
Redesigning for mobile plurilingual futures

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Abstract

The New London Group's 1996 manifesto was a clarion call to educational researchers to fundamentally redesign language and literacy education for the needs of global learners communicating in evolving digital media environments. In this conceptual overview, the "how," "what" and "why" of multiliteracies are critically re-examined from the perspective of mobile digital language learning in posthumanist media ecologies, with attention drawn to paradigm shifts in language, technology, multimodality and context. We argue that Web 3.0 environments, AI and rapidly emerging algorithmic cultures have outpaced earlier critical theorizations of multiliteracies and digitally mediated learning practices as well as meaningful implementation of multiliteracies pedagogies in schools. We then reconsider the affordances and constraints of Web 3.0 tools for multilingual/plurilingual language learning, and sketch pathways for critical and productive engagements with mobile devices and multiliteracies pedagogies that reframe and advance the important critical work of the New London Group.

Key words: multimodality, mobile learning, plurilingualism, posthumanism, production pedagogies

Résumé

Le manifeste du New London Group (1996) était un appel aux chercheurs en éducation afin qu'ils repensent la didactique des langues et de la littérature pour s'adapter aux besoins d'apprenants mondialisés qui commencent à partir de médias numériques toujours changeants. Dans cet ar-

ticle conceptuel, le « comment », le « quoi » et le « pourquoi » des littératies multiples sont réanalysés de manière critique sous l'angle de l'apprentissage numérique mobile des langues dans les écologies posthumanistes des médias, en soulignant les changements de paradigme au sujet des langues, de la technologie, de la multimodalité et des contextes. Nous soutenons que les environnements des médias du Web 3.0, l'intelligence artificielle et les cultures algorithmiques qui émergent rapidement ont dépassé les théorisations critiques antérieures des littératies multiples et des pratiques d'apprentissage numériques, ainsi que de la mise en œuvre significative des pédagogies de littératies multiples dans les écoles. Nous réévaluons ainsi les possibilités et les limites des outils du Web 3.0 pour l'apprentissage multilingue et plurilingue. Finalement, nous présentons des pistes pour un engagement critique et productif avec les appareils mobiles et les pédagogies de littératies multiples qui reformulent et font avancer le travail critique et essentiel du New London Group.

Mots-clés : multimodalité, apprentissage mobile, plurilinguisme, posthumanisme, pédagogies de la production

Introduction

The New London Group's (NLG) 1996 landmark article, "A pedagogy of multiliteracies: Designing social futures," was a clarion call to educational researchers towards a fundamental redesign of language and literacy education in the shifting geopolitics and dawning digital era of the late 20th century. The ten collaborating authors who formed the NLG coined the term *multiliteracies* to refocus literacy learning on the social futures of linguistically and culturally diverse learners in evolving digital societies, addressing the "why" (responding to radically changing socio-technical contexts), "what" (multimodal redesign) and "how" (*situated practice, overt instruction, critical framing and transformed practice*) of multiliteracies (NLG, 1996).

The authors' manifesto jump-started reconceptualizations of language and literacy education in diverse global contexts, stimulating a plethora of research studies and pedagogical explorations that took varied trajectories. Multiliteracies was interpreted kaleidoscopically, variously enfolding New Literacy studies, sociocultural learning theory, games studies, systemic functional linguistics, identity investment in digital storytelling, plurilingualism and so forth into critical explorations and pedagogical applications. Research and practice variously centred on, included, briefly mentioned, or basically skirted language learners.

Early research on multiliteracies in educational practice focused on shifting pedagogies in digital literacies (Selber, 2004); globally transformed classroom practice (Anstey & Bull, 2006; Cole & Pullen, 2009; Healey, 2008; Mills,

2010; Unsworth, 2001); New Literacy studies (Lankshear & Knobel, 2006; Pahl & Rowsell, 2005); and plurilingual learning designs (Cummins & Early, 2011; Lotherington, 2011). Multiliteracies as a label was, thus, loosely applied around multimodal resets in pedagogical interventions and applications, rendering the term somewhat difficult to pin down. As Web 2.0 tools and environments emerged in the early 2000s, multiliteracies pedagogies faced challenges from co-emerging institutional constraints and standardization movements shaped by neoliberal narratives (Garcia, Luke & Seglem, 2018). In this political climate, the NLG's focus on learner agency in some interpretations of multiliteracies was diluted, as was the emphasis on students being active knowledge makers and situated co-designers of their futures. In what follows, we briefly examine these historical shifts and tensions, as well as the need to reassess multiliteracies pedagogies and language learning in and for Web 3.0 mobile and networked contexts.

"A pedagogy of multiliteracies: Designing social futures" was, in all fairness, a temporal snapshot of socio-political conditions and the Web 1.0 media environments of the mid-1990s. Notably, over the ensuing quarter century, a number of participating NLG authors continued to advance their theoretical positions. Bill Cope and Mary Kalantzis, who have continued to research and publish voraciously, revised the "how" of multiliteracies from "situated practice, overt instruction, critical framing, and transformed practice" (NLG, 1996, p. 88) to "'knowledge processes' of experiencing, conceptualizing, analyzing and applying" (Cope & Kalantzis, 2015, p. 1) as they moved into a more design-based reflexive pedagogy of knowledge-action. Their continuing research invites us to interrogate normative definitions of language (Kalantzis & Cope, in press).

Gunther Kress, who motivated the "what" design agenda of the NLG (personal communication, 2009) continued to develop a social semiotic approach to multimodality that has deeply influenced the fields of applied linguistics and second language education (e.g., Bezemer & Kress, 2016; Jewitt & Kress, 2010; Kress, 2010). Meanwhile, Allan Luke (Luke et al., 2017) continued to advance the critical framing agenda, reminding us that ecological, social justice and ethical exigencies today require us to rethink digital literacy learning as a means of situating learners in agentic roles in the present, where students are understood as actors capable of confronting real-world challenges and controversies using digital tools in authentic contexts (Thumlert et al., 2018).

Just over a decade after the original manifesto was published, Cope and Kalantzis authored the article, "'Multiliteracies': New literacies, new learning" (2009), which attested to the enduring theoretical value and practical relevance of "A pedagogy of multiliteracies" in changing socio-technical contexts. This work addressed Web 2.0 environments supportive of remix, read/write

(R/W), convergence and participatory cultures: increasingly democratized digital spaces where learners co-create and share media online fostering greater learner agency and situated practices of making, digital design and community-based participation. By this time (2009), multimodal redesign was being reconceived with and through significantly more powerful tools (e.g., websites, blogs and wikis, video editing software, graphic text-making tools), fanfiction networks, digital audio workstations (DAWs) and creative applications for the smartphone. At the same time, corporative interests and social media conglomerates were becoming increasingly pervasive in digital spaces that had previously been idealized as radically democratic (see Berners-Lee, 1996). In 2009, the “why” domains of techno-capitalist work, social media communication and politics had not yet outpaced the scope, critical aims and transformative purposes of “A pedagogy of multiliteracies.” However, earlier NLG terms, “post-Fordism” and “fast capitalism” (p. 66), were being subsumed by neoliberalism, and neoliberal and market-driven logics were clearly shaping the everyday world of institutional schooling, aligning older logics of technocracy and administration with new forms of standardization and accountability emphasizing content coverage and decontextualized skills learning (Lotherington & Jensen, 2011; Thumlert et al., 2015). This leads us to question whether we have truly succeeded in instituting multiliteracies in formal educational spaces, or only in piecemeal, insular and institutionally attenuated practices.

While we agree that the key critical, theoretical and pedagogical insights of the NLG are enduringly valuable, socio-technical contexts have, since 2009, been reshaped by emerging Web 3.0 environments where participatory cultures have been recoded from the inside out by algorithmic cultures, artificial intelligence (AI), bots, big data, data analytics, machine learning, gamification systems and related social media technologies that learn to interpellate unique users into increasingly insular consumer and ideological worlds. If early multiliteracies work was in part shaped by sociocultural learning theory and New Literacies studies (Street, 1984) as well as the newer literacies described by Rowsell and Walsh (2011), then contemporary contexts require us to attend to what Tonicic (2020) calls “newest literacies”: understanding the algorithmic and AI-mediated literacy practices and systems that have emerged over the past decade that mediate and organize communication on the posthuman spectrum. Navigating these newest literacies, as we discuss below, necessarily involves examining the complex relationships language users form with human and digital nonhuman others in Web 3.0 environments, and understanding the varied ways posthuman actants (Latour, 2005) (e.g., bots, conversational agents) and algorithmic systems influence and shape language learning, language use and literacy practices in and beyond digital environments (Jones, 2021; Leander & Buriss, 2020). Notably, we turn to posthumanism as one contextualizing fea-

ture of the digital language landscape, paying particular attention to the human-technology dynamic wherein technologies are not only used by or acted upon by human users, but also act upon and through users, in turn.

Particularly in the context of mobile language learning, we advocate for a dismantling of pervasive binaries that define societal views of technology. In this article, technology is neither a neutral tool mobilized towards self-transparent mastery or standalone accomplishment, as represented in language apps such as Duolingo (Ahn & Hacker, 2012), nor is it a purely negative force. Moving beyond essentialist divisions (e.g., user/tool, human/machine and serious/social language use), language learning and literacy researchers must attend to both the profound and nuanced ways language is in constant flux across platforms, contexts and Web 3.0 tool ecologies, where myriad human and posthuman interlocutors are networked and in play.

This article examines evolutions in selected aspects of the “how” and the “what” of multiliteracies as conceptualized a quarter century ago from the contemporary vantage point of mobile digital language learning, drawing attention to paradigmatic changes in language in digital communication; technology, as considered through posthumanism and multimodality frameworks; contexts and situated practice afforded by networked mobile devices; and the opportunities for multimodal redesign in an era where ubiquitous digital media and tools are in play to support learner agency and learning through art/knowledge co-construction and meaningful creative production: the redesigned. Recent and ongoing studies and data sources support the conceptual overview, which commences the reconsideration of the “what” of multiliteracies by examining technology and learning from Web 1.0 and the static e-bulletin boards of the NLG’s 1996 article through the social media explosion of Web 2.0 into the creep of artificial intelligence (AI) in Web 3.0 smart technological design. The article then focuses attention on the institutionally neglected space of language learning in mobile contexts and digital ecologies, re-interpreting language, plurilingualism and new hybridities in complex digital/physical contexts. We then rethink the “why” of multiliteracies, elaborating on the technological affordances (Norman, 1988) of multimodal media in Web 2.0 and 3.0 environments. While emerging networked spaces and forms of interaction are subject to algorithmic mediation veering from assistive to gamified to menacingly invasive, we highlight where emerging sites and tools provide opportunities to critically rethink multilingual/plurilingual learning in contexts where language learning apps, AI, virtual assistants and algorithmic systems simultaneously shape and constrain opportunities for language learning and creative production. In conclusion, we foreground a situated “production pedagogy” (Alonso-Yáñez et al., 2019) orientation to language learning alongside changing trends in immigration and forced migration that have led to superdiverse (Blommaert, 2013;

Vertovec, 2007) classrooms across much of North America. These contexts require researchers and educators to take up a renewed focus on equity, diversity and inclusion (EDI) as a lens for redesigning plurilingual learning opportunities, multilingual/multimodal learning supports and ecologically responsive language learning, particularly in the Canadian context, which, as Kubota and Bale (2020) point out, stubbornly continues to focus on English-language learning (ELL) and French as a second language (FSL).

Reconsidering the “what” of multiliteracies

The NLG (1996) described the “what” of multiliteracies from the central concept of *design*, presaging multimodal composing, among myriad educational redesigns. Multimodal meaning making challenges a number of sedimented concepts that formed the bedrock of language teaching, learning and assessment, including static and universalist notions of language, grammar and text, as well as separating speaking, listening, reading and writing into siloed skills. These notions are now discussed and reformulated in the context of mobile digital language learning.

Multimodal redesign

Multimodality is common to all communication, written and spoken. No matter how limited by mediation (e.g., voice bereft of physical action in audio recordings or alphabetic print devoid of illustration in paperback novels), there are concurrent indices supporting communicative intent: voice modulation and vocal emphasis, layout and font choice, for example. However, as many researchers have pointed out, it is the ever-increasing functionality in manipulating and combining semiotic resources for meaning in digital environments that has stimulated increased attention to multimodal composing.

The term multimodality is used in a variety of disciplines to describe different phenomena or domains of inquiry (Kress, 2010; Mondada, 2016). Research on language pedagogy has tended to define modality operationally, e.g., “A mode is a socially and culturally shaped resource for making meaning. Image, writing, layout, speech, moving image are examples of modes, all used in learning resources” (Bezemer & Kress, 2008, p. 171). Multimodality, though, is an intricate concept, approached from intercepting and interwoven histories of thought, as well as diverse contexts of practice, composition and textual distribution.

In the field of applied linguistics, multimodality is primarily described from a social semiotic perspective (Kress, 2010; Kress & van Leeuwen, 2001; Hodge & Kress, 1988), which is grounded in Ferdinand de Saussure’s (1916/1995) semiology, and in the influential grammatical theories of linguist Michael Halliday (1978), which further generated thinking on intersemiosis (Liu &

O'Halloran, 2009; Royce, 1999), resemiotization (Iedema, 2003) and transduction (Bezemer & Kress, 2016). Given that multimodality displaces logocentricity, repositioning language as one of many semiotic resources (Mondada, 2016), accounting for sensoriality and mobility of embodied interaction benefits from Elleström's semiotically based intermediality paradigm (2010, 2018, 2021).

Research on multimodality fundamentally theorizes semiotic resources in complex and dynamic interaction, encompassing not simply modes as interacting entities but dynamic modal relationships, genres and design choices (Bezemer & Kress, 2016). Kress (2005) explains:

I use the term “mode” for the culturally and socially produced resources for representation and “medium” as the term for the culturally produced means for distribution of these representations-as-meanings, that is, as messages. These technologies — those of representation, the modes and those of dissemination, the media — are always both independent of and interdependent with each other. (pp. 6–7)

Not dissimilarly, Elleström's intermediality theory (2021) “distinguish[es] between two profoundly interrelated but nevertheless discernible basic facets of the communicative process: mediation and representation” (p. 39). However, in Elleström's theory (2018), four modalities — the “material, spatiotemporal, sensory and semiotic” (p. 292) — characterize all basic media, which are further qualitatively situated and technically displayed.

Despite the elegance of these and other influential theorizations of multimodality, a commonality is the superficial glossing over of technology as primarily involved in material display. This obscures the ineluctably social construction of technology, as well as the various social practices of making and learning with technology, which we now introduce as a prelude to understanding the mobile device and its technological, socio-political and pedagogical positioning.

Technology and learning

Technology — whose etymology derives from a combination of the Greek *techne*, art or skill, and *logos*, speech or reason — has been variously understood to be restricted to or to include technique or technics, machines and structures, the mechanical arts and crafts, applied science, invention, engineering, the pursuit of power or efficiency, any means to an end, and more. (Mitcham, 2009, p. 469)

Technology is a complex and variegated term enfolding diverse epistemologies. But as Mitcham (2009) helpfully summarizes, at its core, technology features not just objects made and used by human beings in different contexts, but also techniques and forms of doing, or practice. Latour (2005) reminds us

that tools and other non-human actants act upon, constrain and/or provide affordances for human actors who engage them, or repurpose them situationally within networks that compose stable or changing fields of discourse and practice. In a posthumanist understanding of technology, action and agency, the dynamic is inherently complex and the tools we design, utilize, repurpose or modify are in many ways interactive “co-participants” (Toohey et al., 2015) in our modes of inquiry, creative endeavours and language learning communities of practice.

Recognition of the socio-technical relationship between maker, artefact and user starts to dissipate historically with the evolution of complex mass technologies (Mitcham, 2009), rendering digital tools as black boxes. However, losing sight of the “irreducibly social” (Lawson, 2008, p. 48) and constructed nature of technology is fatal to critical engagement with digital tools, leading to the assumption that a technical artefact is an autonomous source of intellectual or pedagogical direction or, alternately, that tools are neutral, self-transparent objects which simply extend our intentions and amplify capacities. The essentialist understanding of a device or a program as an autonomous technology that benignly enhances, amplifies or accelerates misses the intrinsic connection between the artefact and the society in which it was constructed (Bijker, 2010), and how the technical artefact can be variously utilized to reproduce or transform practices, roles and respective positions of capacity or incapacity, or how digital tools — far from being stable entities that must conform with their designers’ intentions — become sites of, and interfaces for struggle, creative repurposing and expropriation (Thumlert et al., 2015). This acknowledgement is critical to conceptualizing language, pedagogy and learning with and through networked mobile devices.

When educational technologies are introduced into educational institutions, they are typically framed as discrete technical artefacts that can enhance, enrich or accelerate existing practices, or make extant instructional methods and assessment practices more efficient: from novel ways of delivering content (e.g., using multimedia, whiteboards, videos and flipped classrooms) to new means of assessment, accountability and state governance, including the digitization and distribution of standardized curriculum and national benchmarks. That is, when implemented in schools, technological innovations are typically mapped onto traditional curricular structures and educational role relations, which are uncritically assumed to be a natural staging upon which the new technology is to be patched or added (Thumlert et al., 2015). In this scenario, innovations are mobilized not to transform or redesign role relations or positions of agency, but to sustain socially reproductive institutional priorities or, under neoliberal conditions, advance techno-evolutionary ideologies and technocapitalist aims.

More problematic still is the quality, relevance and appropriateness of curricular language learning content when accredited institutional oversight and accountability are sidestepped entirely for programmable, marketable product development, as in mobile language learning via commercial apps sold direct-to-consumer on the unregulated digital marketplace. The language app is positioned and positions itself as teacher in a threadbare program of behavioural instruction and assessment of decontextualized vocabulary and phrases (Lotherington, 2018) with possibilities for student redesign evacuated from both engagements with language apps and in related classroom practice and assessments.

Mobile digital language learning

We add mobility to the complex concepts involved in rethinking multiliteracies for contemporary teaching and learning practices. The question of what and who is mobile in mobile learning, and where learning can take place, is thorny: mobility is relative. The learner, the device, the learning, the context and indeed the teacher can all be mobile. But is this polymorphic mobility captured in mobile language learning designs?

Mobile devices (e.g., smartphones and tablets) provide an individualized on-the-go networked portal to the online world, affording a novel platform for learning designs, interest-driven language engagement and situated practice (Godwin-Jones, 2017). Smart mobile devices are powerful handheld computers, housing multiple complex technical functions previously embodied in separate apparatuses (e.g., word processor; camera; photo editor; audio-recorder; video-recorder/editor; music production software). This multifunction capacity is linked to Wi-Fi, cellular networks and global positioning systems (GPS). Mobile devices are, in this way, multimodal-ready, on-the-go digital toolboxes and artistic palettes, complete with bidirectional global location systems, global networking capacity, cloud computing, nanosecond communication and publication affordances. This is a very long way from the Web 1.0 backdrop of the NLG's 1996 multiliteracies manifesto and a salient evolution from Web 2.0 into Web 3.0 environments, providing mobile capacity for exploring language domains in social contexts and for making and sharing complex multi/plurilingual texts.

Early pedagogical aspirations for mobile language learning imagined accessible, low-cost, contemporary language education through design-oriented approaches (Kukulka-Hulme, 2009), facilitating collaborative and customizable language learning. And indeed, digital mobile functionality has been harnessed for innovative language teaching in programs designed by specialists in language learning, such as augmented reality (AR) language trails, utilizing GPS for navigation through physical contexts in a target language (Holden

& Sykes, 2011; Pegrum, 2014), and interactive nonlinear storytelling pinned to place-based quests (Liu et al., 2016). However, the historical genealogy of technology-enhanced language learning is rooted in the 1950s language laboratory when behavioural pedagogies were current (Bo-Kristensen & Meyer, 2008). The untethering of 21st century mobile and virtual labs from floor-bolted technologies enabled design-based, learner-centred pedagogies that fostered agentive learning (Bo-Kristensen & Meyer, 2008). However, as Reinders and Pegrum (2015) pointed out, the commercial trend to “appification” (p. 2) of mobile language learning leads away from collaborative learning designs (mobilizing the innovative affordances of mobile devices) towards what Godwin-Jones (2011) described as: “pedestrian, uncreative, and repetitive [programs that] . . . did not take advantage of the mobility, peer connectivity, or advanced communication features of mobile devices” (p. 7). Commercial language apps default by design to antecedent behavioural drill learning.

Purpose-built third-party applications, including for-profit apps built for language learning, are downloaded onto the individual user’s smartphone at minimal to no upfront financial cost (though costing in privacy through involuntary data-sharing). Many apps offer new means for creating authentic media works and building communities around creative making and sharing (Thumtler, 2015). However, there is also a ballooning assortment of proprietary language applications developed by software developers rather than teachers, for users rather than learners and for purposes of financial gain rather than less instrumentalized forms of educational tool development (Lotherington, 2018).

Though language learning apps have inspired a gamut of reactions from consumer boredom and frustration (Lotherington, 2018) to convenient Chinese vocabulary sourcing (Wu, 2015) to steppingstones for stringing together aridly functional language learning objectives (Alm, 2016), the best use is by knowledgeable professional language teachers strategically choosing and using language apps or language app functionality for design-based learning and meaningfully contextualized language *use*. Machine-accessed learning with algorithmic feedback for the individual language learner, which is the marketing strategy for commercial app downloads, invites wholesale reliance on the app as teacher substitute.

What the casual learner finds in most popular commercial language apps is decontextualized vocabulary and small phrase grammar memorization (Burston, 2014; Loewen et al., 2019; Lotherington, 2018) modelled by digital conversational agents, whose programming cannot accept semantic substitutes or regional pronunciations (Lotherington, 2018). Duolingo, a behemoth on the multibillion dollar app market, provides a lock-step grammar translation course (Jašková, 2014) planned by designers to algorithmically enforce addictive gaming behaviours derived from matching puzzle games to keep learn-

ers in the game, independently of actual language learning (Gannes, 2014). Gamification mechanics are thus used in conjunction with anachronistic drill pedagogies rooted in behavioural learning principles.

Ironically, the behavioural mechanics of gamified learning now widely encoded in commercial language-learning apps are increasingly seen as systems that might be re/applied and re/mapped over educational spaces in schools to make curricular activities more palatable and superficially game-like. Gamification seems a logical goal given that dominant forms of assessment are derived from similar extrinsic-motivational systems: the gamification layer dovetails with existing school cultures where grades, test scores and extrinsic rewards drive instruction and assessment (Nolan & McBride, 2014). Gamification further disconnects language learning from intrinsically motivated — and student-determined — purposes and domains of application. And common language learning apps using gamification principles in turn revitalize behavioural principles of reward, competitive relations and social norm-referencing mechanics, where goals and aspirations are based on external systems (e.g., rank, points, likes and accumulated achievement and status markers). In this regard, the algorithms of digital gamification align with the algorithms of neoliberal schooling.

A primary hurdle in digital language learning — mobile or not — centres on the conceptualization of language. Apps treat languages as bounded abstract systems; programming is based on national standards insensitive to regional and social variation (e.g., a singular British English). Apps are not programmed for plurilingual discourse (e.g., nice idea, *n'est-ce pas?*), and are generally neglectful of multimodal resources and social media discourses. New grammars, particularly those prevalent in small screen environments (e.g., microblogging or texting) are ignored as are expanding hybridized orthographies (e.g., including emoji, such as 🍷 and lexico-grammatical symbols, such as @, #) (Lotherington, 2021). In the next section we consider what is recognized as language in mobile language learning and discuss the shifting borders of language in global multimodal communication, in expanded digital orthographies and in plurilingual communication.

Language, plurilingualism, new hybridities

In formal educational contexts, language has traditionally been viewed as an abstract structure, divided into basic skills for pedagogical purposes: speaking-listening-reading-writing. These four skills and their linear progression reflected 20th century child language socialization patterns followed by print-era school literacy curricula. Early theories of communicative competence, circa 1970 (Campbell & Wales, 1970; Hymes, 1972), were already repositioning language from abstract structure with universalized forms to be correctly

learned towards social medium with communicative functions to be put into appropriate practice; in other words, from what language *is* to what language *does* in social context.

Consistent with the concept of language as abstract structure is the concept of multilingualism, which keeps languages distinct both at the societal level and at the individual level, stressing the separate, advanced mastery of each language used by a person. The concept of plurilingualism, on the contrary, is focused on the fact that languages interrelate and interconnect particularly, but not exclusively, at the level of the individual, stressing the dynamic process of language acquisition and context-specific use, in contrast with the coexistence and balanced mastery of structurally conceived languages (Conseil de l'Europe, 2001; Piccardo, 2013).

Theories and practices of linguistic communication have changed manifestly over the past quarter century since the NLG's landmark article. The appearance of the iPhone in 2007 led to smart devices becoming the predominant access portal for everyday digital communication (Martin, 2017). Rapid socio-technical development has been written into the fabric of language rooted in creative innovations in digital genres that settle into grammatical, discourse and orthographic conventions. New hybridities importantly include:

- emoji, e.g., 🤔, 😊: cross-linguistic icons used to add emotional nuance to communication. Emoji are accessed via an emoji keyboard programmed into smartphones (see Albawardi & Jones, 2020; Hern, 2021; Pardes, 2018);
- grammaticalized symbols, e.g., #, @, which have important information signposting functions in telescoped mobile forums, such as microblogging. Each symbol also has proprietary lexico-grammatical patterning (see Lotherington, 2020; Luzón & Albero-Posac, 2020; Zappavigna, 2015);
- environmental grammars, such as Tweet grammar, which is framed in terms of characters, not words, e.g., “Today is #IReadCanadianDay! 🇨🇦 We are celebrating Canadian authors and illustrators who have created amazing books for everyone to enjoy! 📖 📧 ✨ 🌟 🕒” (see Luzón & Albero-Posac, 2020).

Letters, the sound-graphic interface of written language in pre-digital print environments, form a subset of pixelated symbols used in multimodal composing (Cope & Kalantzis, 2004). Because visual digital media are encoded in pixels, text production becomes a process of multimodal composing, manipulating and organizing semiotic resources into complex ensembles, rather than processing linear alphabetic writing. This hybridization includes language

itself, which is used plurilingually in many learning contexts; alas, as we discuss below, this is not the case in language apps that silo languages through algorithmic encoding.

Multimodal composing on digital canvasses invites myriad new possibilities in language and semiotic resource choice, textual processing and discourse product that is a world away from paper and pencil writing, accomplishing meaning making multidimensionally beyond linear writing/reading processes. A remark formed in linear spatially oriented text: “Here we are in lockdown 2.0,” might receive as reply an appropriate acronym: OMG, used in texting, or an emoji, e.g., 🤔, which, it must be noted, does not have a spoken equivalent. Interestingly, linear textual comments are increasingly invoking time-oriented replies in the form of animated GIFs often functioning as memes (see Ying & Blommaert, 2020), and crossing what Elleström (2010; 2021) refers to as spatiotemporal modality — something that was not technologically possible pre-Web 2.0.

On a discourse level, multimodal texts offer multiple pathways to meaning making, including languages in part or whole, juxtaposed or interposed; illustrations, static and mobile; speech functions; sound files and so forth. The potential for hybridization is vast, and the social wave on which tweets and, particularly, hashtags are carried can be highly politically motivated and invested as in hashtag activism (Yarimar & Rosa, 2015), and hashtag diplomacy (see Collins et al., 2019). However, as our research team is discovering, plurilingual composing can be short-circuited in websites and software programs that algorithmically select a language for the user, something that kicks in automatically with location-finding devices, which will insert, for instance, Finnish ads on Facebook while the English-learning user is in Helsinki.

We argue that it is imperative that language learning theorization be attentive to the reality that learners no longer learn languages in linear, discrete isolation (if they ever did). Acknowledged pedagogically or not, individually measurable language skills have been vastly augmented, and indeed superseded by cognitively distributed problem-solving, using digital toolkits and ecologies enabling collaborative R/W authoring, plurilingual and multimodal design, and even posthuman communication with conversational digital agents. New interactive, multimedia discourses (e.g., Snapchat), and digital performatives (e.g., “like,” “pin”) are in standard digital use. Such innovations cannot simply be dismissed as something that happens online, away from real language use, imagined as basic, though to a former era. To ignore digital language forms and functions is to subscribe wholesale to a “saber-tooth curriculum” (Peddwell, 1939/2004, p. 1) for language learning.

Twentieth-century ideals of what language comprises, and how language is constituted and performed are rapidly obsolescing past utility as guides to

language learning. A fresh multimodal communication palette is available, used by people in everyday social communication. The borders of what were thought of as language, script, grammar, vocabulary: all are reforming under new mediational affordances.

New, newer, newest literacies:

Multiliteracies in posthumanist and algorithmic cultures

Socio-technical contexts for teaching and learning have evolved exponentially; digital communication is now shot through with “smart” Web 3.0 functionality in addition to the more familiar Web 2.0 media affordances. Toncic (2020) aptly invokes the posthuman spectrum in day-to-day communication in his conception of *newest literacies*, a concept we draw on to capture how human language learners in particular engage in communicative networks comprising both other human users and conversational digital agents across digitally mediated platforms and environments, e.g., Twitter bots, Siri/Alexa and database/filtering tools (also see Jones, 2021; Leander & Buriss, 2020).

The widespread insertion of AI into daily life, though the subject of debate and concern, has influenced approaches to teaching and learning. While efforts to educationally mobilize AI have proliferated in app-based language learning, particularly through models of replacement where AI and algorithmic learning tools have been positioned as stand-in teachers and language models, analysis of these tools must be critically directed to how and under what pedagogical conditions AI should be so utilized for learning.

An analysis of the efficacy of language learning apps (e.g., Duolingo, Babbel, Busuu) and the simultaneous reliance on and shortfalls of direct translation tools (e.g., Google Translate) emphasize that AI cannot, especially in its present capacity, replace human interlocutors much less professional language teachers. However, given the inadequacy of traditional models of language learning favouring 2D literacy modalities (Lotherington & Jenson, 2011), AI might in more novel forms, such as digitally mediated communication/creation, help supplement dynamic human-catalyzed language teaching and learning.

Conversational digital agents, an evolutionary upgrade on texting chatbots, use a natural human language spoken interface; these programs are inserted into language apps, ironically, to exemplify human language. While conversational digital agents are programmed to simulate human interaction, the fact that these and other online language tools (e.g., Google Translate) operate through machine learning — via processing and integrating user inputs over time — suggests that digital agents might, someday, be a promising vehicle for conversational practice. Echoing this, Heller and Proctor (2012) and Heller et al. (2005) support the view that the conversational digital agent is a potentially useful pedagogical tool given its increasingly dynamic programmable

conversational capacity and its integration with AR/VR learning environments. This view is supported by Ayedoun et al.'s (2015) research into conversational digital agents motivating learners' willingness to communicate in English as second language learning.

Despite the potential in mobilizing novel forms of AI for situated learning, the slow uptake of meaningful and dynamic uses of digital technologies in institutional language learning can be explained in part by sometimes polarized societal views of technology as either a universal solution or a destructive force. Language apps such as Duolingo promise to help a person master a language without the support of a teacher, e.g., techno-optimism; on the other hand, technology in some educational contexts may be deemed peripheral, even distracting from the real work of language learning, e.g., techno-pessimism. Binary thinking about technology, though, prevents more nuanced understandings of posthuman relationships with technology, specifically with regards to language learning.

Contemporary relationships with digital technologies, and especially AI, are varied and complex (Fuchs & Chandler, 2019); while many view AI as an existential threat, others utilize Alexa and other virtual assistants as friends, therapists and collaborators — and, potentially, practice partners in language learning. In considering impacted human — digital relationships, the context of language learning and the language process invites questions such as: What are the learner's perceptions and uses of technology? What are the teacher's perceptions and uses of technology? Are devices feared as the enemy in the language classroom taking away from authentic language use? Do devices intimidate the teacher, inspire fear or invite creative potential?

Reconsidering the “how” of multiliteracies

In the NLG's (1996) original theorization, four components of pedagogy were described: *situated practice*, drawing on “the experience of meaning making in lifeworlds, the public realm and workplaces” (p. 65); *overt instruction, critical framing* and *transformed practice*, “in which students, as meaning makers, become Designers of social futures” (p. 65). We speak specifically to dimensional complexities in situated practice in mobile digital language learning, and to algorithmic and policy foils to *transformed* — and *transformative* — *practice*. We begin with the thorny concept of *context* in digital mobile communication.

Situated learning:

Context and complexity in mobile digital learning

In an ongoing study exploring digital language immersion using posthuman mechanisms, our research team has encountered myriad complexities in framing context in mobile digital learning environments. Mobile learning is, by

definition, not physically static, but diversely and multiply contextualizable. What our research team is discovering is that context in mobile learning is simultaneously operative in digital, material-physical and digital-physical planes of activity where user interactions with media are interwoven with interactions with place, movement and material-cultural worlds. Recent pedagogical research (Thumlert et al., 2020), for example, highlights the opportunities of using mobile devices to critically explore, decolonize and remap (that is, redesign) urban landscapes while, at the same time, contesting the dominant historical narratives that are embroidered semiotically, materially and toponymically into everyday city-texts. This work signals the opportunities of place-based investigations with mobile devices that enable students to critique dominant visualization media (e.g., Google Maps) and understand how digital maps may (mis)represent forms of community, or exclude diverse languages and cultures, including Indigenous histories and immigrant communities.

Physical context in mobile learning is constantly changing if the learner is ambulatory or otherwise in transit, providing the user with the opportunity to capture contextually meaningful data, e.g., pictures, signs, conversations, sounds and images for site-specific inquiry and learning, accessible later, on demand. Further, in AR applications, physical environments are digitally augmented: AR language trails lead language learners through cityscapes with interactive language activities to be performed or captured in designated geographic locations (Holden & Sykes, 2011; Pegrum, 2014). In VR applications, physical location is supplanted by an enveloping alternate reality where languages, actions and doing are co-situated and contextualized (as in a digital simulation or game) to support language uptake and application. If physical context is not incorporated in curricular design—as in packaged language apps that use mobile access as a convenient product delivery system rather than for creating customizable learning challenges—then a unique mobile learning opportunity is wasted. Further, opportunities for learners to engage domain-specific discourses in site-specific contexts, based on learner interest, are also foreclosed.

Material and social contexts can greatly facilitate language learning, as demonstrated in the popularity of immersion approaches to language learning. Immersion pedagogies immerse the learner in a target language milieu for content learning, enabling and reinforcing meaningful language learning and use. French immersion education, the globally applauded pedagogical model developed, in the main, in Québec schools post 1965 (Lapkin et al., 1983; Ouellet, 1990; Rebuffot, 1993) supports the learner's cultural, linguistic and, to a lesser extent, social learning, as well as economic mobility.

Context can also obstruct language learning. This happens when social, physical or digital responses default to the majority language (in our case,

English). The English-speaking traveller's attempts to functionally use a target language — say, Spanish in Mexico or French in Belgium — are frequently undercut by overzealous English language learners, such that the traveller has to persist en español or en français to create a practice opportunity. In ongoing digital immersion experiments, this linguistic override was experienced in-game too, where human interlocutors switched to English to sidestep the learner's slightly wobbly Portuguese language use. Digital programs, apps and games also foiled the learner's attempts to use plurilingual responses by resetting to either English or correcting to the target language. However, digital games and virtual worlds (MMORPGs¹) provide, especially for ELLs, interactive and narrative contexts for situated meaning (the co-location of words/discourse with objects and modes of action/doing) (Gee, 2003, 2007), and for utilizing English within the game environment, with other players or in para-textual sites and communities outside of the game (Apperly & Beavis, 2011).

In mobile learning, the smart device is a portal to cloud-connected resources, global networks, bidirectional GPS-location and posthuman assistance, enabling the learner and the learning itself to transcend — or, conversely, particularly focus on — changing geographic, social and conceptual spaces. Sharples (2015), among others, explores the seamless potential of mobile learning to invite individual learning “flow states” based on intrinsically motivated tasks (Csikszentmihalyi, 1990), or to facilitate school-home learning connection making. Mobile learning, through perpetual network connection, dynamic processing and cognitive distribution across devices and creative applications, invites exciting new pedagogical opportunities.

Plurilingualism and language education in Canada

Language, like technology, is culturally contingent as well as socially and politically mediated through state and educational policies. Makoni and Pennycook (2007) offer the viewpoint that languages are not neutral entities but “the inventions of social, cultural and political movements” (p. 2), echoing the aphorism that “a language is a dialect with an army and a navy” quoted in Crystal (1967, p. 36). Language, as a form of cultural capital, can be nationalized, idealized and standardized. Through institutional privileging and/or repression, a language is imbued with the potential to do what Bourdieu (1979) termed “symbolic violence” (p. 78) to diverse learners, non-dominant communities and their communication systems.

In Canada, there is an ongoing tension in the historical relationship between francophones and anglophones, accompanied by a constant political push for bilingual identity and language learning in French and English. This

¹massively multiplayer online role-playing games.

impetus for functional societal bilingualism, set in motion by official bilingualism in 1969, is imposed on the indisputably plurilingual reality of the superdiverse (Vertovec, 2007) Canadian nation, a testament to the success of official multiculturalism in 1971 (Haque, 2012). However, as Kubota and Bale (2020) note, Canadian priorities for language education persist in focusing on the teaching and learning of English and French.

Multiple models of multiliteracies' pedagogies that welcomed and validated children's immigrant languages in school classrooms have been implemented in participating schools in the greater Toronto area over the past two decades, funded by research budgets (e.g., Cummins, 2005; Cummins & Early, 2011; Lotherington, 2011; Lotherington and Paige, 2017; Ntelioglou et al., 2014; Prasad, 2015; Stille & Prasad, 2015). These projects did not view language and languages as discrete abstract structures, as bilingual education programs do, but as channels for supporting intergenerational communication and classroom participation and for reaffirming students' plurilingual individual and social identity. Piccardo (2013) describes plurilingual language education in terms of understanding language learning as a nonlinear process, "where preexisting linguistic knowledge and competence is taken into consideration, together with experience in language learning, task accomplishment, different aims, conditions and constraints (p. 603). Potts (2013) argues that the success of plurilingual classroom practices is inextricably connected to students' multimodal meaning making, remarking that "it is difficult to conceive of pedagogic practices that capitalize on students' plurilingualism unless these practices are situated within a broader conceptualization of students' meaning making capacities" (p. 628).

In formal education, the Canadian government continues to roll out initiatives for the promotion of bilingualism and bilingual identity through the improvement of FSL programs and opportunities in French-minority communities across the country (Gouvernement du Canada, 2018). Meanwhile, education initiatives originating outside Canada, such as the influential Common European Framework of Reference for Languages: Learning, teaching, assessment (Conseil de l'Europe, 2001), which promotes pedagogy from a plurilingual standpoint, continue to be implemented nation-wide in assessment practices and provincial language curricula. Given the social changes of an increasingly diverse Canadian population and the technological advancements that promote and foster limitless accessibility to languages and cultures, there is an ongoing call within the field of education to acknowledge both the local and global demands of the country. Education must adapt to a new reality that includes rearticulating our language policies, expanding the scope of language pedagogies offered and, even pondering what language connotes in a plurilingual, digitally intermeshed society.

It is in this political climate that our research team is creatively exploring production pedagogies for mobile language learning that advance agentive customized learning, utilize digital tools in multimodal discourse and composition and create spaces for plurilingual engagement. Here, mobile learning offers an override to exclusive national and provincial English-French curricular programming, enabling access to minoritized in addition to dominant languages. The thorny problem of enabling plurilingualism in mobile language learning persists, nonetheless, wrapped in the socio-technical cycle of communication and action.

Transformed practice:

Learner agency and redesigned production pedagogies

In the NLG's 1996 manifesto, multimodality was saliently interwoven with practices of student inquiry, making and redesign, where *design* referred not just to the semiotic sign and complex multimodal ensembles, but also to the situated agency of learners in taking available designs, e.g., cultural forms, patterns, texts, knowledge and genres, and creatively recombining elements into new designs, new forms of art, knowledge and culture: *the redesigned*. Implicit in this transformative view of design was a specific orientation to a future open to change, offering students the transformative potential of participative agency in the negotiation and co-construction of their own social futures. This productive view of learning and critical making invited us to rethink education not as a developmental system that gradually prepares students for later life, or for a future world hylomorphically understood and anticipated by schooling institutions, but rather as a dynamic vehicle for situated practice, where learners assume agentive roles in the present, and where students can be re/understood as actors capable of engaging open-ended inquiries (Nolan & McBride, 2014) and learning adventures using authentic tools and practices in real-world contexts (Thumlert, 2015).

Interactive multimodal communication applications enable just-in-time and on-demand language learning and invite innovative production pedagogies that are premised on the view that learners learn best and most deeply through making cultural artefacts that address their present needs and purposes: real-world objects and technology artefacts that have social worth and immanent use value, and therefore matter to their makers (Alonso-Yáñez et al., 2019). Production pedagogies offer an interdisciplinary pedagogical orientation where learning actors are supported to engage challenges and design competences using digital tools, “through the making of authentic cultural artefacts — with correspondingly authentic audiences enabled to witness such acts of knowledge production” (Thumlert et al., 2015, p. 797).

In situated language learning contexts, production pedagogies are enacted

when learners explore and decompose models and texts (of all kinds), and then construct their own real-world digital artefacts. Production pedagogy understands that making is, before anything, a process that must be located within and subordinated to meaningful social action, where the production of socially valued things is integral to educational activity, deep learning and authentic making (Alonso-Yáñez et al., 2019). The posthuman assistance and digital toolkits in a smart device support learner inquiry and engagement in language learning by facilitating text creation using multiple semiotic resources that support growing target language proficiencies. In this way, mobile digital language learning invites plurilingual and multimodal pedagogies engaging and immersing learners in language learning through making cultural artefacts.

Production pedagogy in this sense, however, does not yoke production in the service of neoliberalized skills learning: production is not mobilized for the purposes of applying discrete language skills or to demonstrate anticipated outcomes (i.e., prescribed vocabulary or predetermined communicative competences). Rather, language learning, language use, language play and multimodal designs are mobilized for the purposes of the producer/maker to create something that matters to them, where contextually apposite and new domain-specific terminologies and language competences are in play, and in service of student interests, purposes and language inquiries (e.g., What words or stylistic elements do I need to find here, and now, for this purpose?). A designer of a plurilingual graphic narrative text, video work or interactive narrative game will mobilize target language/s to communicate what they need or want to communicate or put into practice, be it the skilled practice of multimodal textual composition, video production, blogging, coding and game design, podcasting, fanfiction or transmedia storytelling, as well as communicating and sharing in online communities and virtual worlds where languages are in play. As exemplified above, mobile devices abet in a multiplicity of ways both language learning and situated production (redesign), which are unified in and through interest and purpose-driven practices. In these media ecologies, mobile devices support creative production and transformed practice through photographic, video and audio tools, as well as provide place-based connectivity to just-in-time and on-demand language and learning resources.

Conclusion: The enduring “why” of multiliteracies

The NLG's mid-1990s manifesto on multiliteracies includes the authors' explicit caution that, though their article summarizes a year-long discussion, it “is by no means a finished piece” (1996, p. 63), but “a programmatic manifesto as a starting point of sorts, open and tentative” (1996, p. 63), probing the content — “what” — and form — “how” — of literacy instruction for the dawning era of marked social change.

In this article, we considered the “what” and “how” of multiliteracies from the vantage point of contemporary mobile language learning, arguing that contemporary digital technologies disrupt theorizations of multimodality that position technology simplistically and uncritically as a medium for material display and dissemination. Given the ubiquity of digital computing, influencing all facets of contemporary life, the interconnected nature of technological tool and human user is increasingly salient. This dynamic is particularly underexamined in language learning contexts where anachronistic competency measures are still prevalent, and where the use of digital technologies often serves to reproduce traditional learning approaches and epistemologies. Here, technological innovation becomes a means of solidifying centralized control of educational systems and what counts as learning based on anachronistic values, roles and exclusionary pedagogies. This is regressive, not at all responsive to the aspirations of the NLG to revise and transform literacy from its pedagogical formulation as a “carefully restricted project—restricted to formalized, monolingual, monocultural, and rule-governed forms of language” (1996, p. 61).

Though mobile learning enables ubiquitous learning, learning in situ and at any hour, interaction with physically distant learners and resources, interest-driven learning, authentic data collection and more, mobile learning has had a spotty uptake in schools generally. In a recent survey, Burden et al. (2019) found that out of 57 articles on mobile learning in schools around the globe (mostly in science education domains), only three could be considered pedagogically innovative. These innovative studies disrupted traditional pedagogies predominantly by engaging the community in project-based learning. Successful classroom-based project-based language learning has a solid history in Toronto (e.g., Cummins & Early, 2011; Lotherington, 2011; Lotherington et al., 2017; Ntelioglou et al., 2014; Stille & Prasad, 2015); these and studies from further afield would easily inform innovative collaborative mobile projects that require a mobile device and utilize student remote collaboration, home spaces and even home languages.

The immense anxiety generated by the overnight conversion to online learning in Ontario (and other provinces and countries) during the repeated pandemic lockdowns of 2020–2021 brought to the surface the unpreparedness of teachers to teach remotely. The myriad problems of learners were often highlighted, suggesting that the online learning is inherently biased to richer students with space, light, bandwidth and good access to computers. News reports featuring children’s consequent learning problems starkly indicate how shallowly mobile learning designs have permeated formal school learning.

In FSL classrooms, where the relationship between pedagogy and technology has been routinely underanalyzed (Boreland, 2018), technology continues to be treated as an enemy intruding on the educational sphere. Studies have

identified the anxiety of FSL teachers towards the incorporation of technology in the classroom and the unavoidable discomforts of shifting from traditional models of language acquisition to learner-centred pedagogies that require action and creation on the part of the learner (Gibson et al., 2014). Rather than being assessed for their creative potential, digital tools instil anxiety and fear in ill-prepared FSL teachers who fear new technologies will monopolize curricular learning and serve to distract from “what needs to be taught.” Indeed, while the use of technology is encouraged to support and enhance learning in the Ontario FSL curriculum, teachers are warned about “potential risks attached to its use [and] the potential for abuse” (Ontario Ministry of Education, 2014, p. 52). As such, technology and education are posed in an adversarial binary relationship.

The assumption that technology is a categorical disrupter is demonstrated by Neiterman and Zara (2019) who examined student and teacher perceptions of off-task technology use in the classroom. Whereas students found off-task technology use an issue only when it was distracting to others, teachers expressed concern about the impacts of technology on learning and the responsibility of educators, underlying an innate distrust of technology in the classroom. Canadian researchers who have investigated how students are using technology in French language learning contexts (Calabrich, 2016; Neiterman & Zara, 2019; Lauricella & Kay, 2013; Peters et al., 2011) have found positive student attitudes towards technology, including mobile tools, in the classroom.

The mandatory transition to online platforms resulting from the Covid-19 pandemic has found language teachers in Ontario unprepared to navigate digital learning that capitalizes on the affordances of digital tools. In a study detailing insights on distance learning in Canada before Covid-19, Wotto (2020) highlighted the need for Canadian institutions to catch up to the international stage, suggesting that “m[obile]-learning can be capitalized to enhance quality and access and to help learning and future employability” (p. 276), and calling for increased “[teacher] training geared to the acquisition of renewed skills” (p. 276) to support distance and mobile learning. An Ontario study completed in 2014, found only limited use of pedagogies utilizing social media and gaming across classrooms. The researchers called for digital learning to be built into students’ education in Ontario through initiatives such as a working definition of digital literacy, inclusive technology use, support for teachers’ professional knowledge development and more (Chen et al., 2014).

From a pedagogical standpoint, we argue that FSL and ELL (and other language) teachers have not latched onto mobile technology to create new pedagogies but instead see digital technologies as largely superfluous to language learning: a glossy interface not needed for traditional pedagogical methods. As noted by Lotherington and Jenson (2011) “[w]herever teachers pose them-

selves on this [comfort with digital learning] continuum, it does not define the worlds of others, notably their students, no matter which languages they bring into the classroom” (p. 241).

Like all media, language is inherently multimodal and intermedial (Elleström, 2021). As language teaching moves towards creative plurilingual, multimodal production pedagogies that engage language as dynamic and remixable semiotic resource and practice, rather than a memorized code, the intricate technology-pedagogy-learner relationship is remade. However, 25 years after “A pedagogies of multiliteracies,” we have not yet widely instituted multiliterate language learning in ways that have permeated the capillaries of formal education or even touched the developer sales pitch of language apps; we have not yet realized or widely activated practices of agentic knowledge making: redesign, the forms of situated learning in skilled multimodal practice, where new knowledge and expressive competences are interwoven within meaningful inquiry and making. Rather, critical framing still remains anticipatory of what could be rather than descriptive of what is.

We continue to struggle with the use of digital tools in formal education to enact key principles of “A pedagogy of multiliteracies,” while neoliberal orientations to educational innovation tend to amplify the very forms of education critiqued by the NLG. Sadly, the mobile language app, a site of potential for radically changed agentic and productive language learning, trends to behavioural memorization pedagogies, gamified motivation of discrete vocabulary learning for meaningless in-app points and regurgitation of AI-modelled speech that algorithmically separates languages into structural channels and away from plurilingual possibilities. The NLG’s motivation “to include negotiating a multiplicity of discourses” (1996, p. 61) to account for global cultural flows that have come to characterize superdiverse cities such as Toronto, our home context, and the wildly diversifying textual world mediated by new technologies that must now account for mobile digital learning, was directed to an enduring “why”: *Designing social futures*. This “why” continues to guide our research into mobile language learning via production pedagogies.

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References

- Ahn, L. von, & Hacker, S. (2012). *Duolingo*. <https://www.duolingo.com>
- Albawardi, A., & Jones, R.H. (2020). Vernacular mobile literacies: Multimodality, creativity and cultural identity. *Applied Linguistics Review*, 11(4), 649–676. <https://doi.org/10.1515/applirev-2019-0006>

- Alm, A. (2016, September 30–October 8). *An auto-ethnographic study on the use of apps for language learning* [Paper]. L2DL/AZCALL [L2 Digital Literacies/AZ Computer Assisted Language Learning] 2016, Tucson, AZ.
- Alonso-Yáñez, G., Thumlert, K., de Castell, S., & Jenson, J. (2019). Pathways to sustainable futures: A 'production pedagogy' model for STEM education. *Futures: The Journal of Policy, Planning and Futures Studies*, 108(April), 27–36. <https://doi.org/10.1016/j.futures.2019.02.021>
- Anstey, M., & Bull, G. (2006). *Teaching and learning multiliteracies: Changing times, changing literacies*. International Reading Association.
- Apperley, T., & Beavis, C. (2011). Literacy into action: Digital games as action and text in the English and literacy classroom. *Pedagogies*, 5(2), 130–143. <https://doi.org/10.1080/1554480X.2011.554620>
- Ayedoun, E., Hayashi, Y., & Seta, K. (2015). A conversational agent to encourage willingness to communicate in the context of English as a foreign language. *Procedia Computer Science*, 60, 1433–1442. <https://doi.org/10.1016/j.procs.2015.08.219>
- Berners-Lee, T. (1996). WWW: Past, present, and future. *Computer*, 29(10), 69–77. <https://doi.org/10.1109/2.539724>
- Bezemer, J., & Kress, G. (2008). Writing in multimodal texts: A social semiotic account of designs for learning. *Written Communication*, 25(2), 166–195. <https://doi.org/10.1177/0741088307313177>
- Bezemer, J., & Kress, G. (2016). *Multimodality, learning and communication: A social semiotic frame*. Routledge.
- Bijker, W.E. (2010). How is technology made?—That is the question! *Cambridge Journal of Economics*, 34(1), 63–76. <https://doi.org/10.1093/cje/bep068>
- Blommaert, J. (2013). *Ethnography, superdiversity and linguistic landscapes: Chronicles of complexity*. Multilingual Matters. <https://doi.org/10.21832/9781783090419>
- Bo-Kristensen, M., & Meyer, B. (2008). Transformations of the language laboratory. In T. Hansson (Ed.), *Digital information technologies: Innovations, methods, and ethical issues* (pp. 27–36). IGI Global.
- Boreland, T. (2018). *La didactique de la traduction : une pédagogie technologique* [Unpublished masters thesis]. University of Guelph, ON.
- Bourdieu, P. (1979). Symbolic power. *Critique of anthropology*, 4(13–14), 77–85. <https://doi.org/10.1177/0308275X7900401307>
- Burden, K., Kearney, M., Schuck, S., & Hall, T. (2019). Investigating the use of innovative mobile pedagogies for school-aged students: A systematic literature review. *Computers & Education*, 138, 83–100. <https://doi.org/10.1016/j.compedu.2019.04.008>
- Burston, J. (2014). The reality of MALL: Still on the fringes. *CALICO Journal*, 31(1), 103–125. <https://doi.org/10.11139/cj.31.1.103-125>

- Calabrich, Simone L. (2016). Learners' perceptions of the use of mobile technology in a task-based language teaching experience. *International Education Studies*, 9(12), 120–136. <https://doi.org/10.5539/ies.v9n12p120>
- Campbell, R., & Wales, R. (1970). The study of language acquisition. In J. Lyons (Ed.), *New horizons in linguistics* (pp. 242–260). Penguin.
- Chen, B., Gallagher-Mackay, K., & Kidder, A. (2014). Digital learning in Ontario schools: The “new normal.” Toronto: People for Education. <http://www.peopleforeducation.ca/wp-content/uploads/2014/03/digital-learning-WEB.pdf>
- Cole, D.R., & Pullen, D.L. (Eds.). (2009). *Multiliteracies in motion: Current theory and practice*. Routledge.
- Collins, S.D., DeWitt, J.R., & LeFebvre, R.K. (2019). Hashtag diplomacy: Twitter as a tool for engaging in public diplomacy and promoting US foreign policy. *Place Branding and Public Diplomacy*, 15(2), 78–96. <https://doi.org/10.1057/s41254-019-00119-5>
- Conseil de l'Europe. (2001). *Cadre européen commun de référence pour les langues: Apprendre, enseigner et évaluer*. Didier. <https://rm.coe.int/16802fc3a8>
- Cope, B., & Kalantzis, M. (2004). Text-made text. *E-learning and Digital Media*, 1(2), 198–282. <https://doi.org/10.2304/elea.2004.1.2.4>
- Cope, B., & Kalantzis, M. (2009). “Multiliteracies”: New literacies, new learning. *Pedagogies: An International Journal*, 4(3), 164–195. <https://doi.org/10.1080/15544800903076044>
- Cope, B., & Kalantzis, M. (2015). The things you do to know: An introduction to the pedagogy of multiliteracies. In B. Cope & M. Kalantzis (Eds.), *A pedagogy of multiliteracies: Learning by design* (pp. 1–36). Palgrave Macmillan.
- Crystal, D. (1967). English. *Lingua*, 17(1), 24–56.
- Csikszentmihalyi, M. (1990). *Flow: The psychology of optimal experience*. Harper and Row.
- Cummins, J. (2005). Multiliteracies pedagogy and the role of identity texts. In K. Leithwood, P. McAdie, N. Bascia, & A. Rodrigue (Eds.), *Teaching for deep understanding: Towards the Ontario curriculum that we need* (pp. 68–74). Corwin Press.
- Cummins, J., & Early, M. (Eds.). (2011). *Identity texts: The collaborative creation of power in multilingual schools*. Trentham Books.
- Elleström, L. (2010). The modalities of media: A model for understanding intermedial relations. In L. Elleström (Ed.), *Media borders, multimodality and intermediality* (pp. 11–48). Palgrave Macmillan.
- Elleström, L. (2018). A medium-centered model of communication. *Semiotica*, 224, 269–293. <https://doi.org/10.1515/sem-2016-0024>

- Elleström, L. (2021). The modalities of media II: An expanded model for understanding intermedial relations. In L. Elleström (Ed.), *Beyond media borders* (Vol. 1, pp. 3–91). Palgrave MacMillan. <https://doi.org/10.1007/978-3-030-49679-1>
- Fuchs, C., & Chandler, D. (2019). Introduction: Big data capitalism — Politics, activism, and theory. In D. Chandler & C. Fuchs (Eds.), *Digital objects, digital subjects: Interdisciplinary perspectives on capitalism, labour and politics in the age of big data* (pp. 1–20). University of Westminster Press. <https://doi.org/10.16997/book29.a>
- Gannes, L. (2014, November 3). Why a computer is often the best teacher, according to duolingo's Luis Von Ahn. *Recode*. <https://www.vox.com/2014/11/3/11632536/why-a-computer-is-often-the-best-teacher-according-to-duolingos-luis/>
- Garcia, A., Luke, A., & Seglem, R. (2018). Looking at the next 20 years of multiliteracies: A discussion with Allan Luke. *Theory Into Practice*, 57, 72–78. <https://doi.org/10.1080/00405841.2017.1390330>
- Gee, J.P. (2003). *What video games have to teach us about learning and literacy*. Palgrave Macmillan.
- Gee, J.P. (2007). *Good video games and good learning: Collected essays on video games, learning, and literacy*. Peter Lang.
- Gibson, P.A., Stringer, K., Cotton, S.R., O'Neal, L., & Howell-Moroney, M. (2014). Changing teachers, changing students? The impact of a teacher-focused intervention on students' computer usage, attitudes, and anxiety. *Computers & Education*, 71, 165–174. <http://dx.doi.org/10.1016/j.compedu.2013.10.002>
- Godwin-Jones, R. (2011). Emerging technologies: Mobile apps for language learning. *Language Learning & Technology*, 15(2), 2–11. <http://dx.doi.org/10.125/44244>
- Godwin-Jones, R. (2017). Smartphones and language learning. *Language Learning & Technology*, 21(2), 3–17. <https://dx.doi.org/10.125/44607>
- Gouvernement du Canada. (2018). *Plan d'action pour les langues officielles — 2018–2023: Investir dans notre avenir*. <https://www.canada.ca/fr/patrimoine-canadien/services/langues-officielles-bilinguisme/plan-action-langues-officielles/2018-2023.html>
- Halliday, M.A.K. (1978). *Language as social semiotic: The social interpretation of language and meaning*. Edward Arnold.
- Haque, E. (2012). *Multiculturalism within a bilingual framework: Language, race, and belonging in Canada*. University of Toronto Press.
- Healey, A. (2008). *Multiliteracies and diversity in education: New pedagogies for expanding landscapes*. Oxford University Press.
- Heller, B., & Procter, M. (2012). Embodied and embedded intelligence: Actor agents on virtual stages. In S. Graf, F. Lin, K. McGreal, & R. McGreal (Eds.), *Intelligent and adaptive learning systems: Technology enhanced support for learners and teachers* (pp. 280–292). IGI Global.

- Heller, B., Proctor, M., Mah, D., Jewell, L., & Cheung, B. (2005). Freudbot: An investigation of chatbot technology in distance education. *EdMedia: World conference on educational media and technology* (pp. 3913–3918). Association for the Advancement of Computing in Education (AACE).
- Hern, A. (2021, February 17). Syringes and a flaming heart: iPhone reveals more than 200 new emojis. *The Guardian*. https://www.theguardian.com/technology/2021/feb/17/vaccine-syringe-and-flaming-heart-iphone-reveals-more-than-200-new-emojis?CMP=Share_iOSApp_Other
- Hodge, R., & Kress, G. (1988). *Social semiotics*. Cornell University Press
- Holden, C.L., & Sykes, J.M. (2011). Leveraging mobile games for place-based language learning. *International Journal of Game-Based Learning, 1*(2), 1–18. <https://doi.org/10.4018/ijgbl.2011040101>
- Hymes, D. (1972). On communicative competence. In J.B. Pride & J. Holmes (Eds.), *Sociolinguistics* (pp. 53–73). Penguin Books.
- Iedema, R. (2003). Multimodality, resemiotization: Extending the analysis of discourse as multi-semiotic practice. *Visual Communication, 2*(1), 29–57. <https://doi.org/10.1177/1470357203002001751>
- Jašková, V. (2014). *Duolingo as a new language-learning website and its contribution to e-learning education* [Unpublished master's thesis]. Masaryk University, Brno, Czech Republic.
- Jewitt, C., & Kress, G. (2010). Multimodality, literacy and school English. In D. Wyse, R. Andrews, & J.V. Hoffman (Eds.), *The Routledge international handbook of English, language and literacy teaching* (pp. 342–353). Routledge.
- Jones, R.H. (2021). The text is reading you: Teaching language in the age of the algorithm. *Linguistics and Education, 62*, 1–7. <https://doi.org/10.1016/j.linged.2019.100750>
- Kalantzis, M., & Cope, B. (in press). After language: A grammar of multimodal transposition. In C. Lütge (Ed.), *Foreign language learning in the digital age: Theory and pedagogy for developing literacies*. Routledge.
- Kress, G. (2005). Gains and losses: New forms of texts, knowledge, and learning. *Computers and Composition, 22*(1), 5–22. <https://doi.org/10.1016/j.compcom.2004.12.004>
- Kress, G. R. (2010). *Multimodality: A social semiotic approach to contemporary communication*. Routledge.
- Kress, G., & van Leeuwen, T. (2001). *Multimodal discourse: The modes and media of contemporary communication*. Arnold.
- Kubota, R., & Bale, J. (2020). Bilingualism — but not plurilingualism — promoted by immersion education in Canada: Questioning equity for students for English as an additional language. *TESOL Quarterly, 54*(3), 773–785. <https://doi.org/10.1002/tesq.575>

- Kukulska-Hulme, A. (2009). Will mobile learning change language learning? *ReCALL*, 21, 157–165. <https://doi.org/10.1017/S0958344009000202>
- Lankshear, C., & Knobel, M. (2006). *New literacies: Everyday practices and classroom learning* (2nd ed.). Open University Press.
<https://www.mcgraw-hill.co.uk/openupusa/>
- Lapkin, S., Swain, M., & Argue, V. (1983). *French immersion: The trial balloon that flew*. OISE Press.
- Latour, B. (2005). *Reassembling the social: An introduction to actor-network-theory*. Oxford University Press.
- Lauricella, S., & Kay, R. (2013). Exploring the use of text and instant messaging in higher education classrooms. *Research in Learning Technology*, 21.
<https://doi.org/10.3402/rlt.v21i0.19061>
- Lawson, C. (2008). An ontology of technology: Artefacts, relations and functions. *Techné: Research in Philosophy and Technology*, 12(1), 48–64.
<https://doi.org/techne200812114>
- Leander, K.M., & Burriss, S.K. (2020). Critical literacy for a posthuman world: When people read, and become, with machines. *British Journal of Educational Technology*, 51(4), 1262–1276. <https://doi.org/10.1111/bjet.12924>
- Liu, Y., Holden, D., & Zheng, D. (2016). Analyzing students' language learning experience in an augmented reality mobile game: An exploration of an emergent learning environment. *Procedia-Social and Behavioral Sciences*, 228, 369–374.
<https://doi.org/10.1016/j.sbspro.2016.07.055>
- Liu, Y., & O'Halloran, K.L. (2009) Intersemiotic texture: Analyzing cohesive devices between language and images. *Social Semiotics*, 19(4), 367–388.
<https://doi.org/10.1080/10350330903361059>
- Loewen, S., Crowther, D., Isbell, D. R., Kim, K. M., Maloney, J., Miller, Z. F., & Rawal, H. (2019). Mobile-assisted language learning: A Duolingo case study. *ReCALL*, 31(3), 293–311. <https://doi.org/10.1017/S0958344019000065>
- Lotherington, H. (2011). *Pedagogy of multiliteracies: Rewriting Goldilocks*. Routledge.
- Lotherington, H. (2018). Mobile language learning: The medium is ^not the message. *L2 Journal*, 10(2), 198–214. <https://doi.org/10.5070/L210235576>
- Lotherington, H. (2020, February 18). Why emojis and #hashtags should be part of language learning. *The Conversation*. <https://theconversation.com/why-emojis-and-hashtags-should-be-part-of-language-learning-123943>
- Lotherington, H. (2021). Language in digital motion: From ABCs to intermediality and why this matters for language learning. In L. Elleström (Ed.), *Beyond media borders* (Vol. 1, pp. 217–238). Palgrave MacMillan.
<https://doi.org/10.1007/978-3-030-49679-1>

- Lotherington, H., & Jenson, J. (2011). Teaching multimodal and digital literacy in L2 settings: New literacies, new basics, new pedagogies. *Annual Review of Applied Linguistics*, 31, 26–246. <http://dx.doi.org/10.1017/S0267190511000110>
- Lotherington, H., & Paige, C. (Eds.). (2017). *Teaching young learners in a superdiverse world: Multimodal perspectives and approaches*. Routledge.
- Luke, A., Sefton-Green, J., Graham, P.W., Kellner, D., & Ladwig, J.G. (2017). Digital ethics, political economy and the curriculum: This changes everything. In K.A. Mills, A. Stornaiuolo, A. Smith, & J.Z. Pandya (Eds.), *Handbook of writing, Literacies and education in digital culture* (pp. 251–262). Routledge.
- Luzón, M. J., & Albero-Posac, S. (2020). ‘Had a lovely week at #conference2018’: An analysis of interaction through conference tweets. *RELC Journal*, 51(1), 33–51. <https://doi.org/10.1177/0033688219896862>
- Makoni, S., & Pennycook, A. (2007). Disinventing and reconstituting languages. In S. Makoni & A. Pennycook (Eds.), *Disinventing and reconstituting languages* (pp. 1–41). Multilingual Matters.
- Martin, B. (2017, January). Mobile’s hierarchy of needs: How mobile evolved as the primary tool for the digital omnivore. *comScore*. <https://www.comscore.com/Insights/Presentations-and-Whitepapers/2017/Mobiles-Hierarchy-of-Needs>
- Mills, K.A. (2010). *The multiliteracies classroom*. Multilingual Matters.
- Mitcham, C. (2009). Religion and technology. In J.K.B. Olsen, S.A. Pedersen, & V.F. Hendricks (Eds.), *A companion to the philosophy of technology* (pp. 465–472). Wiley-Blackwell.
- Mondada, L. (2016). Challenges of multimodality: Language and the body in social interaction. *Journal of Sociolinguistics*, 20(3), 336–366. https://doi.org/10.1111/josl.1_12177
- Neiterman, E., & Zara, C. (2019). A mixed blessing? Students’ and instructors’ perspectives about off-task technology use in the academic classroom. *Canadian Journal for the Scholarship of Teaching and Learning*, 10(1). <https://doi.org/10.5206/cjsotl-rcacea.2019.1.8002>
- New London Group (NLG). (1996). A pedagogy of multiliteracies: Designing social futures. *Harvard Educational Review*, 66(1), 60–92. <https://doi.org/10.17763/haer.66.1.17370n67v22j160u>
- Nolan, J., & McBride, M. (2014). Beyond gamification: Reconceptualizing game-based learning in early childhood environments. *Information, Communication & Society*, 17(5), 594–608. <https://doi.org/10.1080/1369118X.2013.808365>
- Norman, D. (1988). *The design of everyday things*. Basic Books.
- Ntelioglou, B.Y., Fannin, J., Montanera, M., & Cummins, J. (2014). A multilingual and multimodal approach to literacy teaching and learning in urban education: A collaborative inquiry project in an inner city elementary school. *Frontiers in Psychology*, 5:553. <https://doi.org/10.3389/fpsyg.2014.00533>

- Ontario Ministry of Education. (2014). *The Ontario Curriculum Grades 9–12: French as a Second Language*.
<http://www.edu.gov.on.ca/eng/curriculum/secondary/fs1912curr2014.pdf>
- Ouellet, M. (1990). *Synthèse historique de l'immersion française au Canada : suivie d'une bibliographie sélective et analytique*. Bibliothèque nationale du Canada.
- Pahl, K., & Rowsell, J. (2005). *Literacy and education: Understanding the new literacy studies in the classroom*. Chapman.
- Pardes, A. (2018, February 1). The wired guide to emoji. *Wired*.
<https://www.wired.com/story/guide-emoji/>
- Peddiwell, J.A. (2004). *The saber-tooth curriculum*. McGraw-Hill. (Original work published 1939).
- Pegrum, M. (2014). *Mobile learning: Languages, literacies and cultures*. Palgrave Macmillan.
- Peters, M., Weinberg, A., Sarma, N., & Frankoff, M. (2011). From the mouths of Canadian university students: Web-based information-seeking activities for language learning. *CALICO Journal*, 28(3), 621–638.
<https://doi.org/10.1558/cj.28.3.621-638>
- Piccardo, E. (2013). Plurilingualism and curriculum design: Toward a synergic vision. *TESOL Quarterly*, 54(3), 600–614. <https://doi.org/10.1002/tesq.110>
- Potts, D. (2013). Plurilingualism as multimodal practice. *TESOL Quarterly*, 47(3), 625–630. <http://www.jstor.org/stable/43268041>
- Prasad, G. (2015). Beyond the mirror towards a plurilingual prism: Exploring the creation of plurilingual 'identity texts' in English and French classrooms in Toronto and Montpellier. *Intercultural Education*, 26(6), 497–514.
<https://doi.org/10.1080/14675986.2015.1109775>
- Rebuffot, J. (1993). *Le point sur ... l'immersion au Canada*. Centre Educatif et Culturel.
- Reinders, H., & Pegrum, M. (2015). Supporting language learning on the move: An evaluative framework for mobile language learning resources. In B. Tomlinson (Ed.), *Second language acquisition research and materials development for language learning* (pp.116–141). London: Taylor & Francis.
<http://hdl.handle.net/10652/2991>
- Rowsell, J., & Walsh, M. (2011). Rethinking literacy education in new times. *Brock Education*, 21(1), 53–62. <https://doi.org/10.26522/brocked.v21i1.236>
- Royce, T. (1999). Synergy on the page: Exploring intersemiotic complementarity in page-based multimodal text. In N. Yamaguchi & W. Bowche (Eds.), *JASFL Occasional Papers*, 1, 25–49.
- Saussure, F. de, Bally, C., Sechehayé, A., Riedlinger, A., & De Mauro, T. (1995). *Cours de linguistique générale*. Payot & Rivages. (Original work published 1916).

- Selber, S. A. (2004). *Multiliteracies for a digital age*. Southern Illinois University Press.
- Sharples, M. (2015). Seamless learning despite context. In L.-H. Wong, M. Milrad, & M. Specht (Eds.), *Seamless learning in the age of mobile connectivity* (pp. 41–55). Springer.
- Stille, S., & Prasad, G. (2015). “Imaginations”: Reflections on plurilingual students’ creative multimodal works. *TESOL Quarterly*, 49(3), 608–621. <https://doi.org/10.1002/tesq.240>
- Street, B. (1984). *Literacy in theory and practice*. Cambridge University Press.
- Thumlert, K. (2015). Affordances of equality: Rancière, emerging media & the new ‘amateurs’. *Studies in Art Education*, 56(2), 114–126. <https://doi.org/10.1080/00393541.2015.11518955>
- Thumlert, K., de Castell, S., & Jenson, J. (2015). Short cuts & extended techniques: Rethinking relations between technology and educational theory. *Educational Philosophy & Theory*, 47(8), 786–803. <https://doi.org/10.1080/00131857.2014.901163>
- Thumlert, K., Owston, R., & Mulhotra, T. (2018). Transforming school culture through inquiry-driven learning and iPads. *Journal of Professional Capital and Community*, 3(2), 79–96. <https://doi.org/10.1108/JPCCC-09-2017-0020>
- Thumlert, K., Smith, B., Hébert, C., & Tomin, B. (2020). Space is the place: Pre-service teachers re/map cartographic landscapes. *Digital Culture & Education*, 12(1), 52–71. <https://www.digitalcultureandeducation.com/volume-12-papers/space-is-the-place-pre-service-teachers-remap-cartographic-landscapes>
- Tonic, J. (2020). Teachers, AI grammar checkers, and the newest literacies: Emending writing pedagogy and assessment. *Digital Culture & Education*, 12(1), 26–51. <https://www.digitalcultureandeducation.com/volume-12-papers/teachers-ai-grammar-checkers-and-the-newest-literacies-emending-writing-pedagogy-and-assessment>
- Toohy, K., Dagenais, D., Fodor, A., Hof, L., Nuñez, O., Singh, A., & Schulze, L. (2015). “That sounds so coool”: Entanglements of children, digital tools and literacy practices. *TESOL Quarterly*, 49(3), 461–485. <https://doi.org/10.1002/tesq.236>
- Unsworth, L. (2001). *Teaching multiliteracies across the curriculum*. Open University Press.
- Vertovec, S. (2007). Super-diversity and its implications. *Ethnic and Racial Studies*, 30(6), 1024–1054. <https://doi.org/10.1080/01419870701599465>
- Wotto, M. (2020). Learning in Canada, the United States, and France: Insights from before Covid-19 secondary data analysis. *Journal of Educational Technology Systems*, 49(2), 262–281. <https://doi.org/10.1177/0047239520940624>
- Wu, J. (2015). A crowdsourcing approach to Chinese vocabulary learning. *Journal of Language Learning Technologies*, 44(2), 43–63. <https://doi.org/10.17161/iallt.v44i2.8543>

- Yarimar, B., & Rosa, J. (2015). #Ferguson: Digital protest, hashtag ethnography, and the racial politics of social media in the United States. *American Ethnologist*, 42(1), 4–17. <https://doi.org/10.1111/amet.12112>
- Ying, L., & Blommaert, J. (2020). Understanding memes on Chinese social media: *Biaoqing*. *Chinese Language and Discourse*, 11(2), 226–260. <https://doi.org/10.1075/cld.20009.lu>
- Zappavigna, M. (2015). Searchable talk: the linguistic functions of hashtags. *Social Semiotics*, 25(3), 274–291. <https://doi.org/10.1080/10350330.2014.996948>