Designing for Discomfort: Supporting Critical Reflection through Interactive Tools

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ABSTRACT
A focus of human-computer interaction work and a central principle of user experience is that design should avoid discomfort and aim to craft positive experiences for individuals. However, for contexts in which an uncomfortable reaction is intended, instrumental, or indeed inevitable, we recognize that it is inappropriate to design for a positive or "feel good" experience. Herein we describe an investigation into the use of interactive technologies to support transformative learning, a process through which individuals engage with feelings of discomfort. The project is grounded by work with graduate students enrolled in a course that employed decolonizing pedagogies. Throughout the course students responded to uncomfortable, problematic scenarios through interactive tools. We present our analysis of students' learning experiences, their interactions with technologies and their reflections on the effectiveness of these engagements in terms of supporting opportunities for critical reflection, a crucial stage of the transformative learning process.

Author Keywords
design; negative affect; critical reflection; decolonization

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K.4.2 [Computing Milieux]: Computers and Society---Social Issues; H.5.2 [Information Interfaces and Presentation]: User Interfaces---theory and methods

INTRODUCTION
A focus of the human-computer interaction (HCI) work and a central principle of user experience (UX) is that design should avoid discomfort and aim to craft positive experiences for individuals [21]. As stated by Hassenzahl and Tractinsky in their framing of UX research within HCI, "*To prevent frustration and dissatisfaction had always been a core objective even of the most cognitively driven perspective on HCI. What is new in UX research is a focus on positive emotional outcomes such as joy, fun and pride*" ([21], p.93). However, for contexts in which a negative reaction is intended, instrumental, or indeed inevitable, we recognize that it is inappropriate to engineer a positive or "feel good" experience for the user. HCI scholars are beginning to conduct empirical work within such contexts (e.g., the de-gamification of military technologies [23], post-genocide reconciliation [36,49]. In addition, a generative body of work is exposing the assumptions behind dominant HCI research paradigms, advocating for a decentering of the field and engaging critically with the diversity of human experience (e.g., [3,5,6,16,24]). Drawing inspiration from these scholars, we set out to explore the context of discomfort that arises when people engage with societal tensions that are systematic and intergenerational (e.g., colonization) rather than contained and confined by an interaction.

In this paper we describe a blended graduate level seminar course that employed decolonizing pedagogies—philosophies, teaching practices and tools with an aim to "create a sense of the complexity of colonial oppression and how it is systematically exercised" ([25], p.124). We introduce the theory of transformative learning and describe how we applied this lens to our project. We present our analysis of students' learning experiences, their interactions with select educational technologies and their reflections on the effectiveness of these engagements in terms of supporting opportunities for critical reflection.

The goal of the research was to investigate the potential and pitfalls of incorporating interactive technologies into the transformative learning process, through which individuals engage with feelings of discomfort, stress, and uncertainty leading to significant change in perspective. The work is informed by scholarship that explores the reciprocal, intertwined nature of technological engagements (e.g. [30,48]). Our work does not provide a decontextualized functional analysis of tool features. Rather we engage the socio-cultural contexts and histories that mediate and are mediated through technological practice. In summary, our major contributions include:

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- Articulating the need for ethically grounded studies of discomfort and negative affect;
- An example of investigating difficult-to-quantify dimensions of human experience and ongoing processes (e.g. decolonization);
- The theoretical grounding and pragmatic examples of extending interactive system design to include negative affect;
- An initial set of criteria for system affordances that encourage the process of transformative learning, including shared practices of critical reflection; ideologically- and emotionally-contextualized information discovery; slowing down; liminal space; and communication backchannels
- Scholarship that acknowledges human diversity and the risks of generalizing (neutralizing) the term *user experience*.

LEARNING, NEGATIVE EMOTION AND DESIGN

The concept of transformative learning, first developed by sociologist Jack Mezirow, is often understood and referred to as perspective transformation: "the process of becoming critically aware of how and why our presuppositions have come to constrain the way we perceive, understand, and feel about our world; of reformulating these assumptions to permit a more inclusive, discriminating, permeable, and integrative perspective; and of making decisions or otherwise acting on these new perspectives" ([33], p.14).

According to Mezirow's theory, the multi-step process is first triggered by a disorienting dilemma resulting from a disconnect between one's understanding of the world and one's own concept of self. Yet, at this point instead of minimizing mental discomfort as predicted by theories from information science, psychology, and communication studies (e.g., information avoidance, cognitive dissonance, and selective exposure [10,51]), individuals engaged in transformative learning are willing to prolong a state of internal inconsistency.

Scholars across the social sciences have extended Mezirow's work, interrogating the experiences of transformative learning (also termed *pedagogies of discomfort*) [50] through anti-oppressive frameworks (including anti-racist, anti-classist, anti-sexist/feminist, and others critical of expressions of oppression). Upsetting emotions such as denial, contempt, and guilt are commonly experienced, but there is also potential for the negative to foster constructive dialogue, encourage action and allyship, and improve individual self-esteem through increased awareness and mindfulness [41,43].

The theory is not without critiques. The body of research tends to center on the educational benefits for individuals newly encountering dissonance between their understanding of the world and their concept of self. We note that for marginalized people who regularly experience systemic oppressive forces there are different concerns:

- The experience of 'uncomfortable content' (e.g., racist, classist, sexist, transphobic, heterosexist systems or attitudes) is likely daily and ongoing;
- It is never a question of 'willingness' to be subjected to or to prolong mental or emotional discomfort;
- Further exposing oneself to disturbing perspectives does not have the same 'transformative' potential. It can be harmful if threatening to the process of healing and taxing to the human psyche [18];
- Educating others of their "difference" [31] is another burden along with having to find information and perspectives that agree with their own (e.g. seeking a virtual community to experience "a 'presence' that is denied elsewhere ([34], p. 492).

In short, we agree with de jesus: a theory that posits exposing individuals to uncomfortable perspectives as categorically *good* suggests that we are (once again) taking on the perspective of people with privilege [12]. The balance of harms and benefits is complex and nuanced. Yet, for the context in which we situated this work (discussed below), the benefits appear well worth pursuing, albeit cautiously. Ongoing initiatives suggest that developing compassion and understanding often leads to some level of healing and perhaps reconciliation, even for survivors of past harm and those experiencing ongoing oppression (e.g., the work of Canada's Aboriginal Healing Foundation and the Indian Residential School Survivors Association).

Although researchers and designers have started to engage the role of discomfort in UX through work in serious games [32], adversarial interactions [4,13], and in developing the overall concept of engagement [38] the dominant approach is to engineer experiences which are intended to be engrossing and entertaining for the user (e.g., an impossibly difficult video game). It remains a challenge for those who endeavour to "confront participants with difficult decisions involving culturally challenging issues" ([4],p. 2009) to avoid approaches that frame the experiential as episodic, contained and confined by the interaction. It is common for scholars to articulate interaction as a contained experience to be manipulated, with rising action (building suspense); climax (the moment of discomfort); falling action (release of tension); and dénouement (post-experience reminiscence and retelling) [4]. This is problematic when addressing societal tensions that are often systematic, intergenerational and ongoing [18], often unaddressed in the final design.

In this project we are studying design for mediation (a *process* of listening and reflection) rather than agitation (a *state* of provocation). We take into consideration scholarship that explores the role of systems and settings—including discussion boards, content recommendation platforms, user anonymity, and collaborative editing software (e.g., [7,15,28,37,38,44])—in fostering dialogue or listening, encouraging reflection or empathy, supporting learning and engagement in situations of discomfort (i.e., unfamiliar and intimidating environments), and enabling

perspective transformation. However, we view tool engagement as an evolving practice that is influenced by the diversity of experiences, levels of awareness, group identities, and backgrounds of our participants along with the broad socio-technical context [16,24].

Most broadly, our research investigates how technological practice can support engagement in contexts, circumstances, or interactions that are likely to provoke uncomfortable or distressing responses. Our inquiry frames a series of generative research questions: What socio-technical practices show promise for facilitating the experience of negative emotion and scaffolding the transformative learning process? What interaction challenges face those who wish to support engagement in contexts of negative affect? In what ways can interaction design support the process of critical reflection?

ETHICAL PRACTICE: QUESTIONS OF ACTION

A significant challenge for this project was determining an appropriate context to conduct the work. We wanted to ensure that individuals were informed about the potential for discomfort before participation. We conducted the study with graduate students at the University of British Columbia enrolled in an elective class entitled "Information Practice and Protocol in Support of Indigenous Initiatives". We argue that through the description of the course (see Box 1), students who enrolled were aware that course material, assignments, and discussions might prove uncomfortable. Through this approach we hoped to alert anyone who had experience negotiating oppressive frameworks so she or he could avoid additional harms exposure to views expressed in this course might inflict. Students were told about the study and provided with copies of the consent form during the first class meeting by a third party. The instructor was not present. Students were asked to sign consent forms after the course was over. At that time they were better positioned to provide informed consent concerning the use of their data.

A second concern for the project was that the co-leads for the project are non-Indigenous scholars. Neither of us claim to hold or represent Indigenous perspectives. However, as settlers in Canada working with Indigenous colleagues on Indigenous initiatives, we have direct experience with discomfort, negative affect, critical reflection and the transformative learning process. Marginalized peoples do not bear the sole responsibility for inquiries that address bias, oppression and racism.

METHODOLOGY

Mezirow's theory begins with the *experience of discomfort*. It is the first stage in the transformative learning process [8]. Many studies have indicated that the second major stage labeled *critical reflection*—more so than any other—is essential to the transformative learning process [8,33,44]. Though many experience negative emotions when confronted with materials that question their assumptions and worldviews, only those who critically engage with the feelings and question the premises that underlie these assumptions and worldviews (i.e., critical reflection [44] p. 186), develop the foundations necessary for perspective transformation.

Researchers of transformative learning acknowledge the difficulty of quantifying and measuring the process; there is, however, consensus that perspective transformation is a long-term and gradual, incremental process [7,8,15,44], with some work suggesting that the incidence of and capacity for transformation increases with time [8].

- ***Course Goals:***

  This course prepares students to work effectively with Indigenous peoples, communities and organizations in support of ongoing developments in Indigenous culture and languages, self-government, treaty negotiation and litigation. Processes of information creation, sharing, storage, access and use within the information professions can support and/or negate these initiatives. Students will engage with the knowledge traditions, histories, government policies, and litigation that influence contemporary practice and protocols that shape interactions between Indigenous peoples and information systems. Students will develop an appreciation for the range of Indigenous and settler perspectives on information-related topics including: intellectual property; repatriation; knowledge; knowledge organization; orality; and the digitization of cultural heritage. At the end of the course, students will be positioned to undertake experiential learning opportunities within Indigenous-oriented information organizations, including but not limited to libraries, archives and cultural centres.

  Please note: Students are welcomed from widely varied backgrounds. Some students are of Indigenous heritage, well aware of contemporary Indigenous issues and interests and the ongoing influence of colonization. Other students are unfamiliar with Indigenous perspectives and alternate histories of colonization...Students are expected to reflect on these differences while engaging with course materials and interacting with their colleagues.

Box 1

In this study, we sought to avoid getting caught up in decisions of who among our participants had already been 'decolonized'. Instead of seeking to verify individual students' transformative learning process or corroborate their judgments of whether they were undergoing transformative learning, our interest was on investigating the ways in which practices, mediated through interactive tools, can contribute to critical reflection.

Students were assigned six problematic scenarios to read and respond to at six different points in the term. Each scenario highlighted discriminatory, yet standard, information and/or archival situations. Box 2 provides one

example, a session description from a regional library conference. It is a real world example of information professionals framing oral culture as a "lesser than" (and detrimental, backward) way of being. Members of a regional Indigenous information professional interest group shared the examples that we used as the scenarios. Reading, discussing and responding to the scenarios provided opportunities for discomfort for our participants, students in the process of adopting identities as information professionals.

PROBLEMATIC SITUATION #4

You are an active member of your regional professional librarian association; you've served on the conference committee in the past and still contribute your time to the peer-review process to review and recommend papers and submissions. You eagerly look forward to the program every year and while flipping through your pre-conference information package you notice the following session description:

"Can We Talk? Bridging the Gap between Oral Culture and Print Culture"

Oral culture orientation is a main determinant of poverty. This session will focus on how to assist oral culture individuals in gaining the print culture skills necessary to be successful in their own and their family's education. When family members have the skills and the confidence to master print culture skills they can be their child's first and best teacher. Find out how libraries can help to bridge that gap between oral and print culture.

How do you react?

Box 2.

For each scenario they were asked to respond using the private journal (student/instructor only), discussion board (full class), or group wiki (small group access). Journal entries were private, only the student posting to her/his journal and the instructor could view these entries. Discussion board entries were posted by and viewable to all students. Group wikis were editable and viewable by groups of 3 or 4 students. The tools were all part of the Blackboard 9.0 learning management system (LMS). This LMS is provided, endorsed and supported by our university. Ethical and legal concerns related to student privacy, data security and access were (partly) addressed by this choice.

Each tool was assigned twice. The tools offered students a different range of functionality through which to develop a response when viewed from private-public, individualistic-collective, and rhetorical-discursive continuums. We did not seek to contrast the use of the three tools with each other; rather we focused upon how students used the different tools to support a particular type of pedagogical tool (the scenarios) in a specific context.

Engagements with and through the LMS were designed to complement other course activities (readings, short films, lectures, trips to Indigenous-oriented libraries, museums and resource centres) and in-class discussions. In the last three weeks of the class, students contributed to a series of participatory-design-inspired workshops during which they were encouraged to reflect on, critique, imagine, and "mock up" interactions that support critical reflection leading to transformative learning. The workshops were envisioned as an inclusive and collaborative design space with students as learning technology stakeholders [14, 35]. The workshops provided opportunities for students to further contribute to the research by considering other interactive systems outside of our initial selection. Through the application of participatory design methodologies, we sought to minimize the potential for information avoidance, disengagement, and self-censorship within the specific context of transformative learning, engaging uncomfortable content in the classroom. Our intention was that by taking on the role of designers, students would be prompted to imagine and consider a plurality of perspectives, be provided more distance for reflection on the transformative learning process than they would as just "users", and would feel empowered to speak authoritatively, informed by their direct experiences engaging with course content.

ANALYSIS

Once grades were submitted for the course the authors gained access to student consent forms and learned that all 11 students agreed to let us include their course submissions and engagements in the project. For this paper our data set consists of students' responses to the 6 problematic situations (22 individual journal posts, 8 collaborative wiki posts, 2 discussion threads with submissions from all 11 students, 11 written reflections of the design workshop reflections). The workshop reflections included discussions of students' experiences with the course, its content, and activities. We took into account quantitative measurements available through contemporary LMS (e.g. number of posts, page view count, time on page), but do not explore these substantively.

We used grounded theory methods as developed by Charmaz [11] to conduct qualitative content analysis of our data via the online analysis tool Dedoose. Charmaz articulates well the controversy over drawing upon existing theory in grounded theory research ([11], pp.305-310). Our iterative analysis benefitted greatly from multiple passes through transformative learning scholarship. Specifically, we draw the reader's attention to Table 1, which is linked to our review of relevant literature. We used the table to first hypothesize whether we would find evidence of tool use supporting aspects of critical reflection in responses to the scenarios [20]. We returned to the table throughout our analysis to help articulate disconnects between what we expected and what emerged from the interactions. These discussions were generative in developing our themes.

Critical Reflection Activity	Evidenced in Literature		
	Board	Journal	Wiki
Writing as externalization of thought [15, 44]	●	●	●
Socio-communicative exchange (vs. an individual activity) [7, 15, 28, 44]	●		●
Space for collaborative sense-making (i.e. with opportunities for debate, dialogue, agreement, confrontation, negotiation) [7, 15, 28, 44]	●		●
Consensus-oriented [28]			●
Access to information subjective norms (i.e. implicit primers and/or framing for response provided by others) [7, 8, 15, 28, 44]	●		●
Full or partial anonymity possible with response [37]	●		❍
Non-public channels for participation and contribution (e.g. from lurking to liking) [28, 37]	●		❍
Group identification process [7, 44]	❍		●
Asynchronous communication [15]	●		❍
Accountability, autonomy and individual ownership of ideas and actions [7, 15, 28, 44]	❍	●	

Table 1: Critical Reflection Activities in Context

● Evidence that tool use in context strongly afforded the critical reflection activity

❍ Evidence that tool use in context partially affords the critical reflection activity

FINDINGS

Based on the analysis introduced above, we are positioned to discuss themes drawn from: 1) participants' reported reasoning in response to the problematic scenarios (i.e. their statements regarding the modeling of and strategies for engagement, and awareness of social and professional norms); 2) participants' reflections on technology use (including opinions and evaluations of the different tools); and 3) participants' technological use (i.e. their behaviour as evidenced through their technology interactions).

In the following subsections we introduce and expand upon themes that emerged from students' engagements with and through the different tools and their reflections on these engagements: negotiating a professional response; mediating information; the role of time; and qualities of space. We use italics to indicate direct quotations from students' responses.

Negotiating A Professional Response

Frequently students responded to uncomfortable comments, insensitive requests, or offensive viewpoints, by first suggesting that these were a result of an unfortunate but accidental choice of wording or an outdated policy that had no real bearing on standard, contemporary organizational practice. Lack of information was also cited as leading to the situations described in the problematic scenarios. GG noted that oppression and paternalism emerge "*most often from very well intentioned people armed with a great deal of misinformation*."

Given that our participants were aspiring information professionals, articulations of tolerance are not surprising. Often participants referred to professional norms or quoted directly from the American Library Association's core competencies of librarianship. CC's contribution underscored the professional stance of not lecturing patrons on "*the appropriateness of their views*" and HH described the job of a librarian as someone who helped "*patrons find information in a friendly and non-judgmental way…no matter how culturally insensitive*" [the request].

These statements advocating tolerance and expressing a willingness to presume good intentions on behalf of others persisted even when participants reported negative affect (e.g., hurt, dismay, or offense) in reaction to a scenario, such as when PG viewed part of a scenario description as deliberately racist yet still did not "*want to assume that in an initial assessment*". For MW, this was related to perspective taking; while a scenario could be interpreted offensively—a patron or colleague showing a callous attitude—"*a more positive outlook is that* [the patron or colleague] *is simply not aware*." Similarly, EE thought one should strive "*to see such encounters more as opportunities for polite, good-humoured, 'information-added' education*."

Some participants noted that the ability to exercise tolerance was often related to an individual's emotional awareness, particularly in contexts of negative affect when potential triggers and strong emotions could overpower or interfere with the ability to approach situations tolerantly. For example, to PG, it was important to be "*aware of my initial reaction in order to respond … in a respectful and appropriate manner*" and mindful of the need to "*take more time to consider the situation and to look at where it comes from*." The limits of emotional awareness for sustaining perspective taking and open-mindedness in the context of negative affect are worth noting. As previously mentioned with respect to de jesus' writings, in these contexts an extra burden is placed on those who frequently experience oppressive forces and there is little to entice such individuals to engage. In fact, there are many discouraging factors, for example, past experiences that have eroded one's ability to give others the benefit of the doubt.

Mediating Information: Objectivity, criticality and plurality

Drawing upon previous encounters to interpret events and determine the validity of new information is just one of multiple strategies used for making sense of our world [33]

as well as a key teaching of information literacy instruction [1]. Participants in our study often proposed several courses of action in response to scenarios dependent upon what they knew about the precise characteristics of the individuals (e.g. their level of expertise with a topic, their cultural identity, any invested interests or biases, etc.) involved and the broader context of the situation.

Information—understood here as documents and resources regarded as authoritative, but also 'facts' considered common knowledge and conventional wisdom—was also used as a tool for thinking through and formulating responses to scenarios. Given the emotionally charged and at times polarizing nature of the scenarios, some participants viewed information as a mediator and aspired to "let the facts speak for themselves" when possible.

For example, in reaction to a scenario on the use of the word genocide to describe the government of Canada's treatment of Aboriginal peoples, many participants cited, and relied on, the UN's definition in drafting their responses. Here information was deployed as an intermediary, neutral platform of expression and voicing disagreement with others by making it clear that the source of disagreement was not personal grounds, but factual ones; BB stated "*the best, and most diplomatic way to stand up to the Federal Government [was] to cite the UN*."

While this may seem a reasonable approach to responding to the scenario, and, according to communication theory such as non-violent communication, can be a powerful strategy for fostering constructive dialogue [40], in certain contexts, information could become viewed as objective and indisputable—by the same information professionals who were acutely aware of the biases and prejudices that seep into the construction of knowledge.

As previously mentioned, many participants' comments suggested that it was lack of accurate information which stood in the way of perspective transformation or more inclusive and less discriminatory opinions among others. In our study, information was readily invoked by participants in times of uncertainty and while discussing contentious and complicated issues. For example, to return to the political use of the term genocide in Canada, AE's comment on the matter was that the "*United Nations Office of the Special Adviser on the Prevention of Genocide lays out a pretty black and white definition*"—suggesting that the issue described in the scenario was also clear-cut.

While information can serve as a necessary scaffold for thought and frame of reference for those experiencing uncertainty and discomfort, it can also yield to reductionist thinking. Exercising plurality in opinion was a challenge for participants, as was the ability to hold, and honour, different perspectives at one time.

The Roles of Time

While EE wondered if the challenge of pluralism was caused by a pervasive "*sense of there being one right answer*" which could "*inhibit full exploration of the complexities of some issues*," our data suggests that there were other factors at play too, including time.

We believe such an effect would be especially pronounced in a context of classroom behaviour and graded assignments, and, in particular, would manifest in the wiki assignments, which were designed as collaborative activities for participants who had to develop one scenario response per small group rather than an individual response (as was the case for the journal and discussion board).

We anticipated that the wiki assignments would provide interesting insights into the process and practices of consensus building, and would prove more of a challenge for our participants in comparison to the activity of responding as just an individual to problematic scenarios. However, we learned that many participants viewed the wiki as a tool that privileged consensus, or the appearance thereof, over acknowledging diverse perspectives among participants. EE was of the opinion that an orientation towards collective agreement and collaboration from the onset could result in consensus being "*too easily achieved*." Despite our expectations that the wiki would encourage the debate and negotiation of ideas, for participants "*there did not seem strong enough motivation to put forward what might seem a weird, negative, or even contrarian perspective*."

Consensus building practices were related to the time constraints of coursework and the pressures to produce work within a short timeframe. Some participants reported a practice of agreeing with the group's direction in order to get an assignment finished and submitted. Even DD— who enjoyed the wiki format, preferred it over the other tools used during the study, and thought it allowed students to "*collaborate to form one answer that is greater than the sum of its parts*"—was aware that the "*process forced some … opinions and thoughts to be discarded in the final response*." Not all agreed there was not enough time, however; AE thought the two weeks was "*too long to have the wiki 'open'*" as no one even bothered to participate until the second week. AE acknowledged this was likely because "*everyone works on different schedules*" depending on their other commitments (shifts at work, assignment deadlines for other classes, etc.).

For EE, the time constraints made it difficult to have "*organic*" sharing and sense-making processes or create circumstances under which all members of a group could contribute "*in a relaxed, confiding way*." When contributions from all members were incorporated in a final group response, the process was not always done in a considerate or consultatory manner, and participants saw their words misused or ideas misrepresented. There was neither enough time for all group members to state their opinions or for the group to come up with an approach that was inclusive, if not fully representative, of all ideas.

Time can also have an important effect on an individual's critical reflection processes, including their formulation of ideas, and development or evolution of perspectives. As

previously mentioned, taking the necessary time to emotionally and mentally refuel and recharge can be critical for those processing disturbing and upsetting content and mediating the experience of negative emotion.

In contrast to the wiki, the journal and discussion tools provided better support for these needs and the practice of taking time for reflection. DD appreciated the asynchronous nature of these technologies and found it helpful for engaging more deeply with class content, especially sensitive material; compared to face-to-face interactions and in-class discussions, "*the opportunity to think about one's response and conduct some quick background research before hitting 'submit' [was] certainly an advantage*." EE also noted the benefits of having access to other people's comments on the discussion board over the course of a week, as well as the value of reading and reflecting on "*what other people were thinking*" before crafting and posting a response of your own.

This relationship between time and the process of critical reflection is also found in the literature on transformative learning. Specifically, it reinforces Taylor's finding of the "significance of having time to reflect" for transformative learning during asynchronous, online interactions ([44], p. 182). Similarly comments by participants in Boyer's study of transformative learning in online settings reflect on the value of having "time away" ([7], p. 348) from an onslaught of negative emotions be it panic, sadness, or self-doubt.

Space: Safe, Marginalized, Liminal, Shared, Delineated

The idea of having time away from a system and its content also echoes sentiments from participants on the importance of creating space.

For the participatory design activities, students worked in small groups to develop strategies for both physical facilities and virtual systems. One group planned an online portal for teachers to access the resources of the National Research Centre (NRC) for the Truth and Reconciliation Commission of Canada and discover materials for teaching and learning about the residential school system. CC described how their group strived to keep the "*emotional well being (of teachers, students, parents) at the forefront of our discussions*" and emphasized on "*laying the groundwork for establishing a safe and respectful environment in which to discuss [the] difficult subjects*" related to this recent chapter of Canadian history. This was envisioned through featuring information on available health services to support any trauma experienced by engaging with the content. Design considerations also included deliberate liminal spaces intended "*for preparatory interactions with students, parents, and colleagues*" that would provide an emotional buffer and precede users' access to the NRC's resources.

Another group, that deliberated on the physical gallery/exhibit space that would house digital access points to the NRC's online systems, had a similar approach. FF also described how the priority of supporting the well being of visitors led to the design of exits stationed throughout that would "*allow [visitors] to remove themselves into another space where they can reflect and recover from the potentially hurtful information being displayed*." As well as having multiple exits, the group also designed different entry points in order to accommodate visitors of different backgrounds, knowledge, interest, and levels of engagement with the NRC.

In addition to space away, i.e. necessary mind space for emotional processing and reflection, safe space [43] that is "free of manipulation, coercion, and so on" has been identified as an important precursor for constructive dialogue and the transformative learning process ([17], p. 269) which is often characterized by moments of uncertainty and vulnerability. "Safe space" can mean different things to different people (e.g. in the context of our university, it refers to respectful and supportive environments for lesbian, gay, bisexual, queer, transgender, two-spirited and intersex persons); in this paper, we use "safe space" to refer to learning environments that foster trust (e.g. the feeling that others acknowledge and listen to your ideas) as well as support (e.g. the feeling that you can voice your ideas and that others will/can recognize you are in a place of learning and there is room for making mistakes). We do not mean a place where everyone (i.e. everyone who has privilege) is entitled to *not* having to feel discomfort so that voices of dissent (i.e. voices of those without privilege) are either silenced "under the pretence that it makes [others] feel 'unsafe'" ([46], p. 160) or else gentrified to become more palatable forms of discourse [41].

With regards to our participants' experiences throughout the class, it is unclear whether "safe space" was adequately conveyed or provided by the design of the course.

EE believed "*the combination of different modes [of communication] was especially effective*," adding that having to reply to problematic scenarios through discussion board "*postings would have been inhibitory ... had they not been combined with the smaller group experience*." However, MW noted that overall "*it was a bizarrely untalkative class all semester*," even noting that during brainstorming activities – which were part of the participatory workshops and designed to encourage collaboration – "*few people seemed comfortable discussing anyone else's suggestions*." This was also reflected in the class' use of the discussion board tool, which for the most part was used by individuals to post one-off comments, rather than replies to other threads or to engage in back-and-forth conversations.

While it is tempting to conclude this was entirely due to the uncomfortable or challenging nature of the course material, we think the classroom environment also played a large role in shaping participants' expectations and understandings of how to use the different tools in the learning management system. Students mentioned how engagements with course tools were influenced by the motivation to do well in the course and earn a satisfactory grade or participation credits. AE pointed out that *if* the instructor had explicitly indicated that posts in response to someone else's post would still

'count' as a submitted assignment, more students would have been encouraged to "*create more of a discussion instead of just writing their response and putting it up in the discussion board*."

Similarly, there is evidence that use of the wiki was influenced by participants' desire to demonstrate their contributions to this collaborative space. Unlike the popular MediaWiki platform used by Wikipedia, the Blackboard wiki did not provide participants a detailed breakdown of revisions for shared workspaces beyond who had last edited a page. They took significant steps to accomplish this, either by using horizontal lines and different coloured fonts to indicate authorship or through meta-commenting—explicitly stating what they had changed (some even elected to use discussion boards for collaboration and then migrate finished content over to the wiki).

Interactions with other students in the class proved influential in participants' learning experiences. Final reflections from participants suggested that for some, the actions of other students in the class at times detracted from their experiences with course content, as well as the creation of a safe space. Interestingly, this was not restricted to a difference in opinions or problematic comments voiced in class or online, but extended to attitudes, efforts, and the perceived commitments of other students to their learning. For example, a student expressed disappointment with facilitating a discussion on a topic for which many had not done the assigned reading. The final reflections from some of the participants suggested there was a lack of trust among students; more than one participant reflected how the use of online tools seemed to undermine accountability for group work, and expressed scepticism of other students' claims of technical difficulties, seeing it instead as an easy excuse for avoiding work. Additional communication, even to the point of redundancy, would have been welcome in instances such as when AE was left waiting more than a week for group members to reply or when PG's wiki response was never commented on or edited.

RECOMMENDATIONS: SCAFFOLDING EXPLORATION AND DEVELOPMENT

The recommendations section is structured in the form of a narrative rather than compartmentalized, quickly scannable bullet points or a requirements checklist. We use italics to emphasize short form recommendations within the broader framing. Our choice of structure is integral to our content and will be expanded upon at the end of the section. For now, we encourage readers to go through the text slowly, deeply and reflectively and to avoid surface scanning.

We begin by addressing the influence of identity processes and politics on our participants' capacity for exercising tolerance, open-mindedness, and emotional awareness, qualities underpinning sustained engagement in contexts of negative affect and contributing to critical reflection.

In our study, the most relevant identity politics were those related to the information profession. In framing their responses to problematic scenarios, our participants drew from their knowledge of professional norms; their actions were shaped by their understandings of their roles as professionals. We acknowledge this to be a factor of our research design; however, we believe it is applicable to the general design of virtual systems, which are shaped by the existing practices of a community of users.

Technologies mediate practices—this is a foundational tenet of HCI research—but can also challenge or enhance facets of identity [29] and contribute to the development or expression of new ones [34]. A specialist system for disrupting, de-biasing, and decolonizing standard information professional practice would vary considerably from a system designed for a different profession; however, design approaches that *seek to create a shared identity of critical reflection and respectful dialogue among all users of a system* are not only platform-agnostic but can be of equal value to diverse communities. In addition to the positive effect a shared identity can have on cooperation, interpersonal relations, and conflict resolution [22], previous research on online communities recognizes the *opportunity for platform rules, policies, and user agreements to contribute to the development of a shared identity intertwined with shared practices* [9]. While we appreciate the critiques that approaches such as Adversarial Design [13] apply to consensus-based, community-oriented processes, we argue that it is critical to *do more than give voice to dissent. Contentious voices and actions need to be heard*. We saw evidence of frustration followed by disengagement when participants felt ignored or dismissed by their colleagues (concerns articulated but unheard). We believe influencing practice through design has the potential to minimize these types of frustrations.

In particular, we view the application of community code of conducts and anti-harassment policies—such as those adopted by conferences and open source projects like Code4Lib and Django—as strong examples of how to *convey the values and communicate the expectations of using a system and participating on a platform while also creating a culture of critical reflection*. According to the Ada Initiative, an organization that supports women in open technology and culture, an effective code of conduct will: List specific common behaviours that are not okay; Include detailed directions for reporting violations; Have a defined and documented complaint handling process [2].

Effective code of conducts outline what is considered inappropriate and state that there is no tolerance for abusive and discriminatory comments—although, *in order to be successful, system affordances must provide ways to enforce and react to violations of the code of conduct as well as dispute and iterate on the codes themselves*.

Participants' ability and willingness to exercise open-mindedness and engage in perspective taking, such as when encountering an institution's problematic policy, often depended on what they knew about the organization (or individual) with which they were engaging. A code of conduct provides the necessary framing: all individuals are subject to the conditions of the code and presumably in agreement with them as users of a system, making it easier

to presume good intentions (e.g., when an outdated term is posted). Organizations that author or adopt a code of conduct provide more transparency to users by explicitly stating its values and commitments to upholding them.

With regards to identity, we also note *the difference in experiences and interactions between those with privilege and those without in a given context (privilege being relative and situational)*. In thinking about information practices and tools, we return to the challenge faced by marginalized peoples who may be asked or feel the need to educate others and explain the oppression they experience. We envision information systems that *privilege the voices, perspectives, and experiences of these individuals (e.g.,* Aboriginals in discussions of self-determination and colonization, the working class in discussions of social stratification, cis and trans women in discussions of sexism). *Yet these systems must take care to avoid placing unfair demands or expectations upon these individuals, nor assume that there is homogeneity, complete agreement, or one defining experience within these diverse communities*.

We appreciate the complexity and challenges of designing for this context, but there are approaches and affordances in development that may provide support for engagement and the process of critical reflection. We look to Kriplean's et al's ConsiderIt platform [27] and other work in the area of de-biasing interfaces for promising designs.

Users of ConsiderIt are encouraged to create pro/con lists that are representative of their stances yet demonstrate contemplation of both sides of a political issue; there is also a distinctly social dimension to the platform whereby users can include their lists on a site-wide "continuum of conviction" (which acts as an ideological barometer for user activity), as well as consult lists made by others to incorporate new arguments into their own lists with an easy click. The continuum further serves to aggregate and visualize the prevailing positions on issues, both pro and con, allowing users to explore these positions broken down by different attributes or characteristics of users.

By requiring users to include both the pros and cons of an issue, Kriplean's platform *affords and supports pluralism*, especially in comparison to other systems, such as our study's wiki, which privilege consensus and contribute to a perception of total agreement. In addition to the value in *viewing the nuances and variation in opinions among people with different levels of investment in an issue* or who are disproportionally affected by the social and community processes related to an issue, we also see potential in *aggregating user-contributed content in order to crowdsource ideologically contextualized information, and indicate where there are gaps in understanding*.

Designs that serve to *'situate' users* are also of interest to our inquiry. They can *help newcomers—whether to a platform or a way of thinking—identify users who either may be willing to provide mentorship and point to helpful resources or are in a similar place in their learning and welcoming of peer-to-peer support and learning opportunities*. Such an affordance is one that creates a liminal space outside of direct engagement with system content. Wikipedia's Teahouse—"A friendly place to help new editors become accustomed to Wikipedia culture, ask questions, and develop community relationships" [47]—is a good example of liminal space that acknowledges through its design that there are differences among users that need to be respected in order to sustain and increase engagement.

Similar to use of space, designs should also *be responsive to time and its relationship to critical reflection and individuals' capacity to engage with uncomfortable content and negative emotions*. Research on slow technology—and its effects on reflection [39] and information processing [45]—suggests there may be value in further exploring the experience of time when designing for transformative learning. Specifically, slow design theorists argue that slow technologies have the potential to *reveal experiences that are often overlooked by a user and induce deeper reflection and contemplation* [19].

While there are technical ways to slow down the pace of user interactions (for example, periods of disabled access, delayed message relaying, etc.), it's also possible to *design a system such that the time constraints are a product of users' engagements with content and other users*. For example, another platform developed by Kriplean, the Reflect interface [28] add-on, provides a "backchannel" for communication which encourages users to demonstrate they have understood the comments of another, and to seek confirmation of their interpretation, before responding in turn. Users are also able to indicate they have 'heard' another's ideas—but not rate or express agreement or evaluations of the ideas.

While originally envisioned as a design for saving time for users (by allowing succinct and scannable summaries of long online discussions), Reflect slows the discussion board exchange and concentrates users' energies on finding common ground and negotiating understanding in asynchronous interactions. In addition to providing more time for reflection, we see this as a particularly useful functionality *for supporting collaborative work processes in platforms such as wiki that may not preserve the integrity of ideas and perspectives from multiple users*.

This affordance also *provides participation pathways for users* who may not necessarily want to post to the discussion board but are still able to demonstrate that they have read, listened, or understood another's ideas—which can prove key for users *who may be reluctant to publicly engage* because of difficulty articulating their own opinion due to uncertainty, powerful emotional reactions or else fear of getting it wrong. We think a *backchannel for conveying information related to collaboratio*n—availabilities to work on a project, indication of changes, gratitude for others' efforts, emotional states, degree of certainty or comfort one feels about their contribution—may also provide increased support for individuals working with uncomfortable content.

Through the content of the recommendation discussion we highlight tensions that arise when designing for negative affect. Through the structure of the discussion we attempt a (Kriplean-esque) meta reflection encouraging readers to read slowly, deeply and reflectively. We hope that highlighting real-world examples of innovative *and* functional system designs that could be used to support critical reflection and transformative learning will motivate others to consider this area of design scholarship.

CONTRIBUTIONS

Specific contributions of our work include:

Demonstrating a theoretical grounding (transformative learning) for extending interactive system design and the potential for interaction design to contribute to transformative learning processes;

An example of investigating difficult-to-quantify dimensions of human experience and ongoing processes (e.g. decolonization);

Offering an initial set of criteria for system affordances that encourage the process of transformative learning, including shared practices of critical reflection; ideologically- and emotionally-contextualized information discovery; slowing down; liminal space; and communication backchannels;

Providing examples of how to build on these criteria to extend our understanding of interactive system design;

Aware of harms that result from efforts to generalize, normalize and homogenize people and their activities, particularly through research practices (discussed in [5,6,26,42]), we cautiously put forward that aspects of the work *may* have applications for other environments, particularly those with opportunities for actors to undergo paradigm shifts and to engage 'pedagogies of discomfort'. These understandings can be critiqued, expanded upon and developed through future work designing and implementing systems that support the process of transformative learning.

Most broadly, through this project we join others working to add depth and nuance to the way the field of HCI conceptualizes 'user experience' (e.g., [3,5,6,16,24]). In a world fraught with inequities and conflict there remains much to learn concerning the use of interactive tools in support of understanding, healing and reconciliation.

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