagement.

How NFB/Education evolves moving forward will depend both upon navigating the political economy of the sector and creatively building upon what has been learned from the previous four waves, ideally opening new agential realities, inviting teachers and students to learn how to both use and to produce creative ways to participate in the new space, and create narratives of their own choosing, for their own purposes -- claiming their right as citizens and consumers of the new millennium to exercise choice with greater agency than ever before.

CONCLUSION

The impact of Studio G on teaching and learning in Canadian classrooms during the years that it operated cannot be overstated. It was through their productions that millions of schoolchildren across Canada began to weave their own versions of the national narrative that contributed to their sense of identity within this vast, diverse land. It developed the technological imaginations of generations of Canadians by enabling them to develop their ability to use multimedia to create these meanings, beyond the scope of textbooks and lectures. This not only improved the quality of the learning experience, but also shaped the collective imaginations out of which new technologies and media would emerge. The NFB's first forays into online community building and envisioning the creative potential of the Internet were developed by people who honed their craft in Studio G. Even now, almost thirty years later, the experimentation with interactive and virtual technologies taking place at the NFB has an ontological link with its history of educational media production.

This dissertation documents a unique, complex narrative tracing the development of educational media and programming at the NFB over the past fifty-six years. I interviewed thirty-four NFB technicians, administrators, producers and directors to parse together this composite account. It is a story of people, their visions and frustrations, of changing practices of mediated teaching and learning, and of developing media technologies. It traces the many ways in which these forces collectively emerged, were formed, and in turn informed each other in concert with social, political, economic and cultural pressures. It is necessarily a messy story, fraught with tensions and disappointments but also infused with great triumphs and truly innovative productions that have influenced generations of Canadians. The perspectives of the

interviewees sometimes contradict each other, demonstrating the singularity of each account from the perspectives of the people who lived them. Often, enough documentation to verify the memories of informants could not be found. Such documentation may indeed surface and over time, perhaps it will confirm or correct the story here presented. Readers may agree or disagree with certain aspects of this research. But for all that, there is truth here -- the truth of lived experience -- messy, non-linear and complex. Together, these stories intra-act to give shape to the agential reality of education programming at the NFB -- a narrated reality that, rather than lying in wait to be discovered, emerged in the act of creation.

The waves of intra-action which organize these constructed realities are also unruly. Swelling, as waves are wont to do, as they encounter external forces that push them forward for a period of time, before they ebb to make space for innovation to emerge. Each of these movements exhibits a particular dynamic at its core. In Studio G, the first wave foregrounds navigation and pacing, most often realized through teacher interaction with humble media. Using the media to animate and extend a classroom discussion, and having control over the order and speed of media progression enables the teacher to maintain authority over her narrative. However, being able to access these media reliably and customize the content was more often the exception than the rule, and limited to static teacher-produced overheads and slides.

This desire to access rich media when desired was expressed in the second wave with the introduction of computerized media that was intentionally designed for individual students sitting at personal computers using CDs, perhaps with a partner beside them. DVDs provided increased access to multimedia that had previously been available only in films and greatly improved interactive options such as search functions and nonlinear navigation options. But

user input remained somewhat limited regarding media content, that could not be customized or modified without destroying the original media. Nonetheless, the ability to make individual choices at the interface provided students with more control over the path of their learning than they had experienced previously. NFB productions during this time explored the possibilities of computer-based media, and the classroom became one of the few places in which students could engage with software outside the entertainment industry. Despite the level of interactivity that teachers and students had with analogue, humble media, the term "interactive media" became fused with computer technology during the second wave.

In the third wave, designers of pedagogical media at the NFB began to explore the creative and collaborative potential of the Internet beyond its prodigious value as a mechanism for distribution, at least for those privileged enough to have access to the technology. At this point, the ability to customize content re-emerged for the first time since the days of humble media. On-demand access shifted from being a logistical affordance to a creative activity, worthwhile in its own right, as people began to 'surf the net' and engage in social media practices.

Over time, bandwidth increased, home computers became faster, more powerful, less expensive, and creative technologies were designed to be simpler to learn and use, triggering a fourth wave of media intra-action at the NFB that realized a fresh surge of collaborative media-making and sharing projects. Here, the desire for high-touch, face-to-face interactions and on-demand access to media resources came into tension as the NFB sought a balance between transformative and equitable mediated learning experiences in their programming decisions.

While the four affordances of engagement here presented -- navigation, pacing, access and customized content -- are integral in varying degrees to all multimedia, it remains to be

seen whether they will be sufficient to account for the possibilities new innovations may offer. For instance, it is yet to be determined whether the ability to manipulate one's point of view as desired -- an integral part of what makes VR immersive -- is a new affordance. Perhaps it is simply a 3D iteration of navigational affordances. Similarly, the ability of subjects in virtual spaces to alter their environment aesthetically with their movements could potentially be considered a variation of media creation, embodying a variation of the creative impulse to make one's own slides. As the general public becomes more media literate, their ability to take apart pre-made media structures and reassemble them in completely new ways at will may become a desirable affordance, and if so, will this be fundamentally different than creating media content in an existing media form? These conclusions remain to be explored as we collectively accrue more experience with multimedia technologies and our understanding of them has matured.

But the affordances are not just a preliminary taxonomy of interactive options. They are also the technologies through which individuals are able to not just use multimedia, but to absorb them into their semiotic options. Pointing to a detail on a slide, or layering a projectural on another, the media becomes part of a teacher's explanatory repertoire. Students who explore their own curiosities through a DVD richly populated with stunning photography, archival video and sounds that illustrate, and music that informs, are dynamically creating layers of meaning beyond the text alone throughout this journey. These are mediated activities that are far more complex than passive media consumption of films and television.

Further, the ability to not only experience media but to create it is one of the most powerful, but little understood aspects of social and civic participation of the 21st century. It is not enough to know the mechanics of how to follow a procedure to make something happen.

We also need a more nuanced awareness and understanding of the complex intra-relationships between the technologies we use, the reasons we use them, and the ways their design can reinforce or resist their purpose. Our intra-actions with media technologies are one of the most immediate and direct dynamics out of which our agential realities emerge. It is time we understood more about how this interplay works. This research, tracing as it does a specific narrative of media production and interaction, is a modest step in the direction of this larger, and more significant line of inquiry.

The NFB has played a key role in developing innovative media practices, and consequently the ability to take risks is critical to this endeavour. Speaking about the Board's attitude towards emerging media technologies in documentary and animation particularly, Loc Dao explains:

> …this organization has been based on change, and based on the way technology has influenced documentary and animation and storytelling. So on the one hand, it's built into the DNA to expect this, and it's a natural fit. And on the other hand, when we start doing it, the implications are terrifying for everyone because the realities of it are crazy and uncertain and evolving every six months. So I'd say it's definitely mixed, but clearly the most embraced I've seen in any organization since our earlier times in CBC, or else we couldn't have got this far without the organization being on board.
>
> (Dao)

While the NFB seems willing to explore technological innovation to further develop documentary and animation production, the integration of educational production in this brave new world is, and has been since the media production days of Studio G, far less enthusiastic. In an auteur culture firmly grounded in a filmic aesthetic, with leadership deeply invested in

maintaining this culture, educational programming is tolerated for its financial strength but little understood as the creative and innovative venture that it is. The mastery in media design that has been evidenced time and again through educational media produced by Studio G, ACI and programmatically through NFB/Education, is rarely recognized as artistic in any meaningful sense at the Film Board. Funding for 'what-if' ventures in educational programming based on developing technologies has been much more reluctantly granted than for filmmakers experimenting with portable cameras or the multi-screen installations at Expo '67. Even today, developing freelance filmmakers interested in creating interactive and VR productions seem to have had more open access to dedicated funding than have the producers of educational media based on the types of productions being launched.

If the NFB is to maintain its relevancy in the modern classroom, it would do well to encourage the production of engaging, topical and pedagogically-practical media -- the need for which has only increased since the closure of Studio G. Given the economic realities of a publicly funded school system, it is unlikely that this need will ever be satiated by private sector producers. As a federally-funded media producer, NFB alone is, and has always been, in a unique role to create professional quality educational media affordably and to develop the media literacy needed to ensure all Canadians can actively participate in the ongoing weaving of the national narrative, by adding their own digital traces in its creation.

The Board's role in media education extends as much to educators as to their students. Teachers vary widely in their mastery of integrating multimedia into their lesson plans, and only some will be able to develop this literacy in isolation. Even now, teacher education programs are slow to instruct young teachers on how to use educational media with mastery, become familiar with key software and media resources and develop their own set of best

practices on how to integrate multimedia into their lessons. Likewise, the level of media access and literacy of today's students ranges from not having cell phones or home computers at all, to being able to produce and distribute professional quality multimedia. Media resource centres in schools in affluent neighbourhoods benefit from aggressive fundraising by parents with high incomes and available leisure time, while those in poorer, remote communities struggle to buy textbooks and basic school supplies. Further, the Internet is not accessible to all students, and high-speed connection to fewer still. The acquisition of media literacy under such conditions is a slow and tedious process but is undeniably in the national interest. The affordances of navigation, pacing and media creation mean nothing without access. In Canada, these kinds of disparities have always been critical issues, not only in the educational sector, but also in the health, transportation, and social services sectors, to name a few. The loss of the NFB travelling workshop program will be felt in remote communities dearly, where they were pivotal in increasing the media literacy of populations that needed it the most. Unless the online workshops that are being developed to replace these are able to work well on mobile technologies and access to these devices, as well as high-speed Internet is ensured, they will be a poor substitute for the transformative power of the workshop program.

The National Film Board, as it stands today, is not an institution situated outside the winds of change -- it is formed by them, redirecting this energy to create new possibilities for experimentation and story-telling. As such, it has much in common with the scientific practices which drew Barad's attention in that, like them, the NFB is formed through an agential-reality that is consistently being reconstituted through material and discursive intra-actions with technologies of observation, with the way people interact with these, and within the broader contexts in which they are situated. The NFB staff and alumni that helped tell the tale of

educational production herein presented, have been an integral part of what the NFB has been, is, and will be in the future. Their words form the link connecting the past to the future, and out of which never-quite-completely-new tides of innovation will emerge. It is time for the NFB to acknowledge the critical role that educational media developed by Studio G designers has played in the Canadian media landscape, and the contribution it has made to the NFB's ability to respond effectively to the digital age. This dissertation hopes to contribute to the visibility of this important legacy.

BIBLIOGRAPHY

Acland, Charles R., and Wasson, Haidee. *Useful Cinema.* Duke University Press Books, 2011.

Advertising Age. *History: 1980s.* 15 Sep 2003. Accessed 30 Mar 2017 <adage.com/article/adage-encyclopedia/history-1980s/98704/>

Allen, William H. "Research on New Educational Media: Summary and Problems." *Audio Visual Communication Review.* Vol. 7, No. 2. 1959. pp. 83–96.

Anderson, Chris. "The Long Tail." *Wired Magazine*. Blog Entry, 2004. <www.wired.com/2004/10/tail/>. Accessed 7 Mar 2017.

Atkins, M. J. "Evaluating Interactive Technologies for Learning." *Journal of Curriculum Studies.* Vol. 25, No. 4, 1993, pp. 333-342.

Balsamo, Anne Marie. *Designing Culture: The Technological Imagination at Work*. Duke University Press, 2011.

Barad, Karen. "Reconceiving Scientific Literacy and Agential Literacy, or Learning How to Intra-Act Responsibly Within the World." *Doing Science + Culture*. Edited by Roddey Reid and Sharon Traweek, pp. 221-258, Routledge, 2000.

- *Meeting the Universe Halfway: Quantum Physics and the Entanglement of Matter and Meaning.* Duke University Press, 2007.

Barnes, Kassandra, Marateo, Raymond C., and Ferris, S. Pixy. "Teaching and Learning with the Net Generation". *Innovate: Journal of Online Education.* Vol 3, Issue 4, April/May 2007.

Barthes, Roland. "The Death of the Author." *Image / Music / Text.* Translated by Stephen Heath. Hill and Wang, 1977, pp. 142-7.

Baron, Maureen & Pierre Lapointe. Personal Interview. 18 May 2012.

Baron, Maureen. Personal Interview. 27 May 2013.

- *Assessing Teacher's Knowledge and Attitudes Towards the Use of Level 1 Interactive Video in Science Education.* MA Thesis, Concordia University, 1989.
- "New Literacies in Action." *Literature Circles.* 1 Jan 2000. Accessed 15 Mar 2017. <www.academia.edu/2165120/New_literacies_in_action_Circle_de_lecture_literature_circles>

Barry, Andrew. *Making the Active Scientific Citizen*. Presented at 4S/EASST Conference, "Technoscience, Citizenship and Culture", University of Vienna, 28-30, 2002.

- *Material Politics: Disputes along the Pipeline*. John Wiley & Sons, 2013.
- *Political Machines: Governing a Technological Society*. Athlone Press, 2001.
- "On Interactivity: Citizens, Consumers and Culture." *The Politics of Display*. Edited by Sharon MacDonald. Taylor & Francis, 1998, pp. 85-102.

Barthes, Roland, Richard Miller, Howard Richard and Honoré Balzac. *S/Z*. Hill and Wang, 1974.

Baudry, Jean-Louis and Alan Williams. "Ideological Effects of the Basic Cinematographic Apparatus". *Film Quarterly*. Vol. 28, No. 2, Winter, 1974-1975, pp. 39-47.

Bennett, Paul. *Up Against 'Edutopia': Dr. James Daly's Crusade against the Spectre of Progressive Education, 1968–1983*. Historical Studies in Education. 2011. Accessed 29 Jan 2017, <historicalstudiesineducation.ca/index.php/edu_hserhe/article/viewFile-/3193/3531>

Bertrand, Marc. Personal Interview. 7 Jun. 2016.

- Personal Interview. 10 Jun. 2016.

Bijker, Wiebe E. et al. "The Social Construction of Technological Systems: New Directions in the Sociology and History of Technology." *History E-Book Project*. MIT Press, 1987.

www.library.yorku.ca. Accessed 3 Jan 2016.

Bolter, J. David. *Remediation: Understanding New Media*. MIT Press, 1999.

Bradley, Laura. *Brecht and Political Theatre: The Mother on Stage.* Oxford University Press, 2006. *ebrary.* Accessed 1 Jul 2014.

Brand, Dionne. *No Language Is Neutral*. McClelland & Stewart, 1998.

Bruner, Jerome. *Actual Minds, Possible Worlds*. Harvard University Press, 1986.

Bucy, Erik. "Interactivity in Society: Locating an Elusive Concept." *Information Society.* Vol. 20, No. 5, 2004, pp. 373–383.

Campbell, Sandra. "An Overview of Canadian History Education Today." Report prepared for the National Film Board of Canada, Viva Associates, Dec 1995.

Canadian Internet Project. "CIP Executive Summary". *Canada Online!* omdc.on.ca. October 2005. Accessed 20 May 2016.

Carpentier, Nico. *Media and Participation: A Site of Ideological-Democratic Struggle.* Intellect, 2011, pp. 273. ProQuest. Accessed 3 Nov 2016.

CBC News. "NFB to Cut 61 Jobs Across Canada". *CBC*. 4 Apr. 2012. Accessed 13 May 2016. <www.cbc.ca/news/arts/nfb-to-cut-61-jobs-across-canada-1.1180985>

CBC News. "NFB's Films Available Over the Internet". *CBC*. 17 May 2000. Accessed 20 May 2016. <www.cbc.ca/news/technology/nfb-s-films-available-over-the-in-ternet-1.210103>

Chase, Susan E. "Narrative Inquiry: Multiple Lens, Approaches, Voices." *The SAGE Handbook of Qualitative Research.* Third Edition. Edited by Norman K. Denzin & Yvonna S. Lincoln, Sage, 2005, Pp. 651-680.

Chow, Paul. "Teacher's Attitudes Towards Technology in The Classroom." Master Thesis,

University of Toronto, 2015.

Clark, Penney. *Perspectives on Science Teacher's Guide*. The National Film Board of Canada, 1998. <www3.nfb.ca/sg/2253.pdf>

Cochran, Larry. *Career Counseling: A Narrative Approach*. Sage, 1997.

Coffield, Frank, et al. *Learning Styles and Pedagogy in Post-16 Learning*. The Learning and Skills Research Centre, 2004.

Collins, Kristine. Personal Interview. 20 Jan 2014.

- Personal Interview. 30 May 2016.
- Message to the Author. 13 Jun 2016.

Consolidated Film Industries (CFI). "Filmstrips: A Message Communicator." Reprinted from *International Photographer: The Magazine of Picture Arts and Sciences,* no date.

Cottingham, Tey. Personal Interview. 20 Mar 2014.

Cournoyer, Richard and Tamara Lynch. Personal Interview. 17 May 2012.

Cover, Rob. "Audience Inter/Active: Interactive Media, Narrative Control, and Reconceiving Audience History." *New Media and Society*. Vol. 8, No. 1, 2006, pp. 139–158.

Cowan, James. "NFB Goes Head-To-Head with Hollywood." *The Globe and Mail*. 26 Nov 2002.

Crittenden, Brian S. *Means and Ends in Education: Comments on Living and Learning.* Occasional Papers. Ontario Institute for Studies in Education, 1969.

Csikszentmihalyi, Mihaly. *Flow: The Psychology of Optimal Experience.* 1st Harper Perennial Modern Classics ed. Harper Perennial, 2008.

Daly, James. *Education or Molasses: A Critical Look at the Hall-Dennis Report*. Cromlech Press, 1969.

Dansereau, Dana. Personal Interview. 8 Jul 2016.

Daigneault, Denis. *Audio-Visual Media in Education.* Draft of Internal Report, National Film Board of Canada, Aug 1984.

Dao, Loc. Personal Interview. 30 Jun 2016.

Delany, Paul, and George P. Landow. *Hypermedia and Literary Studies*. Technical Communication, MIT Press, 1991.

Dennis, Lloyd. *The Learning Circus: A Memoir*. Toronto, Umbrella Press, 1997.

Denzin, Norman K. "Emancipatory Discourses and the Ethics and Politics of Interpretation." *The SAGE Handbook of Qualitative Research*. Third Edition. Edited by N.K. Denzin & Y.S. Lincoln. Sage, 2002, pp. 933-958.

Derrida, Jacques. *Of Grammatology*. Translated by Gayatri Chakravorty Spivak. Johns Hopkins University Press, 1976.

deVries, Marc J. and Arley Tamir. "Shaping Concepts of Technology: What Concepts and How to Shape Them." *International Journal of Technology and Design Education*. Vol. 7, Issue 1, Jan 1997, pp. 3–10.

Dijk, Jan van. *The Network Society*. Third Edition. Sage, 2012.

Dijk, Jan van, and de Vos, L. "Searching for the Holy Grail: Images of Interactive Television." *New Media and Society*. Vol. 3, No. 4, 2001, Pp. 443– 465.

Drake, E. Lawson. *Science for Every Student – Educating Canadians of Tomorrow's World.* Report 36. Report prepared for the Science Council of Canada, 1984.

Druick, Zoe. *Narratives of Citizenship: Governmentality and the National Film Board of Canada*. Dissertation. York University, 1999. *ProQuest*. Accessed 17 Mar 2014.

Dunn, Rita Stafford and Kenneth J. Dunn. *Teaching Students Through Their Individual Learning Styles: A Practical Approach*. Reston Pub. Co., 1978.

Ekström, Anders, Frans Lundgren and Per Wisselgren, editors. *History of Participatory Media: Politics and Publics, 1750-2000*. Routledge Studies in Cultural History; Journal No. 13. Routledge, 2011.

Elsaesser, Thomas. "The New Film History as Media Archeology." *Cinémas: Journal of Film Studies*. Vol. 2, No.3, 2005, pp. 75–117.

Elliott, Floyd. *Studio G: 1991 and Beyond - Long Range and Near Future Goals*. Internal Memo. National Film Board of Canada. Montreal, 8 Jan 1990.

- Personal Interview. 17 May 2012.
- Personal Interview. 11 Jun 2013.
- Personal Interview. 4 Oct 2013.
- Personal Interview. 5 Oct 2013.
- Personal Interview. 22 Aug 2014.
- Message to the author. 06 Jun 2015.
- Message to the author. 14 Jul 2015.
- Message to the author. 30 Dec 2015.

Eriksen, Svend-Erik. Personal Interview. 9 Jun 2016.

Evans, Gary. *In the National Interest: A Chronicle of the National Film Board of from 1949 to 1989*. University of Toronto Press, 1991.

- "Films That Work: Industrial Film and the Productivity of Media". *Film Culture in Transition*. Edited by Vinzenz Hediger and Patrick Vonderau. Amsterdam University Press, 2009.

Federman, Mark. *What is the Meaning of the Medium is the Message?* uToronto. 23 Jul 2004. Accessed 13 May 2016. <individual.utoronto.ca/markfederman/article_mediumis-themessage.htm>

Feldman, Seth. "Vertov After Manovich." *Canadian Journal of Film Studies*, Vol. 16, No. 1. Spring 2007, pp. 39-50.

- "The Days Before Christmas and the Days Before That." *On Candid Eyes; Essays on Canadian Documentaries*. Edited by James Leach and Jeannette Sloniowski. University of Toronto Press, 2003, pp. 31-47.
- "'Peace between Man and Machine': Dziga Vertov's The Man with a Movie Camera." *Documenting the Documentary: Close Readings of Documentary Film and Video*. Edited by Barry Keith Grant and Jeannette Sloniowski. Wayne State University Press, 1998, pp. 40–53.

Fogg, B. J. "Persuasive Technology: Using Computers to Change What We Think and Do". *The Morgan Kaufmann Series in Interactive Technologies.* Morgan Kaufmann Publishers, 2003.

Foster, Edward. "Grolier Puts Work on CD-ROM." *Infoworld Magazine*. 29 Jul 1985, pp. 22.

Fred Rogers Centre and the National Association for the Education of Young Children. *Technology and Interactive Media as Tools in Early Childhood Programs Serving Children from Birth through Age 8*. Position Paper. Adopted Jan 2012. Accessed 2 Nov 2016. <www.naeyc.org/files/naeyc/file/positions/PS_technology_WEB2.pdf>

Fukushima, Michael. Personal Interview. 27 May 2016.

Galloway, Chad. "Vygotsky's Constructionism". *Emerging Perspectives on Learning, Teaching and Technology*. Edited by M. Orey, AECT, 2001. pp. 48-49.

Gardner, Paul L. "The Roots of Technology and Science: A Philosophical and Historical View." *International Journal of Technology and Design Education*. Vol. 7, Iss. 1, 1997, pp. 13–20.

Gaudenzi, Sandra. "Strategies of Participation: The Who, What and When of Collaborative Documentaries". *New Documentary Ecologies: Emerging Platforms, Practices and Discourses*. Edited by Kate Nash, Craig Hight and Catherine Summerhayes. Palgrave Macmillan, 2014.

Gauthier, James. *Adaptive and Interactive Methods for Gathering User Preferences in Educational Games*. MA Thesis, University of British Columbia, 2003.

Gee, James Paul. *Situated Language and Learning: A Critique of Traditional Schooling*. Routledge, 2004.

Gibson, James Jerome. *The Ecological Approach to Visual Perception*. Houghton Mifflin, 1979.

Gidney, Robert Douglas. *From Hope to Harris: The Reshaping of Ontario's Schools*. Canadian Electronic Library. Books Collection. University of Toronto Press, 1999.

Giroux, Henry A. "On Critical Pedagogy". *Critical Pedagogy Today*. Continuum International Publishing Group, 2011.

- "Cultural Studies, Public Pedagogy, and the Responsibility of Intellectuals." *Communication and Critical/Cultural Studies.* Vol. 1, No. 1, 2004, pp. 59–79.
- "Educated Hope in an Age of Privatized Visions." *Cultural Studies Critical Methodologies.* Vol. 2, No. 2. 2002, pp. 93–112.

Grigg, Trevor. Personal Interview. 20 Mar 2014.

Hall, Dennis. *Living and Learning.* The Report of the Provincial Committee on Aims and Objectives of Education in the Schools of Ontario, 1965. Accessed 10 Mar 2017

<www.connexions.org/CxLibrary/Docs/CX5636-HallDennis.htm>.

Harel, Idit and Seymour Papert. “Situating Constructionism”. *Constructionism.* Ablex Publishing, Spring 1991, pp. 193-206.

Hardtke, Ines. Personal Interview. 26 Jun 2016.

- Message to the Author. 19 Jul 2016.

Hardtke, Ines, Sonja Hyde, Tim Latchem and Susan Nosov. “Clicks and Mortar: My NFB.ca” Internal Correspondence. National Film Board of Canada. 21 Oct 1999.

Hawkins, Robert, John M. Wiemann, and Suzanne Pingree, eds. *Advancing Communication Science: Merging Mass and Interpersonal Processes*. Sage Annual Reviews of Communication Research, Book 16, Sage, 1988.

Hayles, N. Katherine. *How We Think: Digital Media and Contemporary Technogenesis*. University of Chicago Press, 2012.

Hein, Hilde. *The Exploratorium: The Museum as Laboratory*. Smithsonian Institution Press, 1990.

Henning, Michelle. "Chapter 3: Media” in *Museums, Media and Cultural Theory*. Open University Press, pp. 70-98. 2006.

Hindman, Matthew. *The Myth of Digital Democracy*. Princeton University Press, 2008.

Hodgetts, A. B., and National History Project. *What Culture? What Heritage? A Study of Civic Education in Canada*. Ontario Institute for Studies in Education, 1968.

Holton, Gerald. “Harvard Project Physics: A Report on Its Aims and Status.” *Physics Education.* Vol 1, 1969, pp. 19–25.

Hook, Gail. “Education in Canada - A Favorable Climate for Commodores.” *Run Magazine,* Jun

1986, pp. 62–66.

Huhtamo, Erkki. “The Dream of Personal Interactive Media: A Media Archaeology of the Spirograph, a Failed Moving Picture Revolution.” *Early Popular Visual Culture.* Vol. 11, No. 4, 2013, pp. 365–408.

- *Media Archaeology Approaches, Applications, and Implications.* University of California Press, 2011. *Open WorldCat*. Accessed 20 Mar 2015.

Huhatamo, Erikki & Parikka, Jussi (eds). *Media Archaeology Approaches, Applications, and Implications.* University of California Press. 2011.

Jenkins, Henry, Katie Clinton, Ravi Purushotma, Alice J. Robinson and Margaret Weigel. *Confronting the Challenges of Participatory Culture: Media Education of the 21st Century*. MacArthur Foundation, 2006.

Jenkins, Henry. “What Happened before YouTube.” *YouTube, Online Video and Participatory Culture*. Edited by Jean Burgess and Joshua Green. Polity Press, 2009, pp. 109-126.

Jensen, Jens F. “The Concept of Interactivity – Revisited: Four New Typologies for a New Media Landscape.” *Proceedings of the 1st International Conference on Designing Interactive User Experiences for TV and Video.* ACM, 2008, pp. 129–132. Accessed 27 Jun 2014 *ACM Digital Library*.

Jülich, Solveg. “Fetal Photography in the Age of Cool Media.” *History of Participatory Media: Politics and Publics 1750 - 2000*, Edited by Anders Ekstrom, Routledge, 2011, pp. 125-14.

Kadar, Marlene. *Essays On Life Writing: From Genre to Critical Practice*. University of Toronto Press, 1992.

Kalthoff, Herbert and Roehl, Tobias. “Interobjectivity and Interactivity: Material Objects and

Discourse in Class." *Human Studies.* Vol. 34, 2011, pp. 451–469.

Kearns, Patricia. Personal Interview. 8 May 2016.

Kee, Kevin. Personal Interview. 5, 6 & 7 Jul 2016.

Keefe, James W and John M. Jenkins. *Personalized Instruction: The Key to Student Achievement*. Second Edition. Rowman & Littlefield Education, 2008.

Keenan, Thomas W, and Wendy Hui Kyong Chun. *New Media, Old Media: Interrogating the Digital Revolution*. Routledge, 2003.

Kern, Stephen. *The Culture of Time and Space, 1880-1918: With a New Preface*. Harvard University Press, 2003.

Khouri, Malek. *Filming Politics: Communism and the Portrayal of the Working Class at the National Film Board of Canada, 1939-46*. University of Calgary Press, 2007.

Kidwell, Peggy Aldrich. *Tools of American Mathematics Teaching, 1800-2000*. Smithsonian Institution: Johns Hopkins University Press, 2008.

Kidwell, Peggy Aldrich, Amy Ackerberg-Hastings and David Lindsay Roberts. "Ch. 4. The Overhead Projector: Snapping the Class to Attention." *Tools of American Mathematics Teaching, 1800-2000 Teaching*. Smithsonian Institution, 2008, pp. 53–68.

Kim, Jeong-Hee. *Understanding Narrative Inquiry*. Sage, 2016

Kim, Pyungho, and Harmeet Sawhney. "A Machine-Like New Medium - Theoretical Examination of Interactive TV." *Media, Culture, and Society*. No. 24, 2002, pp. 217– 233.

King, Alison. "From Sage on the Stage to Guide on the Side." *College Teaching.* Vol. 41, No. 1, 1993, pp. 30–35.

Kirriemuir, John and Angela McFarlane. "Literature Review in Games and Learning." *A NESTA*

Futurelab Research Report. Report 8, 2004. Accessed 12 Mar 2017 <telearn.archives-ouvertes.fr/hal-00190453/document>.

Koizumi, Anne. Personal Interview. 7 Jul 2016.

Kominski, Robert. *Computer Use in the United States: 1989*. Feb 1991. Accessed 20 Jan 2017.

Kress, Gunther R. *Multimodality: A Social Semiotic Approach to Contemporary Communication*. Routledge, 2010.

Kuskis, Alex. *The McLuhan Galaxy*. Blog. Accessed 7 Mar 2017 <mcluhangalaxy.wordpress.com>

Kuyvenhoven, Jo. *In the Presence of Each Other: A Pedagogy of Storytelling*. University of Toronto Press, 2009.

Lalonde, André. "The Development of Education in Canada." Report for *The Council of Ministers of Education*, Canada, Sept 2001. <cmec.ca/Publications/Lists/Publications/Attachments/34/ice46dev-ca.en.pdf>

Latour, Bruno. "On Interobjectivity." *Mind, Culture, and Activity*. Vol 3, No. 4, 1996, pp. 228-245.

Laurillard, D. et al. "Affordances for Learning in a Non-linear Narrative Medium." *Journal of Interactive Media in Education*. Vol. 2, 2000.

Lauzon, André, dir. *The Prince & I*. The National Film Board. 1996.

Leaning, Marcus. "Issues in Information and Media Literacy: Criticism, History and Policy." Informing Science Press, 2009.

Leavy, Patricia. *Method Meets Art: Arts-Based Research Practice*. Guilford Press, 2009.

Lowe, Graham S. and Harvey Krahn. "Computer Skills and Use among High School and

University Graduates." *Canadian Public Policy / Analyse de Politiques.* Vol. 15, No. 2. 1989, pp. 175–188.

Lynch-Dalgleish, Tamara. *The Design, Production and Evaluation of a Computer-Based Multimedia Learning Program*. Master's Thesis. Concordia University. 2002.

Lynch, Tamara. Message to the author. 31 Jan 2015.

- Message to the author. 17 Dec 2015.
- Personal Interview. 3 Mar 2016.

Lynch, Tamara and Jane Churchill. *Has Anybody Seen My Umbrella?* 1982.

Manovich, Lev. "Database as a Genre of New Media." *AI & SOCIETY.* Vol. 14, No. 2, 2000, pp. 176–183.

- *Software Takes Command*. Continuum Publishing Corporation, 2013.
- *The Language of New Media*. MIT, 2002.

Marchessault, Janine, and Susan Lord. *Fluid Screens, Expanded Cinema*. University of Toronto Press, 2007.

Martin, Wendy. "The Social and Cultural Shaping of Educational Technology: Toward a Social Constructivist Framework." *AI & SOCIETY.* Vol. 13, No. 4, 1999, pp. 402–420.

Matthews, Ian. "Commodore PET History." commodore.ca. Feb. 2003. Accessed 12 May 2016. <commodore.ca/commodore-products/commodore-pet-the-worlds-first-personal-computer>.

Maxwell, John W. "Tracing the Dynabook: A Study of Technocultural Transformations". *Retrospective Theses and Dissertations, 1919-2007*. University of British Columbia, 2006. Accessed 29 Oct 2016 <open.library.ubc.ca/cIRcle/collections/831/items/1.0055157>.

McIntosh, Andrew. "National Canadian Film Day." *Historica Canada Blog*. 29 Apr 2014. Accessed 7 Mar 2017 <www.historicacanada.ca/blog/national-canadian-film-day/>.

McLuhan, Marshall. *The Gutenberg Galaxy; the Making of Typographic Man.* University of Toronto Press, 1962.

McMillan, Barbara A. Rev. of *Science Please!* "CM Magazine" 20 Sep 2002. Vol. ix No. 2. Accessed 17 Jul 2016 <www.umanitoba.ca/outreach/cm/vol9/no2/science-please.html>

"Mediatheque." Def. 1. LaRousse.fr. LaRousse Online Dictionary, n.d. Web. 20 May 2016. <www.larousse.fr/dictionnaires/francais/m%C3%A9diath%C3%A8que/50102q=mediathequ e#50000>

Moeller, Carl A. and Walter L. Cox. *Development and Evaluation of Single Concept Film Loops for Dissemination of Occupational Information to Youth in the Middle School, Phase I.* Final Report. North Carolina State University School of Education, 1971. Accessed on 11 Feb 2017 <files.eric.ed.gov/fulltext/ED051637.pdf>

Moll, Marita. *Tech High: Globalization and the Future of Canadian Education*. Canadian Centre for Policy Alternatives, Fernwood Publishing, 1999.

Möller, Hans. *Media for Discovery.* Maclean-Hunter, 1970.

- "Audio-Visual Media in Canadian Schools." *Audio-Visual Media*. Vol. 3, No. 2, 1969, pp. 39–43.
- Interview with Derek Yaple-Schobert. 8 Jun 2013.
- "Filmstrips for Canadian Schools." *The Teacher's Magazine.* 1963, pp. 12–19.
- "A New Look in Filmstrips" *National Film Board of Canada*. 7 Jan 1964.

Moore, G. A. B. "The Growth of Educational Technology in Canadian Higher Education."

British Journal of Educational Technology. Vol. 3, No. 1, 1972, pp. 32–47. *Wiley Online Library*.

Morabito, Margret. "Grolier - Leading the Way in Education." *Run Magazine.* June 1986, pp. 58–62.

Mosteller, Fredrick. "The Tennessee Study of Class Size in the Early School Grades." *The Future of Children*. Vol. 5, No. 2, 1995, pp. 113–127.

Mumford, Lewis. "Authoritarian and Democratic Technics". *Technology and Culture.* Vol. 5, No. 1, Winter 1964, pp 1-8.

Murray, Janet H. *Inventing the Medium: Principles of Interaction Design as a Cultural Practice*. MIT Press, 2012.

- *Hamlet on the Holodeck*. Free Press, 1997.

Napoli, Philip M. *Audience Evolution: New Technologies and the Transformation of Media Audiences*. Columbia University Press, 2011.

Nash, Kate, Craig Hight, Catherine Summerhayes. *New Documentary Ecologies: Emerging Platforms, Practices and Discourses*. Palgrave Macmillan, 2014

NATO Advanced Study Institute on Theoretical Foundations of Computer Graphics and CAD, and British Computer Society. *Theoretical Foundations of Computer Graphics and CAD*. Edited by J. E. Bresenham and Rae A. Earnshaw. Springer-Verlag, 1988. NATO ASI Series. Series F, Computer and Systems Sciences, Vol. 40.

"The National Film Board 1960 - 1969." *The National Film Board Online*. Accessed 02 May 2016 <www.nfb.ca/historique/1960-1969>

"The National Film Board 1990 - 1999." *The National Film Board Online*. Accessed 19 May

2016 <www.nfb.ca/history/1990-1999/>

"The National Film Board 2000 - 2009." *The National Film Board Online*. Accessed 20 May 2016 <www.nfb.ca/history/2000-2009/>

NFB. "Our Collection." *The National Film Board Online*. Accessed 20 May 2016 <onf-nfb.gc.ca/en/our-collection/series/>

NFB. "History: Towards Universal Access to the NFB's Collection." *National Film Board Online.* Accessed 20 May 2016 <images.onf.ca/cineroute-public/index.jsp>

"NFB Report on Plans and Priorities 2015-2016." *National Film Board Online.* 2015, Accessed 20 May 2016 <ENG_NFB_RPP-2015-16.pdf>

"NFB Action Plan 2009 - 2012." *National Film Board Online.* 9 Jun 2009. Accessed 26 May 2016. <2009_2012-NFB_Action_Plan_June09x.pdf>

"NFB Annual Report 1995-96." *National Film Board Online.* 1996. Accessed 14 Jul 2016. <onf-nfb.gc.ca/publications/en/annualreports/rep1995-1996 ONF_RA-1996-1995EN.pdf>

"NFB Annual Report 1997-98." *National Film Board Online*. 1998. Accessed 20 May 2016. <ONF_RA-1998-1997EN.pdf>.

"NFB Annual Report 2005-06." *National Film Board Online.* 2006. Accessed 17 Jul 2016. <onf-nfb.gc.ca/publications/en/annualreports/rep2005-2006/ONF_Annual-R_05-06.pdf>

NFB. "2008/09 - 2012/13 Strategic Plan." *National Film Board Online.* Apr 2008. Accessed 26 May 2016. <www.onf.ca/medias/download/documents/pdf/NFB_STRATE-GIC_PLAN.pdf>

NFB. "2013-2018 Strategic Plan." *National Film Board Online.* 30 May 2013. Accessed 26 May 2016. <2013-2018NFBStrategicPlanMay30.pdf>.

NFB. “Has Anybody Seen My Umbrella? Teacher’s Guide”. *National Film Board Online.* 1998. Accessed 20 May 2016. <www3.nfb.ca/sg/47390.pdf >.

NFB. “Info-Source.” *National Film Board Online.* Sep. 2010. Accessed 17 Jul 2016. <onf-nfb.gc.ca/en/about-the-nfb/publications/info-source/>.

NFB. “Workshops.” *National Film Board Online*. 15 Sep. 2012. Accessed 5 Aug 2016. <web.archive.org/web/20140813234038/https://www.nfb.ca/education/workshops/>.

NFB. “NFB Announces Conversion Educational Workshops Online.” *National Film Board Online.* 20 Mar. 2015. Accessed 5 Aug 2016.

NFB StopMo Studio. Computer software. Apple App Store. Vers. 1.5.1. NFB, n.d. Accessed 2 Sep 2016.

Nicols, Bill. *Introduction to Documentary.* Indiana University Press, 2001.

Nicholson, Linda. “Feminism in ‘Waves’: Useful Metaphor or Not?” *New Politics.* XII-4.48. 2010. n.p. Accessed 26 Feb 2016.

Norman, Donald A. *The Design of Everyday Things.* Revised and Expanded Ed. Basic Books, 2013.

Norman, Donald. “Signifiers, Not Affordances.” *AMC Interactions.* Vol. 15, No. 6, 2008, pp. 18-19.

Norris, Pippa. "The Digital Divide.” *The Information Society Reader.* Edited by Frank Webster and Raimo Blom. Routledge, 2004, pp. 273-283.

Oblinger, Diana. “Boomers, Gen-Xers and Millennials: Understanding the New Students.” *Educause Review.* July/August 2003.

O’Flynn, Siobhan. “Psychogeography as Social Activism in Kat Cizek/NFB’s Highrise/The

100th Tower & Out My Window." *Narrative Practices and Documentary Film-making Practices: from Propaganda to Dissent*. Edited by Letort, D. and G. Fournier. Vol. XII, No. 1, 2014. LISA e-journal. Accessed 29 Mar 2017 <https://lisa.revues.org/5703>.

Ontario. *Living and Learning: Report of the Provincial Committee on Aims and Ives of Education in the Schools of Ontario.* Edited by Emmett M. Hall and Lloyd A. Dennis. Abridged Edition, The Committee, 1968.

Oppenheimer, Frank. "Adult Play: Exploratorium." *The Exploratorium*. Feb/Mar 1980. Accessed 3 Feb 2017 <www.exploratorium.edu/files/about/our_story/history/frank/pdfs/adult_play.pdf>

O'Reilly, Tim. "What Is Web 2.0." o'reilly.com, 30 Sep 2005, Accessed 12 May 2016. <www.oreilly.com/pub/a/web2/archive/what-is-web-20.html? page=1>

Osborne, Kenneth. *Education: A Guide to Canadian School Debate, Or, Who Wants What Why*. Penguin, 1999.

- "Archives in the Classroom." *Archivaria.* Vol. 21, No. 23, Winter 1987, pp. 16-40.

O'Sullivan, Brian. "Global Change and Educational Reform in Ontario and Canada." *Canadian Journal of Education*. Vol. 25, No. 3, 1999, Pp. 311-325.

Packwood, Keith. Personal Interview. 6 Jun 2013.

Palmer, Bryan. *Canada's 1960s: The Ironies of Identity in a Rebellious Era*. University of Toronto Press, 2000.

Papert, Seymour. *The Children's Machine: Rethinking School in the Age of the Computer*. Basic Books, 1993.

- "Computer-Based Microworlds as Incubators for Powerful Ideas." *The Computer in*

The School: Tutor, Tool, Tutee. Edited by R. Taylor. Teacher's College Press, pp. 203-210, 1981.

Papert, Seymour and Harel, I. "Situating Constructionism." *Constructionism.* Ablex Publishing Corporation, pp. 193-206, 1991, Accessed 29 Oct 2016 <www.papert.org/articles/Situating Constructionism.html>

Parikka, Jussi. *What Is Media Archaeology*. Polity Press, 2012.

Peavy, R. Vance. "A Constructivist Model of Training for Career Counselors." *Journal of Career Development*. Vol. 18, No. 3, 1992, pp. 214-28.

Petrić, Vlada. *Constructivism in Film: The Man with the Movie Camera: A Cinematic Analysis.* Cambridge University Press, 2012.

Phillips, Charles E. "Education in Canada, 1939-46." *History of Education Journal.* Vol. 3, No. 1, 1951, pp. 7–13.

Phillips, D.C. "The Good, the Bad, and the Ugly: The Many Faces of Constructivism". *Educational Researcher*, Vol. 24, No. 7, Oct 1995, pp. 5-12.

Piaget, Jean. *The Language and Thought of the Child*. Translated by Marjorie Gabain, Meridian Books, 1955.

Pitcher, Heather. *Archives in the Classroom: Reaching Out to Younger Canadians Through Archival Documents*. MA Thesis, University of Winnipeg, 2005.

Plante, Johanne and David Beattie. *Connectivity and ICT Elementary and Secondary from the Information Technologies in Schools Integration in Canadian Schools: First Results and Communications Survey, 2003-2004*. Ministry of Industry, Government of Canada, Jun 2004, Accessed 2 Nov 2016 <www.statcan.gc.ca/pub/81-595-m/81-595-m2004017-

eng.pdf>

Prensky, Marc. "Digital Natives, Digital Immigrants Part 1." *On the Horizon*. Vol. 9, No. 5, 2001, pp. 1-6.

Presseisen, Barbara Z. "Learning and Thinking Styles: Classroom Interaction." *NEA Professional Library*, National Education Association, 1990.

Prewitt, Kenneth. "Scientific Illiteracy and Democratic Theory." *Scientific Literacy*. Vol. 112, No. 2, Spring 1983, pp. 49-64

Quarry, Wendy. *The Fogo Process: An Experiment in Participatory Communication*. Thesis, University of Guelph, 1994.

Rafaeli, S. "Interactivity: From New Media to Communication." *Advancing Communication Science: Merging Mass and Interpersonal Processes*. Sage, 1988, pp. 110–134.

Rasinski, Timothy V. *Using Jackdaws to Build Background and Interest for Reading*. Paper presented at 28th Annual Convention of the International Reading Association, May 2-6, 1983, Anaheim. Accessed 7 Jan 2017 <files.eric.ed.gov/fulltext/ED234351.pdf>.

Raskin, Jef. *The Humane Interface: New Directions for Designing Interactive Systems.* Addison-Wesley, 2000.

Reynolds, Paul Davidson. *A Primer in Theory Construction.* Bobbs-Merrill, 1971.

Rieber, Lloyd P. "Computer-Based Microworlds: A Bridge Between Constructivism and Direct Instruction." *Educational Technology Research & Development*. Vol. 40, Iss. 1, 1992, pp. 93-106.

- "Seriously Considering Play: Designing Interactive Learning Environments Based on the Blending of Microworlds, Simulations, and Games." *Educational Technology*

Research and Development. Vol. 44, Iss. 2, Jun 1996, pp. 43–58.

Ritzer, George, Paul Dean and Nathan Jurgenson. 'The Coming of Age of the Prosumer'. *American Behavioral Scientist*. Vol. 56, 2012, 21 Mar 2012, pp. 379–98.

Roberts, James. Personal Interview. 5 Jul 2016.

Rogers, Yvonne. "HCI Theory: Classical, Modern, and Contemporary." *Synthesis Lectures on Human-Centered Informatics.* Vol. 5, 2012, pp. 1–129.

Rosen, Jay. "The People Formerly Known as the Audience." *Pressthink*. 27 Jun 2006. <archive.pressthink.org/2006/06/27/ppl_frmr.html>

Rosen, Larry D., and Michelle M. Weil. *Computer Availability, Computer Experience and Technophobia Among Public School Teachers*. "Computers in Human Behavior." 1995, pp. 9-31.

Rowland, Wade. *Canada Lives Here: The Case for Public Broadcasting*. Linda Leith Publishing, 2015.

Salecl, Renata. *Choice.* Profile Books, 2010.

Sánchez, José. "Linguafilms: The Use of Filmstrips and Slides in Modern Languages." *The Modern Language Journal.* Vol. 36, No. 2, 1952, pp. 77–79. Accessed 02 Jan 2017 JSTOR.

Sandlin, Jennifer A., Brian D. Schultz, and Jake Burdick. *Handbook of Public Pedagogy: Education and Learning Beyond Schooling.* Taylor & Francis, 2009.

Scott, Gary Joseph and Sheila B. Beck. *The English El-Hi Report on Canadian Education and Publishing in Canada, 1982-83 [to] 1988-89.* Pepper Wood Inc., Research and Publishing Services, 1982.

Schaffer, Dale E. *The Filmstrip Collection*. U.S. Department of Health, Education & Welfare, 1971. Accessed 10 Mar 2017 <http://files.eric.ed.gov/fulltext/ED075054.pdf>

Sears, Alan. *Retooling the Mind Factory: Education in a Lean State*. Garamond Press, 2003.

Sharp, Helen. *Interaction Design beyond Human-Computer Interaction,* Second Edition. John Wiley & Sons Ltd, 2007.

Shapiro, Tom. "Something Incredibly Wonderful Happens: Frank Oppenheimer and the World He Made Up." *The Museum Journal*. Vol. 53, 2010, pp. 391–393.

Sicondolfo, Claudia. Personal Interview. 19 Sep 2013.

- Personal Interview. 4 Jun 2016.

Simon, H. A. "What Is an Explanation of Behaviour?" *Psychological Science*. Vol. 3, 1992, pp. 150-161.

Solomon, Michelle. Personal Interview. 11 May 2016.

Spiro, Rand, Richard L. Coulson, Paul J. Feltovitch, and Daniel K. Anderson. "Cognitive Flexibility Theory: Advanced Knowledge Acquisition in Ill-Structured Domains." Presented at *The Tenth Annual Conference of the Cognitive Science Society*, 1988.

Stanfel, Julie. "Perspectives in Science - Exploring Science, Technology and Society." *Educational Media International.* Vol. 25, No. 3, 1988, pp. 172–180. Accessed 02 Jan 2017 *Taylor and Francis+NEJM.*

- Personal Interview. 20 Apr 2016.

- Message to the Author. 8 Aug 2016.

Stanfel, Julie, ed. "Virtual Cities - a Regional Discovery Project." Educational Media International, Vol. 30, No. 1, 1993, pp. 42-45, Accessed 9 July 2006 doi: 10.1080/

0952398930300113.

- "Programming for the Virtual Commons." *Educational Media International.* Vol. 31, No. 4, 1994, pp. 242-246, Accessed9 July 2006. doi: 10.1080/0952398940310407

Steeves, Valerie. *Young Canadians in a Wired World Phase 3 - Teachers' Perspectives.* Mediasmart, 2012.

Strommen, E. F. and Lincoln, Bruce. "Constructivism, Technology and the Future of Classroom Learning." *Education & Urban Society*. No. 16, Vol. 4, Aug 1992, pp. 466-477.

Swagler, Roger. "Evolution and Applications of the Term Consumerism: Theme and Variations." *Journal of Consumer Affairs.* Vol. 28, No. 2, Winter 1994, pp. 347.

Sweeny, Bill. "Multimedia's Relevance to Children's Television Producers: Today's Kids Have 'Multimedia Minds'." *Multimediator*. Nov 1995, pp. 1-4.

Sweeney, Hughes. Personal Interview. 20 Jun. 2016.

Tapscott, Don and Anthony D. Williams. *Wikinomics, How Mass Collaboration Changes Everything.* Atlantic Books, 2008.

Taylor, Kate. "How Tom Perlmutter Turned the NFB into a Global New Media Player." *The Globe and Mail*. 18 May 2013. Accessed 20 May 2016 <www.theglobeandmail.com/arts/film/ how-tom-perlmutter-turned-the-nfb-into-a-global-new-media-player/article11992885/? page=2>.

Thomas, David. "Manufacturing Vision: Kino–Eye, The Man with a Movie Camera, and the Perceptual Reconstruction of Social Identity." *Visual Anthropology Review*, Vol. 8, Iss. 2, Sep 1992, pp. 27–38.

Thompson, John. "Is Education 1.0 Ready for Web 2.0 Students?" *Innovate: Journal of Online*

Education. Vol 3, Iss. 4, April/May 2007.

Thiele, Leslie Paul. "The Ontology of Action: Arendt and the Role of Narrative." *Theory & Event.* Vol. 12, No. 4, 2009. N.p. Accessed 31 May 2014 Project MUSE.

Tufte, E. "PowerPoint is Evil." *Wired*. 9 Nov 2003. Accessed 13 May 2016. <www.wired.com/wired/archive/11.09/ppt2.html>

Turkle, Sherry. *The Second Self: Computers and the Human Spirit*. Simon and Schuster, 1984.

Vanstone, Gail. *D Is for Daring: The Women behind the Films of Studio D*. Sumach Press, 2007.

Verrall, David. Personal Interview. 13 Jun 2016.

Vygotsky, Lev S. *Mind in Society: The Development of Higher Psychological Processes*. Edited by Michael Cole et al. Harvard University Press, 1978.

Waugh, Thomas, Ezra Winton, and Michael Brendan Baker, eds. *Challenge for Change: Activist Documentary at the National Film Board of Canada*. McGill-Queen's University Press, 2010.

Wiesner, Peter K. "Media for the People: The Canadian Experiments with Film and Video in Community Development". *Challenge for Change: Activist Documentary at the National Film Board of Canada*. Edited by Baker, Michael Brendan., et al. McGill-Queen's University Press, 2010.

Wheeler, Steve "Information and Communication Technologies and the Changing Role of the Teacher." *Journal of Educational Media*, Vol. 26, No.1, 2001.

Wikipedia contributors. "CD ROM." *Wikipedia, The Free Encyclopedia*. 30 Apr 2009. Accessed 10 May 2016.

Willms, J Douglas and Bradley A. Corbett. "Information and Communication Technology:

Access and Use (2000 Data).” *Education Quarterly Review*. Vol. 8, No. 4, 2000, pp. 8.

Winner, L. *The Whale and the Reactor: A Search for Limits in an Age of High Technology*. University of Chicago Press, 1986.

- *Autonomous Technology: Technics-Out-of-Control as a Theme in Political Thought*. MIT Press, 1977.

Winston, Brian. *Media Technology and Society: A History: From the Telegraph to the Internet.* Routledge, 1998.

- “The White Man's Burden: The Example of Robert Flaherty.” *Sight and Sound*. Vol. 54, Winter, pp. 58-60, 1984.
- *Claiming the Real II: The Documentary Grierson and After*. British Film Institute, 2008.

Winston, Brian, Gail Vanstone, and Chi Wang. *The Act of Documenting: Documentary Film in the 21st Century*. Bloomsbury Academic, 2017.

Yankelovich, Daniel. “How American Individualism is Evolving.” *The Public Perspective*. Feb/Mar 1998, pp. 3-6.

APPENDIX A: Studio G and ACI filmography used in this research

Title	Director/Producer	Year	Media
Cendrillon	n/a	1957	Filmstrip
Learning About Rocks & Minerals	Floyd Elliott & Hans Möller		Media kit
Harvard Physics Project	NFB	1962 - 1968	Film loops
Perspectives in Science	Julie Stanfel/Floyd Elliott	1988 - 1995	Video and laser disc
Virtual Cities	Julie Stanfel/Floyd Elliott	1992	Video/disc
Canada's Visual History	Frank Corcoran/Isobel Marks	1994	CD-ROM
FlyPast!	Denis Daigneault/Isobel Marks	1995	CD-ROM
Has Anybody Seen My Umbrella?	Jane Churchill/Tamara Lynch	1990 1998	Video CD-ROM
The Prince & I	André Lauzon/Pierre Lapointe	1996	Web project
Pigs in Space/Save the Pig	Tamara Lynch	2003	Web Project
Media & Society	David Adkin, John Spotton; Arlene Moscovitch; Sarah Swartz; Laurie Brown	1989 1993	Video Videodisc
Constructing Reality: Exploring Media Issues in Documentary Film	David Adkin/ John Spotton, Michael Allder	1993	Video
The Cyber Terrorism Crisis	Kevin Kee/Michael Fukushima	2002	Web-project
The Mission/La Mission	Sylvain Charbonneau Marc Roberge /Michèle Bélanger, Marc Bertrand, Guy Boucher	2003	Web-project
Ultrabug Cliposcope	Martin Barry/Marc Bertrand	2002	Web-project

APPENDIX B: List of people interviewed for this research:

NFB Staff and alumni:

1. Maureen Baron
2. Marc Bertrand
3. Pierre Boucher
4. Kristine Collins
5. Tey Cottingham
6. Richard Cournoyer
7. Denis Daigneault
8. Dana Dansereau
9. Loc Dao
10. Floyd Elliott
11. Svend-Erik Eriksen
12. Gerry Flahive
13. Michael Fukushima
14. Trevor Grigg
15. Ines Hardtke
16. Patricia Kearns
17. Kevin Kee
18. Anne Koizumi
19. Pierre Lapointe
20. Tim Latchem
21. Tamara Lynch
22. Isobel Marks
23. Hans Möller
24. Susan Nosov
25. Keith Packwood
26. James Roberts
27. Claudia Sicondolfo
28. Julie Stanfel
29. Hughes Sweeney
30. David Verrall

McIntyre Educational Media:

31. Tom Whyte

NFB Archives:

32. Pierre Boucher
33. Katherine Kasirer

Association of Media Literacy (AML):

34. Michelle Solomon