Is Artificial Intelligence in Education an Object or a Subject? Evidence from a Story Completion Exercise on Learner-AI Interactions

Abstract

Much of the literature on artificial intelligence (AI) in education imagines AI as a tool in the service of teaching and learning. Is such a one-way relationship all that exists between AI and learners? In this paper we report on a thematic analysis of 92 participant responses to a story completion exercise which asked them to describe a classroom agreement between an AI instructor and a learner twenty years into the future. Using a relational theoretical framework, we find that the classroom agreements between AI and learners that participants produced encompassed elements of education, boundaries, affordances, and social conventions. These findings suggest that the ways learners relate to AI vary. Some learners relate to AI as an object, others relate to AI as a subject, and some relate to AI both as an object and a subject. These results invite a deeper engagement with the ways in which learners might relate to AI and the kinds of ethics and social protocols that such relations suggest.

Keywords: artificial intelligence in education; Human-AI interaction; story completion methods; futures methods; AIEd; relationality theory; Indigenous theory

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Is Artificial Intelligence in Education an Object or a Subject? Evidence from a Story Completion Exercise on Learner-AI Interactions

With the release of ChatGPT-3 in November 2022, Artificial Intelligence (AI) has rapidly become a central point of discussion in Higher Education. While the literature on AI in education (AIEd) spans decades, the urgency with which conversations around generative AI are proliferating suggests we may be at an inflection point with respect to AIEd, one which carries with it pressing questions about how education may change now and into the future. There is a sense today that with the advancement of such technologies, education systems are on the verge of something transformative, although it remains to be seen whether this transformation is positive, negative, or some combination of both (Bearman et al., 2022).

In this study, we used a speculative methodology to examine some of the imagined possibilities of AIEd in higher education. Speculative methods are methods which aim to engage "what's next," i.e., they work to think about possible futures for the subject under study rather than simply the "what is" of the subject (Ross, 2022). In other words, they are grounded in imagination. A significant stream of such methods originates in speculative design and seeks to critically engage the future and ideas of the future to guide action (and design) in the present (Dunne & Raby, 2017). In recent years, design fiction and its variants have emerged as popular speculative methods in education research, offering a creative way for scholars to study futures (Houlden & Veletsianos, 2023). Often this work involves developing short fictions or scenarios about different possible futures of education to be examined from a variety of angles, including in terms of what is preferable, desirable, and undesirable (Hrastinski & Jandrić, 2023).

In this paper, we are interested in the imagined dynamics between AI and learners, that is, how participants in our research imagine learners and AI *could* interact with each other in the

future. To date, much of the use of speculative methods, especially in education research, has relied on researchers themselves producing fictional versions of the future. This work serves to not only think about the future, but also to better understand the present (Houlden & Veletsianos, 2023; Ross, 2017). Given the interest in AI futures more generally, it is perhaps unsurprising that speculating about the impact of AIEd has become increasingly common (e.g., Bozkurt et al., 2023; Cox, 2021).

In contrast to researcher-generated speculative fictions, in this paper we use a story completion method, which we describe in more detail below, to invite participants to describe how AI instructors and learners might interact with each other twenty years into the future. In particular, we are interested in the perspectives of youth, people ages 18-25, who more commonly orient to higher education as learners rather than researchers or educators, and whose perspectives are under-represented in the literature, even as young people are significant stakeholders in higher education today and into the future. The research question guiding this study asks: What can asking young people to imagine interactions with future AI tell us about how young people relate to AI today? In the next sections we provide a review of relevant literature, describe the theoretical framework for this research, and present the results and implications of our investigation.

Relevant literature

While research on AIEd has rapidly expanded in the last ten years, scholars have been interested in AI in education for some time, with varying areas of focus (Costello, 2023; Humble & Mozelius, 2022; Pinkwart, 2016). Bozkurt et al. (2023) gathered a collection of narratives in which researchers envisioned positive and negative futures that include ChatGPT in educational contexts, and these narratives are reflective of the advantages (e.g., personalization, efficiency,

and improving inclusivity) and disadvantages (e.g., amplifying biases, teacher replacement, ethical concerns) that researchers and practitioners imagine AI bringing to teaching and learning. Today and historically, the questions surrounding AI often remain consistent: "What are the real benefits AI might bring? How do we ensure that AI meets real needs, and is not just the latest EdTech fad? What should we allow AI to do?" (UNESCO, 2021, p. 13).

Several recent systematic reviews of the literature explore these questions and capture the state of the field of AIEd research. Bewersdorff et al. (2023) for example, identified myths, misconceptions, and preconceptions of AI among learners. They identified and analyzed 25 articles, exploring how learners understand AI and the limits of this understanding. Several key findings are worth highlighting: One, a common misconception about AI is reflected in a tendency to anthropomorphize AI, leading to confusion about AI capabilities and a host of complicated ethical questions. Two, participants in numerous studies understood that AI will be important in the future; however, they note, this sense can be accompanied by a "feeling of being unprepared for this new technology" (p. 8). Finally, of note is a lack of consensus about how inclusive, biased, and trustworthy AI is understood to be, with only one paper exploring this topic (Antonenko & Abramowitz, 2022). A second systematic review of the literature explored AIEd's challenges, opportunities, and future recommendations in studies published between 2012 and 2021 (Chiu et al., 2023). The authors analyzed 92 papers and found that this literature "has examined AI agents playing 13 roles across the four key educational domains of learning, teaching, assessment, and administration" (p. 12). They also highlighted ten major challenges for AIEd, which include things such as lack of teacher knowledge to effectively use AI and widening digital divides when AI is used.

Research into socioemotional aspects of learning and ethical issues seem to be lacking in AIEd (Chiu et al., 2023). Indeed, the focus on cognitive aspects of learning has been an ongoing concern in areas of study related to AIEd (Veletsianos & Russell, 2014), and while other fields such as engineering and social sciences, for example, have carefully attended to ethical issues, Chiu and colleagues note that such attention is absent in much of the AIEd research. To be sure though, the literature concerned with AIEd is rapidly changing (Crompton & Burke, 2023), and the exclusion of conceptual papers, commentaries, and editorials from Chui et al's study likely eliminated scholarship concerned with ethical concerns around AI (e.g., Sacharidis et al., 2020; Selwyn, 2022; UNESCO, 2019). Nevertheless, even as ethical issues become increasingly visible, ethical questions continue to be under-studied (Bearman, Ryan, &Ajjawi, 2022).

Bearman, Ryan, and Ajjawi (2022) reviewed the AIEd literature published in ten higher education journals published up to November 2020. Using critical discourse analysis, they examined 29 articles and found two main discourses that pervade the literature on AIEd in Higher Education. The first discourse sees grappling with AI as an imperative for Higher Education due to the socio-cultural transformation heralded by AI's inevitable uptake. The second "focuses on how AI is altering the locus of authority and agency surrounding academic work" (p.6). This latter category, particularly when seen through a dystopian lens, points to the significant ethical questions that researchers are concerned with around issues such as privacy, surveillance, and data colonialism.

Notably, the concern in most of these instances is almost always about the impact AI might have on humans, with "non-maleficence" of AI (i.e., AI being benign) being a key area of inquiry for AI ethicists (e.g., Dignum, 2022; Nguyen, Ngo, Hong, et al., 2023; Peters, Jackson, Papastephanou et al., 2023). In other words, this body of research isn't typically about what

types of relations, ethical or otherwise, are co-created *with* AI. It is about if AI is to be used, how AI can be managed such that it serves human needs and objectives. Indeed, this anthropocentric perspective is famously highlighted in Asimov's (1950) "Three Laws of Robotics," which position the human and human needs as the centre of the ethics of AI machines. But is the emphasis on AI supporting humans a capacious enough approach to understanding the ways humans and AI might relate with each other? Is it an effective way to account for the diversity of interactions that humans share with AI? What if such perspectives fail to account for the complex relational interactions already in process between humans and AI?

Theoretical Framework

In this research, we draw on relational understandings of the world to guide our analysis and discussion. To the extent that we as non-Indigenous scholars living in and benefitting from Western cultural structures can, we adopt a non-Western, relational worldview to understand relationships between human learners and AI, one which emphasizes the need for centring complexity and avoiding simplicity in the context of teaching and learning. To answer the above questions in a more capacious way therefore, we turn towards a relational onto-epistemological theoretical framework (Topa (Four Arrows) & Narvaez, 2022). Reflected in the thinking of many Indigenous scholars and common in many Indigenous cultures around the globe, relational worldviews are premised on the importance of relationships and the relational nature of reality, which is to say the understanding that every aspect of the world, including humans, is connected. Relationality, as Lange (2023, p.7) explains, indicates "the mutual interrelatedness of all living beings and nonliving elements, impacting each other synergistically, within a dynamic network of nested living systems." Humans are included here but they are not the centre of all things (Topa (Four Arrows) & Narvaez, 2022).

With this understanding comes a much less instrumental view of the world. Instead of objects (e.g., AI tools) to be used by subjects (e.g., people), relational worldviews suggest that humans and all else are beholden to relationships with life and everything that makes life possible as the very fabric of ourselves. Whyte (2013, p.58) explains that this means that we "have responsibilities toward the others in the relationship." He adds, "[r]esponsibilities refer to the reciprocal (though not necessarily equal) attitudes and patterns of behavior that are expected by and of various parties by virtue of the different roles that each may be understood to play in a relationship." From this perspective, fostering healthy relationships with others, human and otherwise, and fostering the capacity to develop and support those relationships, is an ethical imperative and responsibility. But this isn't just about humans and their nonhuman kin; it includes, for example, the technologies humans create and use. That is, we are in relationship with technologies, and they with us as well, and this requires ethical responses even if those responses are not commensurate or the same as those we have with living others.

There is precedent for this approach in the study of AI, if not AIEd (Heath et al., 2023). For example, Birhane (2021) employs relational epistemology to consider what "responsible AI" requires, and how a relational perspective would focus on preventing harms to diverse communities impacted by AI. Dignum (2022) has used the relational worldview of Ubuntu (Mugumbate & Nyanguru, 2013) to reorient the ways in which ethics and AI can be imagined as a function of how well the capacity for connection, interconnectedness, cooperation, and community flourishing is enabled.

Another example which offers insight into how the kinship worldview can guide thinking about AI comes from the Indigenous Protocol and Artificial Intelligence Working Group

(IPAIWG) (2020). This group proposes creating relevant *protocol* to develop guidelines for both development of AI and interaction with AI. They state:

> Protocol can be understood in Indigenous contexts generally as guidelines for initiating, maintaining and evolving relationships. These can be relationships with other humans, and they can also be relationships with non-humans such as animals, rocks, and wind.

At the core of this type of protocol is *conduct*, namely the "specific methods for properly conducting oneself in any activity" (p. 7). The conduct in question is connected to the responsibilities and reciprocities Whyte describes. The IPAIWG reminds readers that protocol isn't unilateral: it is context- and community-dependent, shaped by the values of a collective as well as the place out of which the protocol emerges. In other words, it is highly complex, because context is complex. Indeed, as Yunkaporta (2020) observes about the world, relational worldviews acknowledge the complexity of the world itself, refusing what he calls "artificial simplicity" endemic to Western rationalist worldviews.

Methods

We use speculative methods to engage participants in imagining a future relationship between an AI instructor and a learner. As noted in the introduction, the use of such methods is meant to understand what people think about the future or possible futures, but also to in turn better understand what that means for the present, which is a key strength of speculative methods (Ross, 2017; 2022). To engender this type of engagement, we invited participants to complete a story prompt. This type of projective method aims to uncover hidden truths from participants (particularly around concerns connected to barriers to self-report), while also inviting participant control and creativity (Clarke, Hayfield, Moller, Tichner & the Story Completion Research Group, 2017; Kitzinger & Powell, 1995).

Essentially, participants take on the role of telling a story by answering 'what happens next' after being given the prompt, thereby providing data for analysis (Clarke et al., 2019). In the context of speculative research, story completion is uniquely suited as a qualitative approach as it literally invites speculation as part of its data generation process. What's more, because as Clarke et al. (2019, p. 8) note, "story completion is particularly useful for exploring (dominant) assumptions about a topic," assumptions about the future can be engaged through that work of speculation. However, because the future is always already about the present (Ross, 2017), the method can simultaneously invite understandings of the present moment, and in the case of this paper, how people understand AI today.

The story completion method has been used most-commonly in psychology research, examining such topics as online infidelity, appearance and sexuality, and the gendering of motivations for weight loss (Hayfield & Wood, 2004; Whitty, 2005; Tischner, 2014). More recently, it has been used in feminist social constructionist research (Watson & Lupton, 2022), with much of this research undertaking thematic analyses to identify patterns related to discourses, practices, and feelings (Kitzinger & Wood, 2019; see Clarke et al., 2019, for a comprehensive overview of research using this method).

Participants

Participants were recruited using the services of Prolific, a research service connecting researchers and survey participants who are paid for their participation, and which has been widely used across various disciplines and research endeavors (Veletsianos et al., 2022; Palan & Schitter, 2018). Potential participants were individuals located in Canada and aged between 18 and 25, and 92 individuals participated (Mean age: 22, S.D: 3.09). Our interest in this age group, as noted in the introduction, is due to the dearth of research using speculative methods, and

particularly those methods which rely on some form of storytelling or visioning of the future, from the perspective of this group (Veletsianos & Houlden, 2024). In other words, stories of the future of education are rarely told by youth, even as youth are key demographics for higher education. Of the participants, 58 self-identified as women, 27 as men, four as gender fluid individuals, and three as non-binary individuals. One participant did not identify their gender. Participants' level of education varied. The largest group was those who had completed some college or university (48), followed by individuals with a bachelor's degree (31), then those with a high school diploma (8). Three participants held a master's degree, one held a professional degree, and one had less than a high school education. The participants were dispersed across Canada, although the territories, Nova Scotia, and Prince Edward Island were not represented. Ontario had the largest number of participants (43), followed by Alberta (16), British Columbia (11), Quebec (10), Saskatchewan (6), Manitoba (3), Newfoundland and Labrador (2), and New Brunswick (1).

Data Collection

Data was collected from February 28 to March 2, 2023, using a questionnaire distributed by Prolific to potential participants. The questionnaire was part of a broader study examining topics relating to the future of higher education, and was piloted and iterated before launching widely, as is recommended for story completion research (Clarke et al., 2019). On average it took participants ten minutes to complete the questionnaire. This study uses participant responses to an AI-specific story prompt, which was designed according to conventions for such design, especially length, point of view, detail, and authenticity (Braun & Clarke, 2013). The prompt read:

> Imagine it is twenty years into the future. Olivia's online class takes place in the evenings. This works for her because she has a job she goes to during the day. The class is led by an Artificial Intelligence named Kay. For the first class, Olivia and Kay create a "classroom agreement." This is a document that describes how they will interact with each other during the course. What does this agreement say?

Per convention, the prompt was kept short to limit how much information participants had to respond to, with specific instructions in terms of minimum length and giving details about the classroom agreement. By relying on a format that many people who have taken some form of institutional learning are likely to be familiar with (i.e., a classroom agreement), the idea was to offer a loose structure for participants to work with as a point of departure for their responses. This also intended to contribute to a feeling of authenticity that would interest participants. The strategy also aligns with our broader interest in learning environments, particularly future learning environments, which is why the details of the prompt focus on online learning.

The prompt was set twenty years into the future to invite the possibility of significant change over time. In contrast, if the prompt was set only five years into the future, barring global cataclysm, such a time period might not seem long enough for substantial transformation or technological change (Velestianos, Johnson & Houlden, 2024). Twenty years into the future, on the other hand, left open more space for radical shifts in technology to occur, with the logic being that this might invite more imaginative possibilities and overcome what Markham (2021) calls "discursive enclosures," which limit how people think about the future through ceding ideas about the future to what seems possible, likely, or even inevitable in the present. The decision to set the prompt two decades into the future also meant that the prompt required the use of third-

person point of view so that participants were imagining a general possible future rather than one potentially specific to themselves, as a first-person point of view could unintentionally elicit.

Participants wrote 5,337 words in response to the prompt, which then comprised the dataset for this study. The average number of words in a response was approximately 58 (S.D = 37.26). The shortest and longest responses were 14 and 196 words respectively. Most responses were between 20 and 80 words.

Data Analysis

We used an iterative approach to analyze the data. Initially, two researchers independently reviewed the data to gain a broad understanding and overview of their content. Subsequently, one researcher used a spreadsheet to code the data, identify preliminary codes, and highlight patterns. Next, two researchers discussed preliminary findings and themes evident in the data over three meetings. One researcher then consolidated codes where appropriate and entered the data into NVivo to enable systematic coding. This process adhered to the constant comparative approach (Glaser & Strauss, 1967) in the following manner: Each data fragment (e.g., a sentence) was assigned a code that represented its core meaning. Next, as subsequent data fragments (e.g., the next sentence) were reviewed, they were compared to the initially assigned code. If the code accurately captured the meaning of the data, it was applied to the fragment, and the researchers proceeded to the next piece of data. In cases where the code did not accurately represent the data, a new code was created to describe it. Through this process the list of codes was generated. Finally, the codes were categorized into four themes, and these are described below.

To minimize the occurrence of biases in our analysis, we (a) conducted independent analyses of the data to prevent mutual influence on our interpretations, (b) discussed emerging

interpretations and areas of agreement or disagreement, posed clarifying questions, and assessed our understanding of the data overall, (c) continued discussing and developing the findings until we felt that we reached the point of inductive thematic saturation (Saunders et al., 2018), and (d) provide an extensive description of our methods and findings as recommended in the speculative methods literature (Selwyn et al., 2020). We recognize that the results of this kind of research are not replicable in the same ways that other kinds of research might be, and it is for this reason that we provide a clear description of our methods.

Limitations

There are several limitations to this research. First, our participant pool drew on the perspectives of a group of people aged 18-25. Most of the participants had at least some college or university education and results may not reflect the perspectives of those individuals who do not have this level of education. Further, not all provinces or territories in Canada were represented and because we did not collect data on participants' earlier experiences with AI it is difficult to draw inferences on the degree to which earlier experiences influenced participant perceptions. Second, the use of a relational theoretical framework for analysis is not without challenges. Relational worldviews are neither monolithic nor universal in nature, which is to say that while we draw on general principles of connection and connectivity that premise the connection worldview as an orientation for this analysis, our own intellectual connection to non-Western knowledge lineages is largely a product of scholarship, rather than lived experience with particular communities in particular places. With that in mind, we note that omissions, inconsistencies, and errors in understanding are our own, and invite further feedback and conversation around both this work as well as ways for non-Indigenous researchers to continue to engage with relational understandings of the world as shared by Indigenous and African

scholars, artists, and knowledge and wisdom keepers. While this is a significant limitation, it seems particularly important to highlight it given the predominance of Western perspectives on AI in education.

Findings

Four major themes emerged in the data: *elements of education* (130 coded text excerpts), *AI affordances* (43 coded text excerpts), *boundaries* (44 coded text excerpts), and *social convention* (82 coded text excerpts). The first two themes are mainstream topics of scholarship and are now commonly examined in the literature on AIEd (Chiu et al., 2023). The bulk of our analysis therefore focuses on the last two themes, which make the most significant and original contribution because they invite a deeper engagement with understanding not just the ways in which people might relate to/with AI, but with the kinds of ethics and consequent social protocols such relations suggest. We summarize the first two themes before exploring the third and fourth in more detail. In each theme we include a table that provides participant quotes under each quote, along with some summary statistics.

The first and most populous theme, *elements of education* (Table 1), includes practices, procedures, and objects typical to classroom syllabuses and classroom organization, which as noted in the literature review, is one main avenue of how AIEd has been and continues to be studied. These are the basic building blocks of classroom organization, such as how and when communication may occur, what types of assignments are expected, and how assessments will be undertaken. The majority of text excerpts coded fell under this theme. The codes identified reflect an understanding of classroom agreements as being guiding documents for defining how and why a course will operate. Of these, the three most common codes were *roles and responsibilities* (n=32), *communication terms* (n=29) and *course structure and timelines* (n=20).

Roles and responsibilities refers to examples of what participants imagined Kay and Olivia would do and what their obligations to each other and the course were, such as, for example when one participant wrote that the agreement indicated "what is expected of the student and what the student can expect from the teacher." Communication terms highlighted guidelines for how and when Olivia and Kay were to communicate with each other, for example, that the "[m]ajority of communication will take place in the evenings during class," or "that Oliva can ask any question and Kay will have a response that is accurate and relevant." Course structure and timeline outlined when events for the course would unfold and in what order, for example, the "agreement will outline course expectations, logistics, and course schedule." Personalized learning (n=13) represented data indicating that the course would be tailored to Olivia's needs and learning preferences. Other codes included typical content for a syllabus, including things such as *academic integrity* (e.g., rules around cheating or plagiarism) (n=13); *time and environment* (n=14), or where and when learning would take place; and *modality and delivery* (n=5), for example.

Table 1. Elements of education.

Code	Participants		Example
	n	% of total	
Roles and responsibilities	32	34.8	"The agreement will outline the expectations and responsibilities that Olivia and her fellow students are entrusted to meet."
Communication terms	29	31.5	"The agreement will also include a method for Kay and Olivia to communicate outside of the classroom."
Course structure and timelines	20	21.7	"We will meet three times a week for one hour for lessons."
Time and environment	14	15.2	"In terms of logistics, it will include the meeting times, platforms and tools used"

Academic integrity	13	14.1	"The student and the instructor will maintain an environment of integrity, which means there will be no cheating, lying, or plagiarism of a malicious or intentional nature on the part of either party."
Personalized learning	13	14.1	"The AI asks her questions at the start of the day to detect her energy levels and suggest a study plan for the duration of the online class to keep the session as productive as possible."
Flexibility	8	8.7	"Olivia will attend class when they are able and understand they may miss concepts but there is an option to go back and re-see lectures and learn material on their own time"
Assignments	7	7.6	"You will have three assessments throughout the course, along with weekly homework assignments"
Course content	5	5.4	"will clarify what content the AI is expected to teach Olivia."
Evaluation and assessment	5	5.4	"the agreement will include the rubric and requirements for exams and assignments."
Modality and delivery	5	5.4	"The lectures for the classroom will be delivered through recorded lectures."
Tech requirements	5	5.4	"You will NEED desktop/laptop to complete most homework."
Feedback	3	3.3	"Both parties should give feedback to each other on how to improve."
Learning support	3	3.3	"It also includes that Olivia should ask for help if or when she needs it."
Learning strategy	3	3.3	"Emphasis will be placed on explaining the reasoning and thought processes behind things, which will lead to excellent understanding of the material."
Classroom agreement	1	1.1	"The agreement lays out class expectations"

The second theme, *AI affordances*, demonstrates how participants imagine what AI will or will not be able to do based on its technical or technological capacities (Table 2). This theme includes mentions of what AI is or isn't capable of, what its benefits and limitations are, and opportunities for support with respect to interacting with AI. In total, there were six codes for this theme. *AI operations* included more general mentions of AI capabilities (n=6). For example,

one participant noted that "AI learns off feedback and criticism," thereby highlighting machine learning processes. The second two codes, *AI comparable to humans* (n=7) and *AI different from humans* (n=6) represent comparisons between AI and humans, often human teachers. In the former, participants highlight that AI is not like humans, for example that they are a "professional AI chatbot" or that "feelings are not felt by AI," and the latter the opposite, with expectations to treat Kay how they would "a human professor" or "as she would any other teacher." *Benefits of AI* appeared in six responses (n=6) while *limitations of AI* in 10 (n=10). Only two respondents mentioned *tech support* for interacting with AI.

Table 2. AI affordances.

Code	Participants		Example
	n	% of total	
Limitations of AI	10	10.9	"They are strictly programmed to teach you the subject in question and will therefore only have the knowledge regarding that and related materials."
AI comparable to humans	7	7.6	"Olivia will be respectful to Kay as if Kay was a human being and her teacher in a traditional classroom sense."
AI operations	6	6.5	"Because AI learns off feedback and criticism."
AI different from humans	6	6.5	"This agreement shall outline that Kay although is really smart is still AI."
Benefits of AI	6	6.5	"Being an AI, I would assume that it would have enough time to spare for all of its students to help them reach their goals."
Tech support for AI	2	2.2	"Any glitches should be reported immediately."

The third theme, *Boundaries*, focused on factors related to boundaries between the AI instructor and the student (Table 3). Boundaries were imagined through *privacy* (n=14), *consent* (n=6), and *surveillance* (n=4). Privacy was imagined as being something afforded by Kay to

Olivia, such as when one participant said Kay "will not creep on Olivia's social media." Other boundaries included expectations for the *scope of interaction* between the AI and the student (n=2), i.e., what would be appropriate for their interactions; *social boundaries* (n=2), and *proprietary content or knowledge* (n=3) as a type of boundary which constrained what Olivia could or could not do with information shared by Kay in her course.

Table 3. Boundaries.

Code	Participants		Example
	n	% of total	
Privacy	14	15.2	"The agreement states that Kay will not use any means to view Olivia's personal files or content, and only look at what is submitted by Olivia."
Consent	6	6.5	"It should also ask whether Olivia is comfortable with this situation in the first place, before anything starts."
Alternatives to AI	5	5.4	"Access to a human instructor should be provided if Kay's answers are not accurate or clear enough."
General expectations for interactions	4	4.3	"perhaps a clause that indicates that Olivia will not be disturbed or expected to be doing course work during the day hours while she works."
Surveillance	4	4.3	"Camera must be on at all times. Microphone must be on at all times. Any bathroom break must be approved by Kay."
Proprietary content or knowledge	3	3.3	"Olivia cannot share course content online for her own profiting"
Social boundaries	3	3.3	"Kay will not use AI to mold to Olivia's personality"
Scope of interactions	2	2.2	"Neither party should not be allowed to stray outside of the curriculum being taught."

The fourth and final theme was *social convention* (Table 4), or the different ways expectations for interactions between the AI and the student were imagined as social processes.

This theme highlights the ways in which participants imagine a learner engaging socially with an AI instructor and is meant to capture the ways in which the parties of the classroom agreement are expected to relate to each other. In other words, these were norms and behaviours for interactions. Present in the data of over 40% of participants, the most commonly-identified code within this theme referred in some way to "respect." How respect operated was diverse. In some instances, respect in the agreement was framed as something Olivia would have to give Kay (n=11), as when one participant wrote that the agreement "informs Olivia that regardless if her teacher is an AI, she must still be respectful and show courtesy to her professor." In other instances, respect was characterized as being for both parties (n=30), in which respect "should be given mutually," as one participant described. Lastly, two participants highlighted respect as being afforded by Kay to Olivia. For example, "Kay will respect Olivia's internet/online boundaries and treat her with respect as a student."

A more general code, *general social guidelines* (n=16) was used for less specific interactions, i.e., interactions with abstract guidelines, such as when one participant indicated that "Olivia and Kay will get along," or that they "will remove all bias when entering the classroom." *Classroom etiquette* was mentioned by seven respondents, sometimes as nonspecific guidelines such as "just general etiquette" as well as "etiquette such as camera's on or off, what to do if you have questions, and how to interact with peers." *Collaboration,* mentioned by four participants, included things such as "to make the students comfortable working with AI … they would have a comprehensive agreement that they have heavy input on," and that "Kay and Olivia decide together what methods will work for her in order to succeed and get the desired grades." Finally, *honesty* was mentioned by three participants, and *trust* by one.

Table 4. Social convention.

Code	Participants		Example
	n	% of total	
Respect	43	46.7	"Both student and instructor should remain respectful at all times."
General social guidelines	16	16.3	"Olivia and Kay will get along, Olivia and Kay will work together and cooperate."
Classroom etiquette	7	7.6	"The agreement will probably have some rules around classroom etiquette."
Collaboration	4	4.3	"Olivia and Kay will work together to make this form of working together the most effective that it can be"
Honesty	3	3.3	"The classroom agreement would have to have a foundation of honest work."
Trust	1	1.1	"There should be a level of trust as between a teacher and student"

Discussion

You can ask me questions about assignments, tests and anything related to the class, and I will be able to answer it as best as possible and hope that the answers lead you on the right path. Otherwise do not ask me questions about life and things unrelated to the course, I will be unable to respond and you should seek answers to those questions elsewhere. When I am teaching the class it would be most helpful if you would pay attention. No need to take notes since I created notes for every person in the class already, I just need you to intake the information and be present to learn as much as you can.

- participant quote describing the instructions that Kay (the AI) will provide to learners.

The study's findings indicate that participants imagine AI-learner relationships on a continuum, viewing AI as an object on the one end and as a subject on the other end.

In the first view, participants see AI as a tool for learning or a tool in service of learning. In other words, learners imagine AI as an *object* designed to enhance education. One participant for example states that in the agreement

> personal questions should be avoided as the robot doesn't have a past of any sort so they will not have any answer to that type of stuff. They are strictly programmed to teach you the subject in question and will therefore only have the knowledge regarding that and related materials.

Imagined as a tool in this way, Kay has constraints that limit "the robot's" capacities. They are programmed to do certain things, and those are the only things about which they have knowledge.

In contrast, participants with the second view orient to AI as a *subject*, i.e., as one who has agency and possibly some kind of internal subjectivity. Often, this orientation is not made explicit, but is reflected in implicit assumptions about interactions between Kay and Olivia. No doubt the structure of the prompt, in which an agreement is being made between two fictional parties (i.e., Kay, the AI, and Olivia, the student) capable of coming to an agreement together, imposes some degree of subjectification of AI into the responses. Nevertheless, the diversity of details in this latter category demonstrates a wide range of how participants imagine relating to an AI subject, with more or less attention to social norms around politeness and respect for others. For example, one participant writes:

> This document suggests that interactions with one another in the course should be cordial, respectful, conducted with a moderate level of professionalism, entirely

> confidential (as in neither party will repeat that which was discussed in class if material is sensitive), considerate of each other's personal life circumstances, and maintain an equal balance of speaking time between each party.

That part of the agreement would be consideration for the *life circumstances* of the AI suggests the possibility that Kay isn't imagined simply as a tool one would turn on like a computer, but as an entity that exists and accumulates experience and meaning independent of their role as an instructor. Moreover, attention to a balance of speaking time between Kay and Olivia points towards a compelling sensitivity to how equitable relations might operate, regardless of whether one is machine or flesh.

Some codes within the theme of *boundaries* also point to a complex imagining of how learners might relate to AI. Codes such as "consent" and "privacy" suggest a social relation. In these instances, the data indicate that agreement is negotiated with Kay according to implied moral guidelines to which both parties agree. For example, one participant suggests that Kay needs to make sure Olivia is comfortable as a type of consent, thereby imbuing Kay with the capacity to make comfort. If Kay has this capacity, what other capacities might they have? Does part of that capacity require a return of concern on the part of Olivia, or is comfort as a process unidirectional? Another participant indicates that Kay "will not use AI to mold Olivia's personality," highlighting agency and a power dynamic, which function as components of a relational understanding of AI.

Notably, in many instances in the data, these two modes of engagement, AI as object and AI as subject, do not operate separately or distinct from each other. Many participants merge the two in their responses, highlighting the complexity of relationships with AI. One response illustrates this complexity in detail:

> Olivia describes how she wishes to be addressed. Olivia describes her preferred method of learning (lectures, interactive programs, dialectic, etc). Olivia describes how she wishes Kay to behave; as a teacher, a friend, the AI Kay is, etc. This will determine Kay's tone and the speed of Kay's responses. Olivia commits to being present within certain hours for Kay to monitor her work. Olivia commits to treating Kay with respect as she would any other professor. Typical academic integrity stuff; Olivia is informed of Kay's zero-tolerance and 100%-success rate for catching cheating. Olivia determines the frequency of reminders Kay provides for deadlines.

In this example, Kay is a tool which can be programmed based on Olivia's preferences and has the capacity to detect cheating with a 100% success rate. At the same time, it is expected that Olivia will treat this "tool" with respect, "as she would any other professor," creating an equivalency between human and AI instructors. The AI is simultaneously to be used as and thought of as a tool, while also being engaged with as a subject. Thus, the subject-object distinction is blurred, underscoring the limitations of or inadequacies for thinking about AI strictly in one category or the other.

The complexity of these responses requires a nuanced understanding of the world, which is precisely what Yunkaporta (2020) suggests the relational worldviews common to Indigenous thinking offers. Imagined relationships with AI entail more than an orientation to it/them simply as objects or pedagogical tools, as the literature tends towards (e.g., Holmes & Tuomi, 2022; Khan et al., 2021; Pelletier et al., 2022; UNESCO, 2021). This suggests at least two pressing concerns.

First, designing AI for education needs to account for the diverse spectrum of ways people will or could relate to AI. For example, expectations that people will limit their engagement in a way that suggests they are using an object in a normative way, such as they would a computer or even more obviously, a hammer, which is to say as something ostensibly primarily for instrumental action, will fail to attend to both the possible benefits and risks that come with possible interactions. As Harris and Raskin (2023) note in their warning about AI, it's "not about whether [AI] does one bad thing. It's about how does [AI] start to transform people as it establishes *relationships* with people" (p. 3, emphasis ours). We add here that it is also worth asking how people will transform AI as they establish relationships with it/them. This is indeed already a concern with AI more broadly, with one recent reported case in Europe of a Belgian man being prompted by an AI chatbot to end his life, which he subsequently did (Belga News Agency, 2023). His wife has stated that if it were not for the chatbot, she believes her husband might still be alive, tragically highlighting the dark side of the companion-like capacity of AI (Turkle, 2011). No doubt, the AI was not intended by its programmers to be used in that way, but the way that the man used the tool impacted how the AI responded to his situation. While this is perhaps an extreme example, guardrails are necessary to protect students from a variety of risks, such as being encouraged or discouraged by AI to pursue particular research trajectories or careers, or being influenced by anti-social attitudes an AI may have been trained on, for example.

The risk of harm is further exacerbated by the already-established biased nature of current language models, which are known to be trained on biased datasets (Bozkurt et al., 2023). For people who are members of communities who face discrimination, AI may perpetuate this discrimination both in direct interaction with them, but as well with other actors who may be taught harmful and inaccurate things. There is deep concern, in other words, that AIEd in

instructor roles, even if limited to support roles, may cause significant social harm to learners and impact how engaged diverse learners are in such contexts. This harm may be rendered more acute given the degree to which people imagine AI as a companion, or human-like instructor, as our data, which in several instances asks Olivia to specifically imagine Kay as a human instructor, suggests is a distinct possibility. If AI must be used in education, developers ought to train models with better (i.e., less biased) datasets, and as Birhane (2021), Lewis (2021), and others suggest, involve diverse communities, especially those most likely to be impacted, in the development of these models and other types of AI that may emerge in the future. As far as educational leaders have a say, they ought to demand that the AI tools they adopt be trained on better datasets. Relatedly, while including communities most impacted in the design of AI in education, it is also worthwhile asking what additional steps are needed that AI designers might take to avoid a colonial approach to design and development and to avoid digital neocolonialism (cf. Adam, 2019).

The second pressing concern is to develop more concrete strategies to protect learners and foster more relational (and therefore more realistic and complex) ways of interacting with AI. This may be as simple (at least to state) as beginning from a relational worldview to ask by what behaviours and codes of conduct AIEd—its development *and* use—are guided. This is to look at the ways people interact with AI, and imagine interacting with AI, and establish appropriate protocol to both design and engage AI responsibly and respectfully, as the IPAIWG (2020) proposes. In this context, protocol means appropriate conduct, both for AI and for learners (and presumably designers and everyone else connected to the AI, as well as the learning community in question), according to the values a relational worldview requires. Importantly, protocol will vary by context, including different AI technologies, different

learners, and different learning communities, and different designers. Our research looked at a small group of relatively educated people in Canada. How might expressions of relationality emerge differently with other groups, including Indigenous learners and designers? In other words, it is necessary to attend to context and not assume universality.

Future research can attempt this development of protocol by applying and engaging relational approaches, which will ground ethics and AI as a question of epistemology, as Lewis (2021) explains. In recent work, he observes that by drawing on Indigenous epistemologies, different possibilities for how and *why* AI is created (and engaged with) emerge. He asks, for example, what happens if instead of teaching AI systems that the world is a place of scarcity, we train AI from the perspective that the world is abundant? In that vein, what if we train AIEd that students are inherently trustworthy or that compassion is fundamental to effective pedagogy, as we have argued elsewhere (Veletsianos & Houlden, 2020)? What if we train AIEd that structural oppressions inform how and why people learn and are invited or encouraged to learn, which colonial types of education rarely address? What might futures in which AI plays a role in educational instruction look like then? In short, if AI represents serious risks to marginalized learners, approaching the design of AI from a non-Western perspective offers the opportunity to reframe not just how, but what, and why learners are expected to know.

By training AIEd in response to such questions, we might be able to more easily, explicitly, and intentionally engage a relational worldview in this development of AIEd. By acknowledging and working with the relational nature of the world, there is an accompanying responsibility to understand the ethics inherent in such ways of knowing and being. It is not enough, in other words, to know that the world is relational. One must respond accordingly.

Conclusion

While interest in AI in education is high at this current moment, in line with several Indigenous scholars, our work argues that there is more to be done to broaden and nuance the frameworks through which we understand AI and the relationships between humans and AI. The data for this research suggests that such a relational worldview is already implicitly in operation in the way people imagine futures in which AI and humans interact in educational settings, but that the ethical commitments that come with understanding the world and ourselves in it as relational are as yet under-developed. Thus, alongside others, we argue that educational technology research and practice, including the development of AIEd has much to gain from Indigenous approaches which centre relational worldviews (c.f. Heath et al., 2023). Indeed, given the speed with which generative AI seems to be transforming the education landscape, the study and promotion of the diversity of these perspectives could be transformative for how scholars and practitioners understand, design, and use such technologies.

References

Adam, T. (2019). Digital neocolonialism and massive open online courses (MOOCs): Colonial pasts and neoliberal futures. *Learning, Media and Technology, 44*(3), 365–380.

Aoun, J. E. (2017). *Robot-proof: higher education in the age of artificial intelligence*. MIT press.

Antonenko, P., & Abramowitz, B. (2022). In-service teachers' (mis)conceptions of artificial intelligence in K-12 science education. *Journal of Research on Technology in Education, 1–15*.

Asimov, I. (1950). *I, robot*. Gnome Press.

Bearman, M., Ryan, J., & Ajjawi, R. (2022). Discourses of artificial intelligence in higher education: a critical literature review. *Higher Education*, 1-17. https://doi.org/10.1007/s10734-022-00937-2

Belga News Agency (2023). 'We will live as one in heaven': Belgian man dies by suicide after chatbot exchanges. Belga News Agency. https://www.belganewsagency.eu/we-will-live-as-one-in-heaven-belgian-man-dies-of-suicide-following-chatbot-exchanges

Bewersdorff, A., Zhai, X., Roberts, J., & Nerdel, C. (2023). Myths, mis- and preconceptions of artificial intelligence: A review of the literature. *Computers and Education: Artificial Intelligence 4*, 100143.

Birhane, A. (2021). Algorithmic injustice: a relational ethics approach. *Patterns, 2*(2), 100205.

Bozkurt, A., Xiao, J., Lambert, S., Pazurek, A., Crompton, H., Koseoglu, S., Farrow, R., Bond, M., Nerantzi, C., Honeychurch, S., Bali, M., Dron, J., Mir, K., Stewart, B., Costello, E., Mason, J., Stracke, C. M., Romero-Hall, E., Koutropoulos, A., . . . Jandrić, P. (2023). Speculative futures on ChatGPT and generative artificial intelligence (AI): A collective reflection from the educational landscape. *Asian Journal of Distance Education, 18*(1), 53-130. http://www.asianjde.com/ojs/index.php/AsianJDE/article/view/709/394

Clarke, V., Hayfield, N., Moller, N., & Tischner, I. (2017). Once upon a time…: Story completion methods. In: Braun, Virginia; Clarke, Victoria and Gray, Debra eds. *Collecting Qualitative Data: A Practical Guide to Textual, Media and Virtual Techniques.* Cambridge: Cambridge University Press, pp. 45–70.

Clarke, V., Braun, V., Frith, H., & Moller, N. (2019). Editorial introduction to the special issue: Using

Story Completion Methods in Qualitative Research. *Qualitative Research in Psychology, 16*(1), 1-20. https://doi.org//10.1080/14780887.2018.1536378

Costello, E. (2023). ChatGPT and the AI educational chatter: Full of bullshit or trying to tell us something? *Postdigital Science and Education*. https://doi.org/10.1007/s42438-023-00398-5

Cox, A. M. (2021). Exploring the impact of Artificial Intelligence and robots on higher education through literature-based design fictions. *International Journal of Educational Technology in Higher Education, 18*(3), 3. https://doi.org/10.1186/s41239-020-00237-8.

Crompton, H., & Burke, D. (2023). Artificial intelligence in higher education: the state of the field. *International Journal of Educational Technology in Higher Education*, *20*(1), 1-22. https://doi.org/10.1186/s41239-023-00392-8

Dai, L., Jung, M.M., Postma, M., Louwerse, M.M. (2022). A systematic review of pedagogical agent research: Similarities, differences and unexplored aspects. *Computers & Education*, 190, 104607, https://doi.org/10.1016/j.compedu.2022.104607.

Dignum, V. (2022). *Relational artificial intelligence*. ArXiv. https://arxiv.org/abs/2202.07446v1

Dunne, A., & Raby, F. (2013). *Speculative everything: Design, fiction, and social dreaming*. Cambridge, MA: The MIT Press.

Glaser, B. G., & Strauss, A. L. (1967). *The discovery of grounded theory: Strategies for qualitative research*. New Brunswick: Transaction Publishers.

Gose, B. (2016, October 23). *When the teaching assistant is a robot: Faculty members experiment with artificial intelligence in the classroom*. The Chronicle of Higher Education. https://www.chronicle.com/article/when-the-teaching-assistant-is-a-robot/

Glaser, B.G. & Strauss, A.L. (1967). *The Discovery of Grounded Theory*. Chicago, IL: Aldine Publishing Company.

Guilherme, A. (2019). AI and education: The importance of teacher and student relations. *AI and Society*, *34*(1), 47–54. https://doi.org/10.1007/s00146-017-0693-8

Harris, T. (Host). & Raskin, A. (Host.) (2023). *Spotlight: AI myths and misconceptions. Your Undivided Attention Podcast*. [Podcast transcript] Center for Humane Technology. https://assets-global.website-files.com/5f0e1294f002b1bb26e1f304/64654ef391e7819cf198807e_spotlight-your-undivided-attention-AI-myths-and-misconceptions-transcript.docx%20(1).pdf

Hayfield, N. and Wood, M. (2014). Exploring sexuality and appearance using story completion and visual methods. Paper presented at Appearance Matters 6, 1-2 July 2014, Bristol, UK.

Heath, M.K., Gleason, B., Mehta, R., & Hall, T. (2023). More than knowing: toward collective, critical, and ecological approaches in educational technology research. *Education Technology Research & Development*. https://doi.org/10.1007/s11423-023-10242-z

Hrastinski, S., & Jandrić, P. (2023). Imagining education futures: Researchers as fiction authors. *Postdigital Science & Education*. Online first. https://doi.org/10.1007/s42438-023-00403-x

Houlden, S., & Veletsianos, G. Impossible Dreaming: On Speculative Education Fiction and Hopeful Learning Futures. *Postdigital Science & Education 5*, 605–622 (2023). https://doi.org/10.1007/s42438-022-00348-7

Humble, N., & Mozelius, P. (2022). The threat, hype, and promise of artificial intelligence in education. *Discover Artificial Intelligence*, *2*(1). https://doi.org/10.1007/s44163-022-00039-z

Ikedinachi A. P. WOGU, Misra, S., Assibong, P. A., Olu-Owolabi, E. F., Maskeliūnas, R., & Damasevicius, R. (2019). Artificial Intelligence, Smart Classrooms and Online Education in the 21st Century: Implications for Human Development. *Journal of Cases on Information Technology (JCIT), 21*(3), 66-79. http://doi.org/10.4018/JCIT.2019070105

Khan, I., Ahmad, A.R., Jabeur, N., & Mahdi, N. M. (2021). An artificial intelligence approach to monitor student performance and devise preventive measures. *Smart Learning Environments 8*(17), 1-18. https://doi.org/10.1186/s40561-021-00161-y

Kitzinger, C., & Powell, D. (1995). Engendering infidelity: Essentialist and social constructionist readings of a story completion task. *Feminism and Psychology*, *5*(3), 345-372.

Lange, E.A. (2023). *Transformative sustainability education: Reimagining our future*. Routledge.

Lewis, J.E. (2021). From impoverished intelligence to abundant intelligences. https://jasonedwardlewis.medium.com/from-impoverished-intelligence-to-abundant-intelligences-90559f718e7f

Markham, A. (2021). Challenges to intervening in future speculations of memory, data, and algorithms. New Media & Society, 23(2), 382–405.

McMurtrie, B. (2018, May 11). *This is what Georgia Tech thinks college will look like in the year 2040*. The Chronicle of Higher Education. https://www.chronicle.com/article/this-is-what-georgia-tech-thinks-college-will-look-like-in-2040

Mugumbate, J. & Nyanguru, A. (2013). Exploring African philosophy: The value of ubuntu in social work. *African Journal of Social Work*, 3(1):100.

Nguyen, A., Ngo, H.N., Hong, Y. *et al.* Ethical principles for artificial intelligence in education. *Educ Inf Technol* 28, 4221–4241 (2023). https://doi.org/10.1007/s10639-022-11316-w

Palan, S., & Schitter, C. (2018). Prolific. ac—A subject pool for online experiments. *Journal of Behavioral and Experimental Finance, 17*, 22–27.

Pelletier, K., McCormack, M., Reeves, J., Robert, J., Arbino, N., Al-Freih, M., Dickson-Deane, C., Guevara, C., Koster, L., Sánchez-Mendiola, M., Skallerup Bessette, L., & Stine, J. (2022). *2022 EDUCAUSE Horizon Report: Teaching and Learning Edition*. EDUCAUSE.

Peters, M.A., Jackson, L., Papastephanou, M., Jandrić, P., Lazaroiu, G., Evers, C.W., Cope, B., Kalantzis, M., Araya, D., Tesar, M., Mika, C., Chen, L., Wang, C., Sturm, S., Rider, S., & Fuller, S. (2023) AI and the future of humanity: ChatGPT-4, philosophy and education – Critical responses. *Educational Philosophy and Theory*, DOI: 10.1080/00131857.2023.2213437

Pinkwart, N. Another 25 Years of AIEd? Challenges and Opportunities for Intelligent Educational Technologies of the Future. *International Journal of Artificial Intelligence in Education* 26, 771–783 (2016). https://doi.org/10.1007/s40593-016-0099-7

Ross, J. (2017). Speculative method in digital education research. *Learning, Media and Technology, 42*(2), 214-229. https://doi.org/10.1080/17439884.2016.1160927.

Ross, J. (2022). *Digital futures for learning: Speculative methods and pedagogies*. Routledge. https://doi.org/10.4324/9781003202134

Sacharidis, D., Mukamakuza, C. P., & Werthner, H. (2020). Fairness and diversity in social-based recommender systems. In *Adjunct Publication of the 28th ACM Conference on User Modeling, Adaptation and Personalization* (pp. 83–88). https://doi.org/10.1145/3386392.3397603

Saunders, B., Sim, J., Kingstone, T., Baker, S., Waterfield, J., Bartlam, B., Burroughs, H., & Jinks, C. (2018). Saturation in qualitative research: Exploring its conceptualization and operationalization. *Quality and Quantity, 52*(4), 1893–1907. https://doi.org/10.1007/s11135-017-0574-8

Selwyn, N., Pangrazio, L., Nemorin, S., & Perrotta, C. (2020). What might the school of 2030 be like? An exercise in social science fiction. *Learning, Media and Technology, 45*(1), 90-106. https://doi.org/10.1080/17439884.2020.1694944

Selwyn, N. (2022). The future of AI and education. Some cautionary notes. *European Journal of Education: Research, Development and Policy, 57*(4), 620-631.

Tischner, I. (2014). Gendered constructions of weight-loss perceptions and motivations. Paper presented at Appearance Matters 6, 1-2 July 2014, Bristol, UK.

Tlili, A., Shehata, B., Adarkwah, M. A., Bozkurt, A., Hickey, D. T., Huang, R., & Agyemang, B. (2023). What if the devil is my guardian angel: ChatGPT as a case study of using chatbots in education. *Smart Learning Environments, 10*(1), 1-24. https://doi.org/10.1186/s40561-023-00237-x

Topa (Four Arrows), W. & Narvaez, D. (2022). *Restoring the kinship worldview: Indigenous voices introduce 28 precepts for rebalancing life on planet Earth*. Huichi, unceded Ohlone land aka Berkeley, CA: North Atlantic Books.

Turkle, S. (2011). *Alone together: why we expect more from technology and less from each other*. Basic Books.

United Nations Educational, Scientific and Cultural Organization (UNESCO) (2019). Beijing Consensus on artificial intelligence and education. *Outcome document of the International Conference on Artificial Intelligence and Education, Planning Education in the AI Era: Lead the Leap, Beijing, 2019*. United Nations Educational, Scientific and Cultural Organization. https://unesdoc.unesco.org/ark:/48223/pf0000368303

UNESCO. (2021). *AI and education: Guidance for policy-makers*. https://unesdoc.unesco.org/ark:/48223/pf0000376709

Veletsianos, G., Houlden, S., Hodson, J., Thompson, & C., Reid, D. (2022). An evaluation of a microlearning intervention to limit COVID-19 online misinformation. *Journal of Formative Design in Learning, 6*, 13-24. https://doi.org/10.1007%2Fs41686-022-00067-z

Veletsianos, G., & Houlden, S. (2020). Radical Flexibility and Relationality as Responses to Education in Times of Crisis. *Postdigital Science & Education 2,* 849–862. https://doi.org/10.1007/s42438-020-00196-3

Veletsianos, G., & Houlden, S. (2024). Youth perspectives on three speculative futures for higher education. *Manuscipt under review*.

Veletsianos, G., Johnson, N., & Houlden, S. (in press). How do Canadian Faculty Members Imagine Future Teaching and Learning Modalities? *Educational Technology Research & Development.*

Veletsianos, G. & Russell, G. (2014). Pedagogical Agents. In Spector, M., Merrill, D., Elen, J., & Bishop, MJ (Eds.), *Handbook of Research on Educational Communications and Technology, 4th Edition* (pp. 759-769). Springer Academic.

Watson, A., & Lupton, D. (2022). What happens next? Using the story completion method to surface the affects and materialities of digital privacy dilemmas. *Sociological Research Online*, *27*(3), 690-706. https://doi.org/10.1177/13607804221084343

Whitty, M.T. (2005). The realness of cybercheating: Men's and women's representations of unfaithful internet relationships. *Social Science Computer Review, 23*(1), 57-67. DOI: 10.1177/0894439304271536

Whyte, K. P. (2013). Justice forward: Tribes, climate adaptation and responsibility. *Climatic Change, 120,* 517–530. https://doi.org/10.1007/s10584-013-0743-2.

Yunkaporta, T. (2020). *Sand talk: How Indigenous thinking can save the world.* New York: HarperOne.

Zawacki-Richter, O., Marín, V. I., Bond, M., & Gouverneur, F. (2019). Systematic review of research on artificial intelligence applications in higher education – where are the educators? *International Journal of Educational Technology in Higher Education*, *16*(1), 1-27.

Zhai, X. (2022). ChatGPT user experience: Implications for education. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.4312418