Interactive Technology and Smart Education

Exploring opportunities for language immersion in the posthuman spectrum: lessons learned from digital agents

Heather Lotherington
Faculty of Education, York University, Toronto, Canada

Mark Pegrum
The Graduate School of Education, University of Western Australia, Perth, Australia

Kurt Thumlert
Faculty of Education, York University, Toronto, Canada

Brittany Tomin
Faculty of Education, University of Regina, Regina, Canada

Taylor Boreland
Digital Learning, eCampusOntario, Toronto, Canada, and

Tanya Pobuda
Creative Industries, Toronto Metropolitan University, Toronto, Canada

Received 15 February 2024
Revised 13 June 2024
Accepted 24 June 2024

Abstract

Purpose – Technologically-enhanced language education has shifted from computer-assisted language learning (CALL) to mobile-assisted language learning (MALL), including the use of conversational digital agents, and more recently, towards the use of generative artificial intelligence (AI) large language model (LLM) programmes for language learning purposes. This paper aims to explore the interplay between such posthuman communication and posthumanist applied linguistics, and between digital agents and human agency in response to the increasing permeation of AI in life and learning.

Design/methodology/approach – A core team of four researchers investigated how digital agents could be leveraged to support immersive target language learning and practice, focusing specifically on the

The authors gratefully acknowledge the Social Sciences and Humanities Research Council of Canada for funding this research project and thank York University and The University of Western Australia for supporting the collaborations underpinning the data analysis and final writing. The authors also acknowledge and thank for the helpful guidance of research collaborator, Professor Bob Heller of Athabasca University on conversational digital agents.

Interactive Technology and Smart Education
Emerald Publishing Limited
1741-5659
DOI 10.1108/ITSE-02-2024-0038

conversational AI that pervaded digitally-mediated communication prior to the release of generative AI. Each researcher engaged in a digital autoethnography using conversational agents found in the digital wilds to learn a target second language via digital immersion.

Findings – Through qualitative data analysis of autoethnographic narratives using NVIVO, four key thematic codes characterizing the learning journeys emerged: context, language learning, posthuman engagement and technological parameters. The posthuman learning experiences conflicted with the multisensory, embodied and embedded ethos of posthumanist applied linguistics, indicating that informed human pedagogical agency must crucially be exercised to benefit from the learning potential of posthuman agents. Interactions with conversational agents did provide small-scale, just-in-time learning opportunities, but these fell short of immersive learning.

Originality/value – The methodology and findings offer a unique and valuable lens on the language learning potential of emerging LLM-based generative agents that are rapidly infusing conversational practices.

Keywords Artificial intelligence (AI), Conversational AI, Generative AI, Mobile-assisted language learning (MALL), Posthumanist applied linguistics

Paper type Research paper

1. Introduction

Contemporary language learning is facing a number of linguistic, technological and pedagogical transformations. Firstly, language is changing thanks to digital mediation, global physical and digital mobility and the expansion of artificial intelligence (AI). At the same time, our understanding of language is shifting towards a posthumanist perspective on communication that emphasizes the interconnectedness of humans, tools − including digital platforms − and environments (Pennycook, 2018). Secondly, technology is rapidly evolving, notably due to the rise of AI and its smart interfaces, making language-mediated programmes increasingly available, convenient and ubiquitous. At the same time, awareness is dawning of the embeddedness of such technology, particularly resource-intensive AI, within capitalist profit structures that mine users' data while exploiting human labour and degrading biophysical environments (Crawford, 2021). Thirdly, technologically-enhanced language education has shifted its emphasis from computer-assisted language learning (CALL) to mobile-assisted language learning (MALL), with a growing focus on the potential of conversational digital agents, and more recently towards generative AI large language model (LLM) programmes, to mediate the everyday "digital wilds", which Sauro and Zourou (2019, p. 2) describe as "digital spaces, communities, and networks that are independent of formal instructional contexts", that is, environments where learning, making and doing with digital media are not mediated – or "domesticated" – by institutions, curricular purposes or the priorities and policies of educators or school boards, including the administration of acceptable internet use within institutions.

This article explores the potential for using a variety of conversational digital agents to support personal language learning journeys anchored in everyday environments; it is an exploration of the digital wilds using available digital tools. We queried whether the digital wilds could support an immersive experience parallel to cultural immersion. Given the notoriously behaviouristic designs of MALL, we were not searching for digital drills but for conversational learning opportunities: engaging posthumans agents towards human language learning.

Following the wave of generative AI that ensued from the release of OpenAI's ChatGPT on 30 November 2022, the technology press has begun to distinguish between *conversational AI*, whose software bases were designed to provide help over limited conversational turns on smartphones (e.g. Apple's Siri) and smart speakers (e.g. Amazon's Alexa), and *generative AI*, LLMs that are trained on vast data sets of language in multiple

uses and designed to generate "novel" content in response to user queries (e.g. OpenAI's GPT, Google's Gemini and Meta's LLaMA) (see Brown, 2023; Sridhar, 2023). ChatGPT [1], which caught the world's attention on its release, creates an interface which is both conversational and generative. Our research, conducted during the first winter of the pandemic, focuses on what is currently conceived as conversational AI: *conversational (digital) agents*, and has implications for generative AI operating on conversational interfaces: *generative (digital) agents*. These digital interfaces fall within a spectrum of *posthuman agents* that draw on human data to act semi-autonomously within the posthumanist language landscape. Like other researchers working in this space (e.g. Jeon *et al.*, 2023), we find there is much to be learned from conversational agents about rapidly evolving generative agents.

Informed by Braidotti's (2019) foundational work on posthumanism, and grounded in Pennycook's (2018) theorizing of posthumanist applied linguistics, which suggests "important ways of thinking about language, the individual, context, cognition and communication that open up new avenues for research and education" (p. 2), our inquiry asked the following research questions:

RQ1. Can posthuman conversational agents support immersive language learning in the digital wilds?

RQ2. How do posthuman conversational agents fit within a posthumanist linguistic landscape?

RQ3. Where does communicative agency lie in human interactions with posthuman conversational agents?

Responding to these questions, we report on the autoethnographic journeys of four language learners in three languages (Portuguese, German and French) where learners explored the affordances of various digital resources for target language practice, principally, Apple's Siri as an interlocutor, and non-player characters (NPCs) and in-game help resources in the massively multiplayer online role-playing game (MMORPG), *Bloodstone*. Our posthuman interactions were aided by supportive digital tools, including translation software.

The research was conducted as part of a larger study that was reframed during Covid-19 lockdowns in tune with the pivot from physical classrooms to digitally-mediated learning. The tools selected were socially pervasive conversational agents that we consulted in our daily digital lives: tools we saw as embedded in the digital wilds we inhabited. Our study findings illuminate potential language learning benefits and drawbacks with the selected digital agents.

2. Literature review

2.1 Changing language: towards a posthuman(ist) communication environment

Language usage is changing with the growth of digital communications, particularly those associated with mobile devices, Web 2.0 and social media cultures of instantaneous, informal, multidirectional, multimodal sharing (Lotherington and Bradley, 2024; Pegrum, 2019); the growth of human physical and digital mobility, enhancing the superdiversity of both local geographical spaces and online spaces, where languages, dialects and registers overlap and interpenetrate (Creese and Blackledge, 2018); and more recently, the growth of the AI-enabled Web 3.0 and conversational agents (e.g. Klopfenstein *et al.*, 2017; van Dis *et al.*, 2023).

The way we understand and frame language(s) is also changing, which finds its clearest expression in *posthumanist applied linguistics* (Pennycook, 2018). Building upon a succession of social and critical turns in applied linguistics, posthumanist applied linguistics can be seen as elemental to *posthumanist philosophy*, which seeks to move beyond the limitations of European subject-centred humanism and anthropocentrism (Braidotti, 2019). In posthumanist applied linguistics (Pennycook, 2018), communication is viewed as social, translingual, multimodal and multisensory, and distributed across people, objects, spaces, times and linguacultural traditions (Pegrum, 2019), while humans are seen as closely connected with other people, life forms and the environment (Kukulska-Hulme *et al.*, 2020). Note that *posthumanist*, describing current language usage, is distinct from *posthuman*, describing conversational and generative AI agents, though these developments are contemporaneous.

2.2 Changing technology: towards posthuman(ist) interactions

The past decades have borne witness to rapidly morphing hardware and software: from mainframe computers to personal devices, smartphones to wearables, Web 1.0 to 2.0 to 3.0 and desktop software to mobile apps and cloud-based platforms. The most significant recent changes have been associated with AI and machine learning, in particular deep learning based on artificial neural networks (Kaplan, 2016), giving rise to intelligent computing, including speech recognition, natural language processing and machine translation, all of which feed into today's posthuman conversational agents.

The earliest example of a chatbot − a programme to "hold a text- or speech-based dialogue with people through an interactive interface" (Bendig *et al.*, 2019, p. 3) − was Weizenbaum's ELIZA (Klopfenstein *et al.*, 2017), rolled out in the mid-1960s, and patterned to Rogerian psychotherapy statements (Cristea *et al.*, 2013). Weizenbaum (1966) insisted that ELIZA was not intended to be mistaken for a human, though an *ELIZA effect* has been observed whereby humans anthropomorphize chatbots (Cristea *et al.*, 2013; Hofstadter, 1996). Moreover, people have been observed applying principles of human interactional politeness to computers whether or not there is a vocal interface (Reeves and Nass, 1996).

Chatbots have now transformed into sophisticated commercial bots and smart voice-activated assistants and, more recently, generative agents. Even prior to generative AI, conversational agents had been continually improving at answering human questions and sending us apposite reminders in apparently friendly language. Current rebuilds now include generative AI capabilities (e.g. Perez, 2023; Wiggers, 2023). In the background, technology corporations are exploiting our attention (Berthon and Pitt, 2019), pushing us to create mineable data by posting, tweeting, sharing and liking (Fuchs, 2017; Grimshaw, 2018). Thus, technological advances have occurred in tandem with the rise of platform capitalism (Srnicek, 2016) and surveillance capitalism (Zuboff, 2019).

2.3 Changing language teaching: towards posthuman(ist) pedagogies

The impetus to customize digital technologies for language learning purposes is not new. There has been a long history of CALL (e.g. Levy and Stockwell, 2006; Son, 2014) followed by a more recent history of MALL (e.g. Godwin-Jones, 2017; Stockwell, 2021). Yet CALL and MALL outcomes have often been disappointing; this is seen most notably in commercial language learning apps grounded in outdated pedagogies, which fail to reflect contemporary mobile uses of language and modes of interaction (Lotherington, 2018).

Associated with MALL, recent years have seen growing interest in the language teaching potential of conversational agents (Fryer *et al.*, 2020; Godwin-Jones, 2022, 2023; Kukulska-Hulme, 2019). Until late 2022, this typically involved digital assistants on smartphones or

standalone speakers, allowing humans to communicate while remaining mobile within interior spaces or in vehicles. Such agents provide "models of expert speakers, and, compared to humans, possess infinite patience, allowing for extensive trial and error without judgment" (Godwin-Jones, 2022, p. 126), though it has been noted that they may fail to recognize learners' accents or grammatical constructions. Digital agents have also been found to encourage direct imperatives and unvarying pronunciation, thus nudging learners to reduce their conversational politeness, shift pronunciation towards dominant norms and simplify vocabulary and grammar (Finn, 2017; Pullen, 2017). Moreover, all posthuman agents, including generative AI programmes, e.g. ChatGPT, can misunderstand and factually misinform (Alkaissi and McFarlane, 2023; Kukulska-Hulme, 2019). Nonetheless, there is untapped promise in posthuman conversational exchanges for language learning purposes, and we stand with Godwin-Jones' (2022) recommendation to experiment with digital agent applications.

Going beyond CALL and MALL, recurrent themes in language education research include the value of immersion in target language contexts (Collentine and Freed, 2004) and the importance of encouraging learner agency in self-study settings, e.g. by using mobile devices to access digital tools from multiple locations outside the classroom (Lotherington *et al.*, 2021) in concert with self-directed inquiry. Indeed, students' engagement in dynamic, purpose-driven learning stands in contrast to the passive, behaviouristic learning programmed into many MALL apps (Loewen *et al.*, 2019; Shortt *et al.*, 2023). The notions of immersive and agentive self-study meet CALL and MALL in the concept of informal language learning outside traditional classroom contexts in the digital wilds, where novel language learning opportunities, potentially accommodating plurilingual exchanges, might be forged. So we, as language learners, undertook to investigate interacting with posthuman agents for informal language practice in the digital wilds.

3. Research design

The exploratory study reported in this article was situated within a multistage research project to build mobile production pedagogies for immersive language learning. Our transdisciplinary research community comprised a team of core researchers and a roster of collaborating consultants, spanning three nationalities. The project included a review of changes in digitally-mediated language (Lotherington *et al.*, 2024) and a follow-up survey of language teacher candidates' preferred practices with digital resources (Boreland *et al.*, 2023). The study described here was conducted in preparation for the development of interactive mobile language learning pedagogies, which proved methodologically impossible during the pandemic. Ultimately, however, our Covid-enforced autoethnographic language journeys with digital agents anticipated potential benefits and limitations of language learning now emerging with generative agents, as discussed in the conclusion.

Four researchers in the core team, including two faculty members in Education and two PhD research assistants, conducted coordinated autoethnographic journeys exploring selected digital interlocutors for immersive conversational practice. Autoethnography is "an approach to research and writing that seeks to describe and systematically analyse (graphy) personal experience (auto) in order to understand cultural experience (ethno)" (Ellis *et al.*, 2011, p. 273), leading to documentation of an ethnographic inquiry. Digital ethnography fundamentally includes exploration of digitally-mediated communication and ethnographic methods (Varis, 2016). As an approach, rather than set of techniques, it explores context and contextualization in environments shaped by diverse digital affordances. Both game and phone assistants are digital agents that exemplify the inextricable link between online and offline interaction and activity.

Over the course of two weeks in January–February 2020, the researchers carved out individual digital conversational pathways with selected agents in a target language of personal interest. All were native English speakers with varying histories of language learning both generally and in the target language: Portuguese (N = 2), German (N = 1) and French (N = 1). The primary software explored included Siri, Apple's virtual assistant and NPCs in the MMORPG *Bloodstone*, with support from a variety of online translators and occasional use of the commercial language app, Duolingo.

Writing of the individual autoethnographies was analysed qualitatively, using open coding, consolidation of open coding across team members and fine-grained iterative analysis, supported by NVIVO software (see, for example, Allsop *et al.*, 2022). We proceeded as follows. The core researchers met weekly on Zoom during quarantine isolation; all discussions were recorded and transcribed. After standardizing story reporting, and amalgamating the stories into a data set, each core researcher individually coded the full data set. Via weekly discussions, we compared and commented on individual results. Through successive data-driven coding, we arrived at a unified coding matrix and recoded the full data set using NVIVO software. Interpretation of the results included both core and collaborating researchers, working in person and online.

4. The autoethnographic journeys

This section briefly summarizes the comments of the four core researchers on their autoethnographic digital language immersion experiments in Portuguese (P1; P2), German (G1) and French (F1).

4.1 P1 (Portuguese)

P1 is an English-French bilingual whose background in learning Portuguese has included Duolingo and interactions with Portuguese relatives.

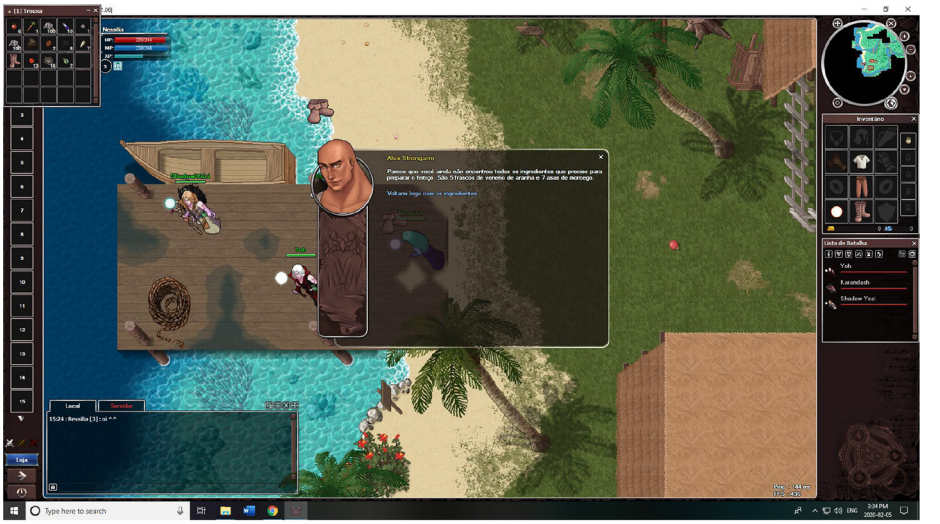
> I explored Siri as a conversational mediator over the course of five conversations in Portuguese: three with my English-Portuguese bilingual partner and two with a relative in Portugal. The conversations lasted 20–30 minutes each over a two-week period.
>
> My immersion experiment began with a self-assessment. In conversation with my partner, I realized that I hadn't remembered as much as I'd hoped from personal interactions and Duolingo study. I turned to Siri as a conversational mediator but soon realized that I didn't have a high enough language threshold level to interact with or manipulate the program for personal communicative purposes. So, Siri was repurposed as an agent of direct translation. This did not go well either:
>
> P1: Siri, how do I say 'I spent all day reading' in Portuguese?
> Siri: *Passei o dia todo lendo.* [I spent all day reading.]
> P1 [to S2]: *Passei o dia todo lendo.* [I spent all day reading.]
> S2: Por que você esta a falar brasileiro? [Why are you speaking Brazilian?]
> P1 [to S2]: I just repeated what Siri told me […] I don't know the difference with pronunciation and Brazilian slang. Siri, what is the word *terminou* in English?
> Siri: I can't translate into English yet.
> P1 [to S2]: How do I say 'what does the word *terminou* mean in English' in Portuguese to ask Siri?
> S2 [to Siri]: Siri, o que terminou significa em inglês? [What does terminou mean in English?]

Siri: I'm not sure I understand.
S2: O que terminou significa em inglês? [What does terminou mean in English?]
Siri: Sorry I missed that. Can you say it again? [Pause.] I'm not sure I understand.
I had switched Siri to Portuguese on my phone to discover that the default variety of Portuguese for both Siri and Duolingo is Brazilian. I hadn't realized how different this was from the variety spoken in Portugal. In any case, Siri was unable to translate from Portuguese into English even after the language settings had been adjusted.
There were positives: from listening to Siri's pronunciation, I could repeat until I was better understood, although I apparently didn't sound like I was from Portugal. But using Siri to learn a language was problematic given the lack of physical cues with a disembodied digital agent. There was also the complication of language power; I defaulted to English as the conversation faltered.

4.2 P2 (Brazilian Portuguese)

P2 is an experienced digital game player who studied Portuguese through Rosetta Stone, Duolingo and cultural immersion in Brazil.

I wanted to improve my Portuguese by using my personal interest in medieval fantasy-style MMORPGs to play a similar game designed for a predominantly Brazilian Portuguese-speaking population, *Bloodstone*, where the game client and NPC scripts are in Portuguese. I immersed myself in *Bloodstone* over a 2-week period, with two hours dedicated to exploring the website and eight hours to playing the game. The gameplay occurred in two 1-hour blocks and two 3-hour blocks.
Bloodstone uses a guild system, through which players can connect with each other and team up. It has a website that provides instructional support and an in-game tutorial area but my tutorial gameplay was slow, given my emphasis on L2 learning/comprehension plus notetaking, so my immersion experience took place in the instructional part of the game world. I did not engage much with other human players, mostly focusing on understanding quest details and the underlying game *lore* or backstories. I also relied heavily on a voice-activated translation app.
I created a character (Nessilia [P2]), and began playing in *Bloodstone*'s in-game tutorial area. The playable tutorial phase features pop-ups in Portuguese on first login, and symbols/icons drawing your focus to different parts of the client, such as an arrow pointing to your character's backpack, and colored outlines around inventory slots. The visual aspects are supported by text-based instructions (see Figure 1).
I misunderstood the part of the tutorial that instructed me to speak to a particular NPC to find a weapon. The NPCs require specific prompts in order to give the correct line of dialogue; without the exact words, there is no way to progress. After going around in circles, I decided I was lost and had to default to another human player for help (Speaker 2 [S2]), attempting to explain my problem in Portuguese:



Source: Figure by authors

Figure 1. P2 [Nessilia] engaging with an NPC in Bloodstone

P2: *oi* [hi]
S2: *opa* [hi]
P2: *voce ajudar pra mim?* [can you help me?]
P2: ???????????
P2: *desculpe, eu e canadense e eu e jogar por apprendir portugues* [sorry, I am Canadian and I am playing to learn Portuguese]
P2: *muito dificil* [very difficult]
S2: yehh, very hard

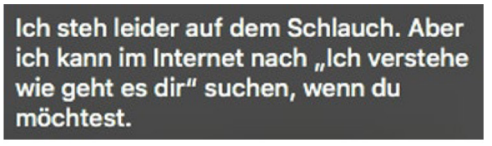
It was clear to Portuguese-speaking players that I was not a fluent user of Portuguese, and once I told them where I was from, players started using English with me (with varying degrees of fluency). While this made it easier for me to figure out how to play, it negatively impacted the immersion experience. Even when I stated I was playing to learn Portuguese, players still used English.

I expected signs and vocabulary items in the game world to be context-appropriate, but this wasn't always the case. I found myself stuck when engaging with NPCs unless I knew the exact word to use to prompt the next line of instruction, which forced me to turn to other players instead of engaging exclusively with NPCs and other game features. Playing the game with access to English instructions made me consider how flexible contexts shape language learning experiences. My partner didn't have the option of switching game clients to Portuguese, and so was forced to learn English in order to play. This suggests that for English speakers, games and other media are only as target language-immersive as the player chooses.

4.3 G1 (German)

G1 learned German as well as Polish through both formal schooling and, more successfully, cultural immersion, applying self-study methods.

> The goal of this experiment was to immerse myself in the target language through conversation with Siri in order to refresh my German language knowledge and to test the AI "rules of the game", as programmed in this help software. I spent four or five 30-plus minute sessions and one extended driving session using German with Siri.
>
> My experience attempting immersive conversations was endlessly frustrated. Given Siri's minimal conversational memory, any attempt to continue a conversational thread was quickly thwarted. Siri used confusing expressions, failed to understand my questions and could not maintain a logical course of interaction. Interactions were reduced to the most utilitarian of transactions. Eventually I ended up trying to "game" (rule-test) Siri with a proposal of marriage, compliments, and cries for help, to which Siri could only offer web links or help numbers, with algorithmic expressions of generic and unconvincing pity (*Mitleid*).
>
> Over several attempts, I tried to converse with Siri about Goethe, which Siri consistently misunderstood as *Götter* [gods], replying variously that this was a big mystery and whereas people have religion, Siri has silicon. I did, however, learn a new word: *Silizium* [silicon]. In a more successful exchange, I learned the idiomatic phrase *Ich steh leider auf dem Schlauch*, which translates literally to "I stand, unfortunately, on the hose," meaning "I don't get it" (see Figure 2). I also learned, after addressing Siri using *Sie* (formal *you*), that Siri "preferred" *Du* (informal *you*); the request that I use the informal, conversational form was ironic, given Siri's systematic inability to engage in chatty conversation.
>
> Siri could be provoked into generating simple sentences providing contextual clues for understanding new vocabulary and observing grammar rules. However, engaging with Siri proved frustrating, except when I activated the iPhone map directions in my car and, to my surprise, Siri started directing me in German. The driving instructions, situated in the context of action and spatial cues, were the closest I came to being immersed in German, as words, things and actions coalesced.
>
> Despite my frustrations, Siri forced me to articulate more clearly through constant repetition, and attempted to compensate for my unclear or halting speech with a voice



Source: Figure by authors

Figure 2. Siri is standing on the hose. [I don't get it. But I can search the internet for *"I understand how are you" if you would like.]

translation algorithm. While pronunciation improvement was the most demonstrable outcome, I also refreshed my German vocabulary, learned new words including idioms, and by observing sentence-level context clues, got reacquainted with grammar rules. Perhaps the most useful aspect of Siri was that I was prompted to go elsewhere, including German websites and online translation apps like Google Translate, to figure out idioms or pursue emergent inquiries.

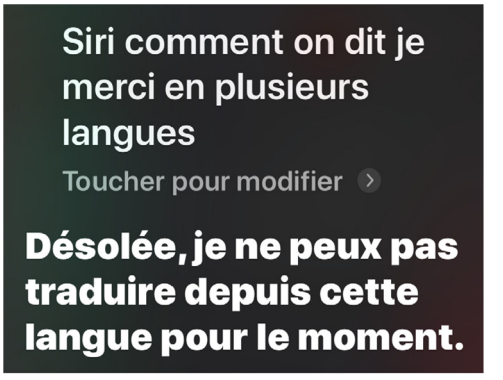
4.4 F1 (Canadian French)

F1 lived in bilingual communities as a teenager, studied French at school, and periodically took adult classes. F1 has also studied other languages formally and through cultural immersion.

My aim was to explore the potential of immersion in the digital wilds using Siri as interlocutor in French conversations. I hoped to improve my fluency and accuracy. My experiment talking with Siri daily took place over two weeks.

I turned the default language on my iPhone to Canadian French so that help functions and spoken notifications, as well as Siri's wake-up words, were automatically in French. This forced me to use French for everyday functions though I tended to avoid asking difficult questions of Siri, which admittedly defeated the purpose.

I seemed to mostly fail at getting Siri to understand me. If I hesitated, Siri tried to fill in the blanks, which I could see because Siri "writes and speaks" at the same time. Software programs do not think, they pattern-match, so conversation with Siri required a degree of pronunciation and grammatical accuracy that would be unrealistic for beginning language learners. Upon asking Siri how to say thank you in a variety of languages which, curiously, was ungrammatically transcribed to accommodate my hesitations, I got a response, even if it was a negative one: "Sorry, I cannot translate from this language at the moment" (see Figure 3).



Source: Figure by authors

Figure 3. Siri is sorry [*Siri how does one I say thanks in several languages/Touch to modify/ Sorry, I cannot translate from this language at the moment.]

My questions to Siri often dead-ended. On my third try to get a piece of information from Siri in French, with Siri continually misinterpreting my input, Siri replied "*coucou*". Google Translate indicated *coucou* meant "hello" (not in Canada), as well as "imbecile, idiot". Siri, built for native speakers of a variety of French seemingly other than Canadian, did eventually interpret my request, but this led to renewed questions about the target language threshold needed to work a voice-activated program and highlighted the inauthenticity of having to mimic Siri's algorithmically correct pronunciation (not to mention lexicon) in order to ignite a conversation. Siri's repeated failure to understand me led me to doubt my pronunciation. "Sorry, I didn't get that" is hardly encouraging for learners trying to form a question in a target language and needing support.

While I did benefit from increased passive exposure to French, which popped up unexpectedly after Siri "learned" to use French with me and thereafter announced phone calls *en français*, I was foiled in attempts to get any extended interaction with Siri as a "conversational" agent.

5. Analysis and discussion

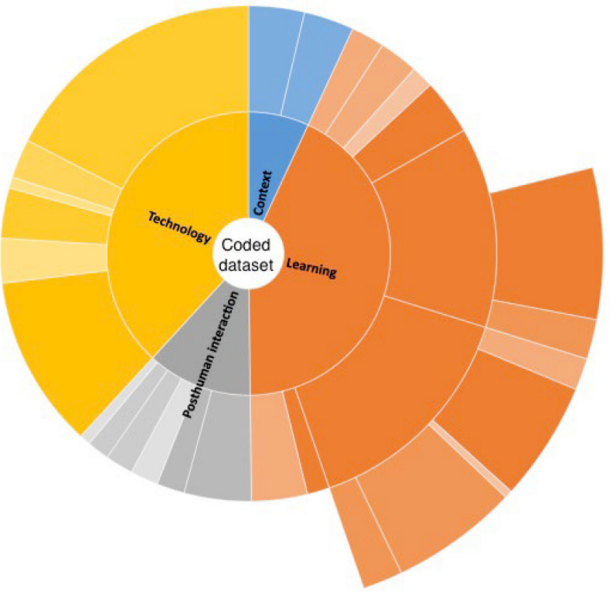
In this section, we explore the four overlapping macro-themes that emerged from our collaborative coding process of the full data set − *context*, *language learning*, *posthuman engagement* and *technological parameters* − and the threads crosscutting these themes. The data were coded using NVIVO; the resultant codes and subcodes are shown in Figure 4. Given that *technological parameters*, coded in short form as *technology*, documented the software we used in addition to other technological parameters, the central importance and richness of *learning*, including the subcoded areas in the "fishtail", can be seen at a glance. The implications of our experiences with conversational agents for emerging language learning practices with generative AI programmes are discussed in the conclusion, following our analysis.

5.1 Theme 1: context

Contex.t was coded simply in terms of facilitating or impeding language learning (see Figure 5). However, context in digital and, particularly, mobile use proved to be complex, encompassing interwoven physical and digital dimensions, including local time and geographical space as well as the global, "timeless time" and "space of flows" into which users connect (Castells, 2013). Accordingly, it included the affordances (and limitations) of hardware, software and network connectivity, online and offline support and interactions with digital and physical environments, ranging from in-game settings to driving a car.

A facilitating context is obviously instrumental to effective language learning. The programmed nature of digital contexts undermined the language varieties sought by P1, who discovered that Siri and Duolingo systematically defaulted to Brazilian Portuguese, offering no other variety, nor any translation layer in Siri's case, and by F1, whose French Canadian Siri used idiomatic continental French. Neither disembedded digital agents nor game-embedded NPCs were equipped with topic memory beyond an immediate problem-solving response (G1; F1; P2), and for P2, exact words were sometimes needed to trigger needed information, so conversational turns were, by default, linguistically, logically and socially discontinuous.

Disembodied agents, by definition, have no facial expressions or gestures to support communication paralinguistically (cf. P1; P2). Decontextualized cues, hints and NPC encounters (P2) limited the inherent potential of gameplay to co-locate new vocabulary items



Source: Figure by authors

Figure 4. Coded data set

Source: Figure by authors

Figure 5. Coding of context

in contexts of use and make clear *situated meanings* (Gee, 2003). Nonetheless, impasses that required follow-up help or translation directed us all to explore wider digital and human ecologies, so a negative digital context sometimes, counterintuitively, piqued further inquiries and learning.

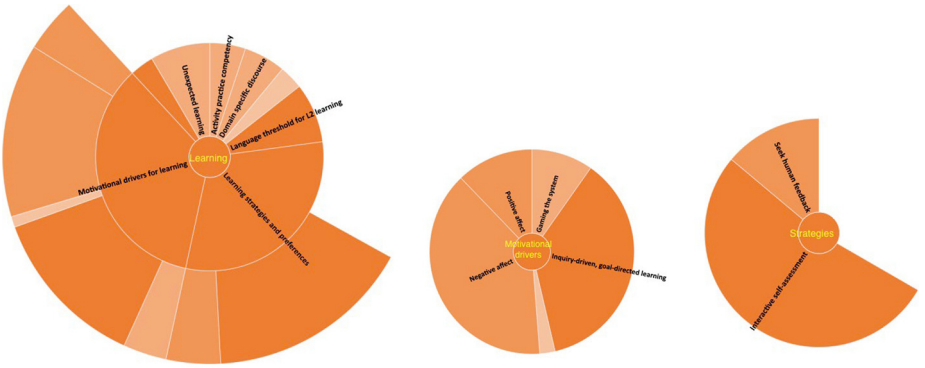
Contextual hindrances in wider physical environments included low bandwidth, which could interrupt participation in an MMORPG, and a noisy setting, which foiled being "understood" by Siri. Interestingly, our most successful learning was situated within physical environments that provided natural, practical context clues, e.g. driving instructions (G1) via smartphone GPS satellite connection. Overall, our interactions with conversational agents were far removed from the embedded, embodied ethos of posthumanist language use (Pennycook, 2018).

5.2 Theme 2: language learning

Language learning, coded as *learning*, yielded a richly layered thematic code, comprising varied *motivational drivers for learning*, positive and negative*; learning strategies and preferences;* problems, including *target language threshold*, *domain-specific language requirements* (important in gaming) and *activity competency;* and *unexpected learning* (see Figure 6).

Obstacles to learning were pervasive. We had to work within conversational agents' databanks of stock replies (P2), restricted topic memories (G1; F1) and narrow pronunciation comprehension and production range (P1; G1). This limited language–culture orientations, contextual support (Theme 1) and human–posthuman engagement (Theme 3) thanks to algorithmic inflexibility (Theme 4). Designed for proficient speakers, neither Siri nor NPCs had the facility to adjust their language for learners as would sensitive human interlocutors and, certainly, teachers.

There were mitigated successes. We associatively learned and then researched Siri's quirky databank replies, e.g. Siri's atypical use of "*coucou*", translating as both *hello* and *idiot* (F1), and the idiomatic "*Ich steh leider auf dem Schlauch*" (G1). To overcome the inherent gatekeeping limitations of Siri's phonetic programming, a shortcoming in conversational agents' comprehension systems noted by Godwin-Jones (2023), P1 and G1 were forced to enunciate more carefully, effectively improving their pronunciation. But whose agency determined the target pronunciation standards (see Themes 3 and 4)?



Notes: Subcodes with minimal data identified but not labelled on this NVIVO visualization include: embodied learning and target language history and also, within the subcode motivational drivers, language and identity
Source: Figure by authors

Figure 6. Coding of language learning

We had expected posthuman agents to be able to provide language help; this was seldom the case, so we turned to available human help when stymied (P1; P2). We exploited translation software for just-in-time learning and self-assessed assistance needs. Faced with Siri's transactional as opposed to conversational programming, G1 "gamed" the app for humorous replies, reasserting human agency while exploring system rules and boundaries.

In the context of *Bloodstone*, programmed NPCs required specific lexical input to respond meaningfully in the target language, based on the closed-ended, decision-tree logic of common NPC designs. While NPCs were not perceived to support language immersion in this particular game experience, the MMORPG provided P2 with a significant community resource within and outside the game − effectively, a paratext which could serve as a site of self-directed language learning (Walsh and Apperly, 2012). Tools like Siri could only awkwardly activate self-directed inquiry, not stimulating curiosity or interest in any sustainable, meaningful way.

Ultimately, our problems led to informative learning experiences, especially on the meta-level of *how to learn languages* with digital agents. Our teaching backgrounds and past language learning experiences emerged as critically important as we self-identified learning gaps and recalibrated strategies. Pedagogical understanding, an exploratory disposition and a willingness to leverage a wider network of linguistic resources emerged as prerequisites for human language learners to assert agency *vis-à-vis* the digital agents we engaged with. For non-teachers, this speaks to the importance of adequate learner preparation prior to embarking on learning journeys in digital spaces (Palalas and Hoven, 2016; Stockwell, 2021).

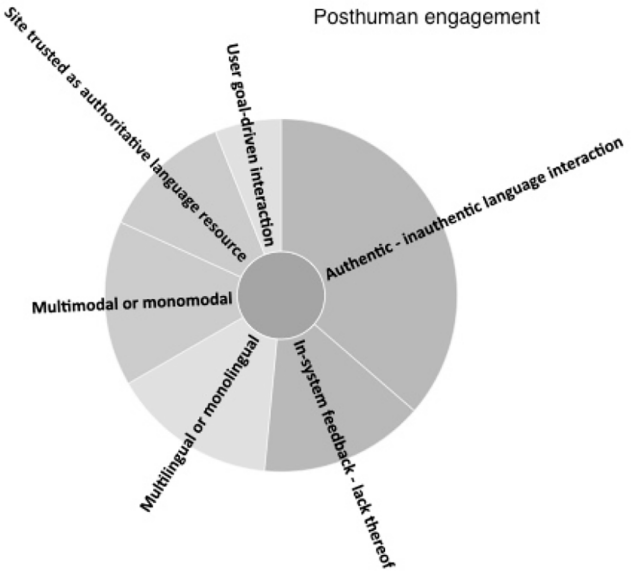
5.3 Theme 3: posthuman engagement

Posthuman engagement, which encapsulated human agency versus algorithmic programming, encoded *user goal-driven interaction*; *authenticity* of language use; *linguistic authority* regarding correctness and social appropriateness; and *in-system feedback*, referencing the quality and appropriateness of programmed replies (see Figure 7). Monolingual programming and limited modality, both indicating algorithmic inflexibility (Theme 4), were coded as separate categories, given our language learning focus.

In response to the critical question of who or what directed, constrained or terminated conversational interactions, the balance consistently tipped towards digital agents. We defaulted to what we could say so the software would "understand" us and, in cases of limited in-system feedback, resorted to online translation tools (P2; G1; F1) and occasional human support (P1; P2). We implicitly, if naively, trusted the programs we consulted. As already briefly suggested (see Theme 2), this begs questions about *linguistic authority* and the agency to exercise it: who determines the language "standards" – whether pronunciation, idiomatic usage or translations – of posthuman agents? It equally anticipates questions about *rhetorical authority*, given that digital agents often sound authoritative − an issue that becomes even more pressing with generative AI (see Conclusion) − but, in fact, have no built-in basis for truth or factuality, ethical compass or lived experience of the human world.

Limited *in-system feedback* foiled expectations of conversational *authenticity*, as seen in Siri's sometimes inauthentic idiomatic usage (F1) or prepackaged empathizing (G1), which led to bewilderment, frustration or laughter. This should come as no surprise: authentic uses of idioms or expressions of empathy rely on an understanding of context, both conversational and real-world, neither of which are accessible to posthuman conversational agents.

Plurilingual interaction, which is possible in the digital wilds and offers support for language learners, was undermined by conversational agents' programmatically monolingual and modally limited databases. The tendency to default to English indexed a



Source: Figure by authors

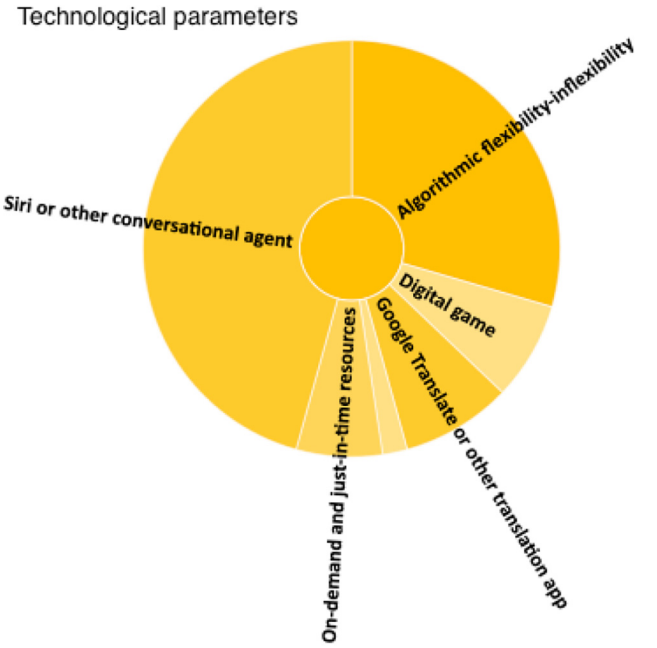
Figure 7. Coding of posthuman engagement

powerful bias, both human and posthuman (P1; P2), which was also reflected in Siri's translation capabilities: while English-speaking Siri could translate into different languages (P1), the same facility was not available vice versa (P1; F1). Overall, notwithstanding small-scale learning successes, the digital agents studied offered quite limited *posthuman engagement* for language learning.

5.4 Theme 4: technological parameters

Theme 4 documented the conversational agents, games and mobile support software we accessed in our explorations and captured technological parameters that interconnected with posthuman engagement, notably *algorithmic flexibility–inflexibility* and *on-demand and just-in-time resources* (see Figure 8).

A factor threading across Themes 1, 2 and 3 was *algorithmic inflexibility.* Braidotti (2019) points to the familiar gatekeeping *I'm not a robot* in reCAPTCHA as an example of having to prove one's humanity against a central reference of algorithmic computational culture. In our study, posthuman algorithmic inflexibility was pervasive across both Siri and NPCs, frustrating learner agency. The internet transcends terrestrial nations, but conversational agents manage language varieties according to their programming biases (P1; F1). Apart from speaking robots, conversational agents are disembodied, so can offer no paralinguistic clues (P1). They are socially decontextualized and have no emotions, so lack a base for conversational appropriacy and impart stock replies when words trigger a need for emotionally nuanced responses (G1). Moreover, the agents we accessed lacked topic memory across turns, having been designed to support simple help requests (P1; P2; G1; F1).



Notes: The thin unlabelled slice was for Duolingo, which was consulted sparingly in one case
Source: Figure by authors

Figure 8. Coding of technological parameters

Nonetheless, algorithmic inflexibility did make space for judgement-free repetition and self-testing towards improved pronunciation (P1; G1), and even inspired unintended learning as we tried to make sense of socially awkward replies (G1; F1). Online translation resources were useful for on-demand support when inquiries or curiosities emerged out of interactions (P1; P2; G1; F1). This suggests that flexibility derives less from individual software programmes than from the learner developing an ecology of resources and the know-how to access various on-demand supports. It is important for language teachers to recognize this to capably guide learners through the potholed terrain of digital language learning tools.

Significantly, the macro-context of the digital wilds proved far less "wild" than we had initially anticipated on the platforms our team explored. Since the heyday of Web 2.0 startups, the digital wilds have been increasingly fenced in by expanding technology corporations mining users' interactions for profit (Fuchs, 2017). Indeed, a key purpose of conversational digital agents (though not NPCs) is to learn from us, thus improving their underlying algorithms and honing the monetization of their functions. Conceivably, Siri learned more from our interactions than we did.

6. Conclusion

Our research explored the possibility of immersive target language learning and practice with selected conversational digital agents that team members consulted in daily life. Our

aim was to explore available tools in the digital wilds, as conceptualized by Sauro and Zourou (2019), that could be co-opted for immersive language learning.

6.1 What we learned about conversational digital agents

It is important to note at the outset that NPCs have different capacities from phone help agents, though both are posthuman interlocutors. Our first research question, "Can posthuman conversational agents support immersive language learning in the digital wilds?", revealed that across our digital autoethnographic journeys we experienced marginal gains in pronunciation, vocabulary acquisition and idiomatic knowledge, thanks in part to the capacity of digital agents for tireless repetition, but we categorically failed in attempts to engage any digital agents in sustained conversations. (This shortcoming, though, has been addressed in generative AI programmes.) On the other hand, researchers using digital agents in real-world settings where physical actions were required encountered meaningful and practical just-in-time language input: immersive applications included driving with German navigation (G1), and attending to phone announcements in French (F1), though neither situation permitted interactive conversation.

In short, digital agents can play a supportive role as a component of language learning. However, their database lacunae, restricted comprehension of learner pronunciation and/or lexis and limited topic memory all undermine the possibility of immersive conversational learning. Moreover, their confinement within heavily surveilled corporate reserves limits the extent to which they can be viewed as part of the digital "wilds".

Our second question, "How do posthuman conversational agents fit within a posthumanist linguistic landscape?", revealed a poor fit. Posthuman agents' DNA is binary code, rooted in algorithmic patterns abstracted from the messy embodiment and experiential socialization which shape human language use. Halliday (1993) considered "a natural language [to be] a theory of experience" (p. 108), explaining that "meaning is at once both doing and understanding" (p. 100). The "natural language processing" of digital agents is far from the natural, the particular or the lived. By contrast, posthumanist applied linguistics is grounded in an ethos of communication which is multisensory, fully embedded in local contexts and dependent on an interwoven web of people, other life forms, objects, experiences, spaces and times (Pennycook, 2018). The internationalized, standardized, disembedded and disembodied posthuman agents engaged with constitute at best one element of such a communicative environment.

Our final question, "Where does communicative agency lie in human interactions with posthuman conversational agents?", highlighted the fine line between humans using a digital assistant for human-designed purposes, and humans submitting to technologically determinist programming. We were readily ensnared in the ELIZA effect (Hofstadter, 1996), anthropomorphizing posthuman agents, assuming that they were trustworthy and that our interactions were linguistically authentic. Yet trusting software as a linguistic (or epistemic) authority is hazardous. We are not privy to the qualifications, purposes or assumptions of the programmers, and the direct-to-consumer model of the digital marketplace skirts professional quality control measures and democratic governance (Lotherington *et al.*, 2024); perhaps even more importantly, neither we nor the programmers are privy to the full functioning of the black box algorithms developed through machine learning from large data sets (Pasquale, 2015). Bots (though not NPCs) are language learners too, learning from us as much as − if not more than − we learn from them to improve their underpinning algorithms. Siri (and Alexa, etc.) are ultimately agents of extractive capitalism (Grimshaw, 2018), mining earthly resources for their production and operation and mining human cultural and conversational resources for their data.

In summary, we found the embedded, embodied ethos of posthumanist language use (Pennycook, 2018) to stand in stark contrast to the largely abstract, context-free linguistic ethos of the posthuman conversational agents we explored. It is vital for humans to develop *AI literacy* (Miao and Holmes, 2021; Pegrum *et al.*, 2022), also called critical algorithmic literacies (Dasgupta and Hill, 2021; Thumlert *et al.*, 2022), to ensure we keep a critical eye on technological opacity and corporate imbrication, and to direct technological tools in ways that optimally support human learning purposes. Teachers as language learners have key advantages here, being well-placed to prepare learners to exercise the pedagogical agency essential for maximizing the sporadic language learning support provided by posthuman conversational agents, while bearing in mind their misalignment with the posthumanist linguistic ethos.

6.2 What conversational agents can teach us about generative agents

As MacKenzie and Wajcman (1999, p. 1) explained, "technologies change, either because of scientific advance or following a logic of their own; and they then have effects on society". Since late 2022, the emergence of generative AI programmes using conversational interfaces, e.g. ChatGPT, has changed public expectations of posthuman communication. Although based essentially on sophisticated pattern matching and functioning as "stochastic parrots" (Bender *et al.*, 2021, p. 610), generative AI chatbots create an illusion of near-sentient intelligence. Underpinned by vastly larger databases than conversational agents, LLM-based generative agents support greater topic memory, flexible interpretation of user input, plurilingual processing and translation, multimodal interaction and are increasingly accessible through voice interfaces. In the present, this has already opened up an array of language learning possibilities including target language conversations, with generative agents able to take on the role of Socratic tutors, an approach currently being explored by the likes of the Khan Academy and Duolingo in its Max subscription version. On the horizon are revamped digital assistants like Siri or Alexa, updated with generative AI capacities (e.g. Perez, 2023; Wiggers, 2023), as well as NPCs capable of responsive, on-the-fly, procedurally-generated conversations that are potentially more supportive of language learning (Papp, 2023). Nonetheless, while generative agents appear to have solved the short topic memory, limited lexical and pronunciation acceptance and conversational breadth problems of earlier conversational agents, a closer look reveals that many of the issues we identified with conversational agents remain pertinent; some are exacerbated. Our experiences offer a cautionary tale.

Regarding our first macro-theme, *context*, generative agents demonstrate substantial improvements over conversational agents in large part because their conversational memory extends over multiple turns. Nonetheless, generative agents remain disembodied (despite growing multimodal input and output options), disembedded (despite users being able to supply contextual details manually in their prompts) and disconnected from any real-world knowledge or experience. Meanwhile, the bandwidth requirements of generative agents render questions of technology access more problematic than with conversational agents.

Regarding our second macro-theme, *language learning*, generative agents show much greater flexibility than conversational agents in interpreting and responding to user input, adjusting language to user levels (especially if prompted to do so), handling language varieties and providing language support and correction on demand. Furthermore, generative agents enable users to converse on topics of interest where domain-specific vocabulary might be situationally engaged. However, researchers have questioned the linguistic and cultural biases inherent in programmes like ChatGPT (Walker-Rettberg, 2022), not to mention the plagiarism detection software that has sprung up to police its use by students (Liang *et al.*, 2023). It remains essential to approach all posthuman agents with informed pedagogical and

critical understanding to use such tools effectively as part of a comprehensive ecology of language learning resources.

Regarding our third macro-theme, *posthuman engagement*, generative agents are increasingly being programmed towards greater facility with multiple languages and can shuttle more easily between them than monolingual conversational agents. Yet all generative AI is subject to linguistic, gender, sexual, racial and other biases baked into the historical data sets drawn on (Bender *et al.*, 2021; Leaver and Srdarov, 2023). Concerns over linguistic and epistemic authority therefore not only remain, but are intensified, since generative agents can "hallucinate" (Alkaissi and McFarlane, 2023; Sharples, 2023) factual-sounding false data couched in a confident rhetorical authority that has neither linguistic nor real-world referents.

Regarding our fourth macro-theme, *technological parameters*, generative agents offer greater algorithmic flexibility, contextualization and multilingual support than conversational agents, though superficial flexibility may mask database fixities: even programmers have little insight into what is going on inside their black box algorithms. Most ICT technologies are implicated in platform capitalism; this is entrenched in AI with its "extractive politics" (Crawford, 2021). AI is extraordinarily expensive to develop and run, with the costs borne by users, labourers and the environment (Bender *et al.*, 2021; Leaver and Srdarov, 2023). Wittingly or unwittingly, all of us are a source of free labour for AI, which blithely scrapes our published online data to inform its algorithms and learns from us each time we interact with it. Asking critical questions of our devices, and balancing costs against benefits when considering educational and wider uses, has never been more urgent.

To briefly revisit our research questions: generative agents have better potential for supporting immersive language learning but, like conversational agents, remain disconnected from real-world contexts. They are dependent on unknowable algorithms that mine biased data sets and entail development and operational costs far removed from idealistic conceptions of digital wilds. Like conversational agents, generative agents are, at best, one (albeit literally more generative) component of our wider posthumanist linguistic landscape, which they can supplement but in no way supersede. AI is sophisticated black box programming, not artificial humanity.

Agency remains a vexed question: what is certain is that educators must help students develop the pedagogical expertise, coupled with AI literacy, to use all available technologies in critical and self-directed ways. Only thus can we as humans retain a measure of agency over our posthuman agents.

Lastly, though the digital agents we investigated have been superseded by more conversationally generative agents, our findings remain broadly applicable to the project of developing immersive language learning and practice opportunities with posthuman agents. Going forward, we invite research which retools and expands our autoethnographic experiment to include next-generation AI, while bearing in mind the lessons of first-generation AI.

Note

1. Also see for example Anthropic's Claude, Microsoft's Copilot and Google's Gemini.

References

Alkaissi, S. and McFarlane, S.I. (2023), "Artificial hallucinations in ChatGPT: implications in scientific writing", *Cureus*, Vol. 15 No. 2, pp. 1-4, doi: 10.7759/cureus.35179.

Allsop, D.B., Chelladurai, J.M., Kimball, E.R., Marks, L.D. and Hendricks, J.J. (2022), "Qualitative methods with Nvivo software: a practical guide for analyzing qualitative data", *Psych*, Vol. 4 No. 2, pp. 142-159, doi: 10.3390/psych4020013.

Bender, E.M., Gebru, T., McMillan-Major, A. and Shmitchell, S. (2021), "On the dangers of stochastic parrots: can language models be too big?", *FAccT'21: Proceedings of the 2021 ACM Conference on Fairness, Accountability, and Transparency, Virtual Event, Canada*, pp. 610-623, doi: 10.1145/3442188.3445922.

Bendig, E., Erb, B., Schulze-Thuesing, L. and Baumeister, H. (2019), "The next generation: chatbots in clinical psychology and psychotherapy to foster mental health – a scoping review", *Verhaltenstherapie*, Vol. 32 No. Suppl. 1, pp. 1-13, doi: 10.1159/000501812.

Berthon, P.R. and Pitt, L.F. (2019), "Types of mindfulness in an age of digital distraction", *Business Horizons*, Vol. 62 No. 2, pp. 131-137, doi: 10.1016/j.bushor.2018.10.003.

Boreland, T., Lotherington, H., Tomin, B. and Thumlert, K. (2023), "The use of digital tools in French as a second language teacher education in Ontario", *TESL Canada Journal*, Vol. 39 No. 2, pp. 1-37, doi: 10.18806/tesl.v39.i2/1375.

Braidotti, R. (2019), *Posthuman Knowledge*, Polity Press, Cambridge.

Brown, R. (2023), "A complete guide: Conversational AI vs. generative AI", Data Science Central, available at: www.datasciencecentral.com/a-complete-guide-conversational-ai-vs-generative-ai/

Castells, M. (2013), *Communication Power*, Oxford University Press, 2nd ed, Oxford.

Collentine, J. and Freed, B.F. (2004), "Learning context and its effects on second language acquisition: Introduction", *Studies in Second Language Acquisition*, Vol. 26 No. 2, pp. 153-171.

Crawford, K. (2021), *Atlas of AI: Power, Politics, and the Planetary Costs of Artificial Intelligence*, Yale University Press.

Creese, A. and Blackledge, A. (Eds), (2018), *The Routledge Handbook of Language and Superdiversity: An Interdisciplinary Perspective*, Routledge, Abingdon.

Cristea, I.A., Sucala, M. and David, D. (2013), "Can you tell the difference? Comparing face-to-face versus computer-based interventions. The 'Eliza' effect in psychotherapy", *Journal of Cognitive and Behavioral Psychotherapies*, Vol. 13 No. 2, pp. 291-298.

Dasgupta, S. and Hill, B. (2021), "Designing for critical algorithmic literacies", MIT Press: Works in Progress, available at: www.wip.mitpress.mit.edu/pub/designing-for-critical-algorithmic-literacies/release/1

Ellis, C., Adams, T.E. and Bochner, A.P. (2011), "Autoethnography: an overview", *Historical Social Research*, Vol. 36 No. 4, pp. 273-290, doi: 10.17169/fqs-12.1.1589.

Finn, E. (2017), *What Algorithms Want: Imagination in the Age of Computing*, MIT Press, Cambridge, MA.

Fryer, L.K., Coniam, D., Carpenter, R. and Lăpușneanu, D. (2020), "Bots for language learning now: current and future directions", *Language Learning and Technology*, Vol. 24 No. 2, pp. 8-22, doi: 10125/44719.

Fuchs, C. (2017), *Social Media: A Critical Introduction*, Sage, 2nd ed, London.

Gee, J.P. (2003), "What video games have to teach us about learning and literacy", *Computers in Entertainment*, Vol. 1 No. 1, Palgrave Macmillan.

Godwin-Jones, R. (2017), "Smartphones and language learning", *Language Learning and Technology*, Vol. 21 No. 2, pp. 3-17, doi: 10125/44607.

Godwin-Jones, R. (2022), "Chatbots in language learning: AI systems on the rise", in Arnbjörnsdóttir, B., Bédi, B., Bradley, L., Friðriksdóttir, K., Garðarsdóttir, H., Thouësny, S. and Whelpton, M.J. (Eds), *Intelligent CALL, Granular Systems and Learner Data: short Papers from EUROCALL 2022*, Research-publishing.net, pp. 124-128, doi: 10.14705/rpnet.2022.61.1446.

Godwin-Jones, R. (2023), "Emerging spaces for language learning: AI bots, ambient intelligence, and the metaverse", *Language Learning and Technology*, Vol. 27 No. 2, pp. 6-27, doi: 10125/73501.

Grimshaw, M. (2018), "Towards a manifesto for a critical digital humanities: critiquing the extractive capitalism of digital society", *Palgrave Communications*, Vol. 4 No. 1, pp. 1-8, doi: 10.1057/s41599-018-0075-y.

Halliday, M.A.K. (1993), "Towards a language-based theory of learning", *Linguistics and Education*, Vol. 5 No. 2, pp. 93-116, doi: 10.1016/0898-5898(93)90026-7.

Hofstadter, D.R. (1996), "The ineradicable Eliza effect and its dangers", in Hofstadter, D.R. (Ed.), *Fluid Concepts and Creative Analogies: computer Models of the Fundamental Mechanisms of Thought*, Basic Books, pp. 155-169. New York, NY.

Jeon, J., Lee, S. and Choe, H. (2023), "Beyond ChatGPT: a conceptual framework and systematic review of speech-recognition chatbots for language learning", *Computers and Education*, Vol. 206, doi: 10.1016/j.compedu.2023.104898.

Kaplan, J. (2016), *Artificial Intelligence: What Everyone Needs to Know*, Oxford University Press, Oxford.

Klopfenstein, L.C., Delpriori, S., Malatini, S. and Bogliolo, A. (2017), "The rise of bots: a survey of conversational interfaces, patterns, and paradigms", *DIS'17: Proceedings of the 2017 Conference on Designing Interactive Systems*, pp. 555-565, doi: 10.1145/3064663.3064672.

Kukulska-Hulme, A. (2019), "Vignette 5.3: to be or not to be … beholden to an AI assistant?", *In M. Pegrum, Mobile Lenses on Learning: Languages and Literacies on the Move*, pp. 185-186, Springer.

Kukulska-Hulme, A., Beirne, E., Conole, G., Costello, E., Coughlan, T., Ferguson, R., FitzGerald, E., Gaved, M., Herodotou, C., Holmes, W., Mac Lochlainn, C., Mhichíl, M.N.G., Rienties, B., Sargent, J., Scanlon, E., Sharples, M. and Whitelock, D. (2020), "Innovating pedagogy 2020", Open University Innovation Report 8. The Open University, available at: www.iet.open.ac.uk/file/innovating-pedagogy-2020.pdf

Leaver, T. and Srdarov, S. (2023), "ChatGPT isn't magic: the hype and hypocrisy of generative artificial intelligence (AI) rhetoric", *M/C Journal*, Vol. 26 No. 5, doi: 10.5204/mcj.3004.

Levy, M. and Stockwell, G. (2006), *CALL Dimensions: Options and Issues in Computer-Assisted Language Learning*, Routledge, New York, NY.

Liang, W., Yuksekgonul, M., Mao, Y., Wu, E. and Zou, J. (2023), "GPT detectors are biased against non-native English writers", *ArXiv*, doi: 10.48550/arXiv.2304.02819.

Loewen, S., Crowther, D., Isbell, D.R., Kim, K.M., Maloney, J., Miller, Z.F. and Rawal, H. (2019), "Mobile-assisted language learning: a Duolingo case study", *ReCALL*, Vol. 31 No. 3, pp. 293-311, doi: 10.1017/S0958344019000065.

Lotherington, H. (2018), "Mobile language learning: the medium is ^not the message", *L2 Journal*, Vol. 10 No. 2, pp. 198-214, doi: 10.5070/L210235576.

Lotherington, H. and Bradley, N. (2024), "Hey Siri: Should #language, and follow me be taught? A historical review of evolving communication conventions across digital media environments and uncomfortable questions for language teachers", *Language Learning and Technology*, Vol. 28 No. 1, pp. 1-19. www.hdl.handle.net/10125/73552.

Lotherington, H., Thumlert, K., Boreland, T. and Tomin, B. (2021), "Redesigning for mobile plurilingual futures," Cahiers de L'ILOB", */OLBI Journal*, Vol. 11, pp. 141-172, doi: 10.18192/olbij.v11i1.6179.

MacKenzie, D. and Wajcman, J. (1999), "The social shaping of technology", LSE Online, available at: www.eprints.lse.ac.uk/28638/1/Introductory%20essay%20(LSERO).pdf

Miao, F. and Holmes, W. (2021), International forum on AI and the futures of education: developing competencies for the AI era, 7-8 December 2020. Synthesis Report. *UNESCO*. www.unesdoc.unesco.org/ark:/48223/pf0000377251.

Palalas, A. and Hoven, D. (2016), "Emerging pedagogies for MALL", in Palalas, A. and Ally, M. (Eds), *The International Handbook of Mobile-Assisted Language Learning*, China Central Radio and TV University Press, pp. 44-85.

Papp, D. (2023), "With ChatGPT, game NPCs get alot more interesting", Hackaday, available at: www.hackaday.com/2023/02/08/with-chatgpt-game-npcs-get-a-lot-more-interesting/

Pasquale, F. (2015), *The Black Box Society: The Secret Algorithms That Control Money and Information*, Harvard University Press, Cambridge, MA.

Pegrum, M. (2019), *Mobile Lenses on Learning: Languages and Literacies on the Move*, Springer, doi: 10.1007/978-981-15-1240-7.

Pegrum, M., Hockly, N. and Dudeney, G. (2022), *Digital Literacies*, 2nd ed., Routledge.

Pennycook, A. (2018), *Posthumanist Applied Linguistics*, Routledge.

Perez, S. (2023), "Google assistant is getting AI capabilities with Bard", TechCrunch, available at: www.techcrunch.com/2023/10/04/google-assistant-is-getting-ai-capabilities-with-bard/

Pullen, J.P. (2017), "A lesson in communication", in Kennedy, K. and Mifsud, C. (Eds), *Artificial Intelligence: The Future of Humankind*, Time Special Editions.

Reeves, B. and Nass, C. (1996), *The Media Equation: How People Treat Computers, Television, and New Media like Real People*, Cambridge University Press.

Sauro, S. and Zourou, K. (2019), "What are the digital wilds?", *Language Learning and Technology*, Vol. 23 No. 1, pp. 1-7, available at: www.lltjournal.org/item/895/

Sharples, M. (2023), "Generative AI and education futures", *2023 UCL Education Conference*, *University College London*, available at: www.ucl.ac.uk/teaching-learning/case-studies/2023/aug/generative-ai-and-education-futures

Shortt, M., Tilak, S., Kuznetcova, I., Martens, B. and Akinkuolie, B. (2023), "Gamification in mobile-assisted language learning: a systematic review of Duolingo literature from public release of 2012 to early 2020", *Computer Assisted Language Learning*, Vol. 36 No. 3, pp. 517-554, doi: 10.1080/09588221.2021.1933540.

Son, J.-B.E. (2014), *Computer-Assisted Language Learning: Learners, Teachers and Tools*, Cambridge Scholars Publishing.

Sridhar, C.S. (2023), "Differences between conversational AI and generative AI", Purple Slate., available at: www.purpleslate.com/differences-between-conversational-ai-and-generative-ai/

Srnicek, N. (2016), *Platform Capitalism*, Polity Press.

Stockwell, G. (2021), *Mobile Assisted Language Learning: Concepts, Contexts and Challenges*, Cambridge University Press.

Thumlert, K., Tomin, B., Nolan, J., McBride, M., Lotherington, H. and Boreland, T. (2022), "Algorithmic literacies: identifying educational models and heuristics for engaging the challenge of algorithmic culture", *Digital Culture and Education*, Vol. 14 No. 4, pp. 19-35, available at: www.digitalcultureandeducation.com/volume-14-4.

van Dis, E.A., Bollen, J., Zuidema, W., van Rooij, R. and Bockting, C.L. (2023), "ChatGPT: five priorities for research", *Nature*, Vol. 614 No. 7947, pp. 224-226, doi: 10.1038/d41586-023-00288-7.

Varis, P. (2016), "Digital ethnography", in A. Georgakopoulou and T. Spilioti, Eds, *The Routledge Handbook of Language and Digital Communication*, Routledge, pp. 55-68.

Walker-Rettberg, J. (2022), "ChatGPT is multilingual but monocultural, and it's learning your values", jill/txt, available at: www.jilltxt.net/right-now-chatgpt-is-multilingual-but-monocultural-but-its-learning-your-values/

Walsh, C. and Apperly, T. (2012), "Using gaming paratexts in the literacy classroom", in Martin, C., Oschner, A. and Squire, K. (Eds), *Proceedings GLS 8.0 Games + Learning + Society Conference*, ETC Press, pp. 322-329.

Weizenbaum, J. (1966), "ELIZA – a computer program for the study of natural language communication between man and machine", *Communications of the ACM*, Vol. 9 No. 1, pp. 36-45, doi: 10.1145/365153.365168.

Wiggers, K. (2023), "Amazon brings generative AI to Alexa", TechCrunch, available at: www.techcrunch.com/2023/09/20/amazon-brings-generative-ai-to-alexa/

Zuboff, S. (2019), *The Age of Surveillance Capitalism: The Fight for a Human Future at the New Frontier of Power*, Public Affairs.

Further reading

Crothers, E., Japkowicz, N., Viktor, H. and Branco, P. (2022), "Adversarial robustness of neural-statistical features in detection of generative transformers", *2022 International Joint Conference on Neural Networks (IJCNN) IEEE*, pp. 1-8, doi: 10.1109/IJCNN55064.2022.9892269.

Corresponding author
Heather Lotherington can be contacted at: hlotherington@edu.yorku.ca