EDTECH BOOKS

Applied Ethics for Instructional Design and Technology

DESIGN, DECISION MAKING, AND CONTEMPORARY ISSUES

edited by

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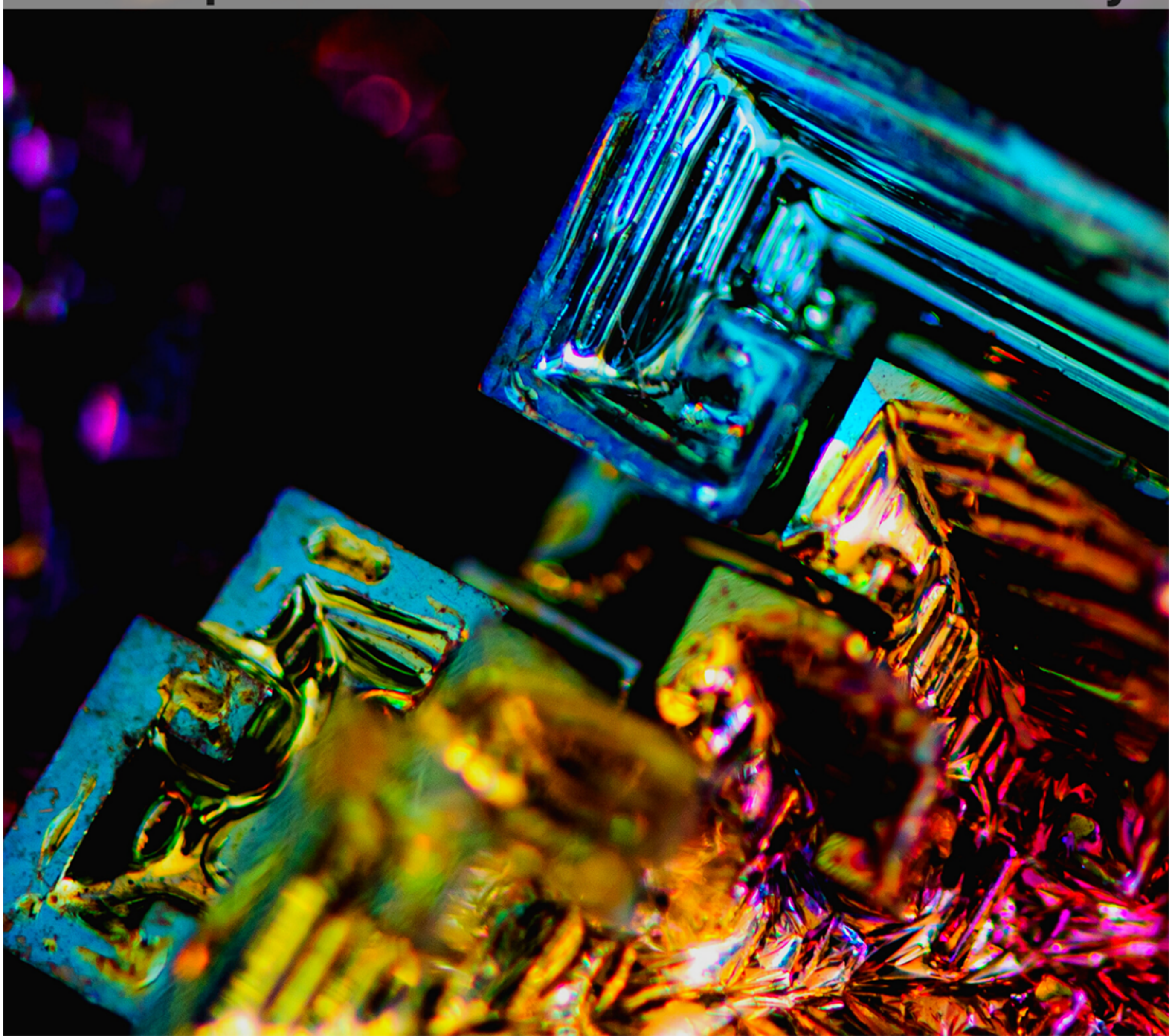

Applied Ethics for Instructional Design and Technology

Design, Decision Making, and Contemporary Issues

Moore, S. L. & Dousay, T. A.

Applied Ethics for IDT is an invitation to a conversation situated at the nexus of ethics, technology, and learning. This conversation is both a critique and a call to action focused on the intricate relationship between ethics and the field of instructional design and technology. Organized into two sections, the book first explores practices that integrate ethics into decision-making processes and practices. The second section invites the reader to critically examine ethical issues in situated contexts. The multifaceted ethical challenges presented in this text implore the reader to consider the realities instructional designers face in a rapidly evolving digital learning landscape and take responsible action with their newfound perspective.

Decision-making Design Educational Technology Ethics Instructional Design

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Integrating Ethics into Design and Decision-Making Processes and Practices

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Instructional Designers as Ethical Mediators

Gray, C. M.

Ethical inscription Ethics Mediation Values

Instructional designers have been instrumental in shaping learning experiences for almost a century—contributing to perceptions of what instructional experiences should be considered valuable, worthwhile, and rigorous. However, instructional theories and models of instructional design practice have rarely considered the ethical role of the designer in creating equitable and inclusive futures. In this chapter, I use two vignettes of instructional design work framed by facial recognition technologies to locate ethical tensions between designers and learners, identifying opportunities to leverage the mediating role of the designer. I describe potential ways forward for researchers, educators, and students that reposition ethics at the core of the discipline.

Instructional designers have been at the forefront of the scale-up of learning experiences of all kinds over the last century—transitioning our societies from highly local instructional practices to ones that have a shared connection to instructional and learning theories that can be practiced at scale. However, in what has been framed as a rush to “scientize” the discipline of instructional design (Smith & Boling, 2009), some of the core components of what it means to re-shape the world through design have potentially been lost. Chief among these components is perhaps the responsibility of the designer themself in creating new futures, shaping worlds and lives, and sustaining or confronting structural norms that more often disempower or exclude rather than empower and emancipate. Indeed, the models that dominate the field of instructional design rarely include references to the moral and ethical components that are at the center of the experienced pedagogy, and this lack of focus has—for decades—kept scholars and practitioners in our field from questioning and negotiating ethical tensions in the design of learning experiences.

In this chapter, I will confront this historic lack of attention to ethics in instructional design by focusing on the role of the designer themself in negotiating competing values and norms as a key part of engaging in design work. I will first provide some brief background to describe how the designer’s role intersects with a broader view of design as intentional change and worldbuilding. I will then use two vignettes that describe the intersection of instructional design and a specific category of technologies—facial recognition—to identify relevant values and ethical tensions that instructional designers must recognize and confront. I conclude with some ideas of how the field of instructional design might relocate ethics to its core, impacting the theory and practice of instructional designers in ways that not only acknowledge but also explicitly leverage the making of more ethical and inclusive futures.

Framing the Ethical Landscape of Design Practice

Design is an ethical act whereby we change “existing situations into preferred ones” (Simon, 1996). However, whose world is being shaped and what constitutes a preferred state is contested and value-laden (Willis, 2006). Even while education and instruction have been framed as a moral enterprise (e.g., Durkheim, 2012; Nucci, 2006) with the learner’s uptake of norms and values as part of their cognitive schema taken as an inherent part of educational praxis, the field of instructional design and technology has unevenly addressed—or even acknowledged—the role of ethics in the design of instructional experiences (see Gray & Boling, 2016; Yeaman et al., 1994 as a synthesis of the nascent interest in ethics in ID across multiple decades).

In my research spanning more than a decade, I have sought to describe how values and matters of ethical concern are manifest in design activity—including work across the spectrum of instructional design, learning experience design, human-computer interaction design, and beyond (Boling et al., 2020; Chivukula et al., 2020; Gray & Boling, 2016; Gray & Chivukula, 2019; Gray et al., 2015). Through this work, my co-authors and I have revealed the subjective and contingent judgments that guide a designer’s practice (Gray et al., 2015), the mediating role of the designer in identifying and responding to ethical design complexity (Gray & Chivukula, 2019), and the practices of designers that often reinforce an imbalance of power between stakeholders and end users through practices such as deceptive design, "asshole design," or the use of dark patterns (Gray, Chivukula, et al., 2020, 2021; Gray et al., 2018). These studies have revealed what has been known by designers since the dawn of the Industrial Revolution: designers are powerful agents that can use their skills to reshape the world, reinforcing structural inequities, pandering to humanity's worst excesses, or contributing to emancipatory and socially just design practices (cf., Costanza-Chock, 2020; Papanek, 1971).

While much previous research has focused on situating ethical engagement in relation to common paradigms of ethics (e.g., consequentialist, virtue, deontological)—for instance, through codes of ethics (Adams et al., 2001; Buwert, 2018) or methodologies that are grounded in moral philosophy (e.g., Flanagan & Nissenbaum, 2014; Friedman & Hendry, 2019), in my previous work, I have sought to describe how designers might frame ethics as a core part of their everyday ways of being and acting in service to client needs in a socially responsible manner—which others have described as "everyday ethics" (cf., Halberstam, 1993), building on the pragmatist tradition of ethical engagement that prioritizes both ethical awareness and attention to intentionally reshaping society in accordance with one's values (Dixon, 2020; Steen, 2015).

Doing "Ethics by Other Means"

According to philosophical engagement by Verbeek (2006) and underscored by empirical work by Shilton (2013, 2018), designers of all sorts engage in ethical reasoning and pragmatic action. However, designers do so in ways that are characteristically different from moral philosophers or those only seeking to theorize what should or ought to be. Instead, designers (re)shape the world through judgments that are always already value-laden—or what Verbeek (2006) describes as "doing ethics by other means"—whether designers are aware of this ethical armature embedded within their work or not.

What does this engagement look like when a designer is ethically aware? And what might a design situation or set of design outcomes look like when awareness and sensitivity to ethical impact are lacking? I will present two brief vignettes of recent contexts of instructional design work, focusing on the integration of specific emerging technologies to illustrate the inscribed values present in designed outcomes and identify opportunities for increasing a designer's ethical awareness and ability to act. Both vignettes focus on one specific type of technology deployed in the service of learning experiences to allow comparison—namely, the use of facial recognition and computer vision as a surveillance technology. Comparable technology-driven application contexts for learning (e.g., social learning via web-based interactions, engagement through mixed reality, or learning analytics-focused approaches, just to name a few) could be evaluated similarly using this same approach.

Surveilling Affect and Attention in the Residential Classroom

First, I will describe a vignette from prior to the COVID-19 pandemic, which leveraged advances in computer vision. With the rise of capacity to perform facial recognition in real-time, this technology has also been applied in educational contexts. More recently, the use of facial recognition and computer vision techniques has evolved beyond mere recognition (which has applications for educational settings in attendance tracking, for instance; Mothwa et al., 2018) to attempt to evaluate student attitudes, emotions, or attention (Barrett et al., 2019; Zaletelj & Košir, 2017).

Early techniques to detect learner characteristics took place in physical learning environments, using detection techniques that included video cameras and, in some cases, Kinect sensors. Facial recognition and evaluation models have been proposed using these data sources to classify learner behaviors about engagement, attention, and emotion. For example, one such proposed system published before the pandemic, known as EmotionCues, used "[a]naly[sis of] students' emotions from classroom videos [to] help both teachers and parents quickly know the engagement of students in class" (Zeng et al., 2021). These types of detection and analysis techniques have continued to be honed through the pandemic, leading to recent plans for integration into a commercial product called Class offered by Intel and Classroom Technologies[1] that will "capture[] images of students' faces with a computer camera and computer vision technology [on Zoom] and combine[] it with contextual information about what a student is working on at that moment to assess a student's state of understanding" (Kaye, 2022).

What values were in tension when considering the design and deployment of this system? First, let us consider how these beliefs might emerge in relation to an instructional designer or instructor's goals of evaluating or characterizing learner attention or understanding:

- Visible learner attention is critical to the efficacy of learning experiences
- Learner attention can be rigorously tracked and evaluated through facial recognition technologies
- Tracking the attention of individual learners in large groups is important to provide customized learning or tutoring
- Visible emotions can indicate a learner's level of understanding (as a proxy for learning)
- Even if emotional or attention tracking is knowingly flawed, it is better than nothing

Second, we can consider beliefs from the perspective of a learner whose attention or emotions may be continuously tracked by such technologies, with or without their knowledge:

- I want to be valued as an individual.
- I want to have control over how I am perceived by others.
- I want to be aware of what data is being collected about me and how these data might be used to inform my learning experience.
- I want to be able to say no to being surveilled as part of my learning experience.
- I am okay with being tracked by video, but I want to know how the instructor uses these data or if they relate to my participation grade.

Some assumptions by the instructional designer or educator are rooted in learning theory, where the learner's attention is a critical pre-condition for them to engage in a learning experience and/or construct their knowledge. For instance, the ability of an instructor to visually recognize when students are less attentive might be a trigger to use a different pedagogical strategy (perhaps planned by an instructional designer) that is more engaging. However, some other assumptions relate to what is technically possible or how technical possibility might relate to other aspects of the learning experience. For instance, one could easily move from the belief that tracking the attention of individual learners is important to assume that any technology that could scale this assessment from dozens of learners to hundreds might bring pedagogical value. In parallel, a belief that technologies can accurately detect human emotions, attention, or other proxies for "understanding" or "learning" might lead an instructional designer to specify these technologies without anticipating instances where these technologies fail or otherwise lead to inaccurate results. For instance, Barrett et al. (2019) have previously identified numerous assumptions built into flawed models of emotion, including a lack of consideration of context, individual personality, and cultural factors. The values of the designer and learner come into tension around the technological capacity of tracking and the pragmatics of using these technologies to inform the learning experience. The learner may want to be able to express their choice not to be surveilled, even while they may have little or no agency to make this choice in their learning environment.[2] From a more pragmatic perspective, the instructional designer or instructor may recognize that the attention scores produced by the machine learning model are flawed but reason that these scores are "better than nothing." There are numerous values in tension in this example—some which relate to technological capacity or efficacy, others that relate to learner autonomy versus instructor support, and still others that relate to the surveillance "end state" of learning technologies, which some scholars have openly criticized (Andrejevic & Selwyn, 2020).

This vignette raises several questions about the roles and decision-making capacity of multiple stakeholders in relation to emerging technologies and the kinds of evidence that lead to certain decisions being made. Should a student have recourse if their "attention" is deemed lacking, but this lower attention score relates to different cultural background, neuroatypical or disability status, or other failures of the tracking technology? How accurate should technologies be for them to be allowed in the classroom? How much control should learners be able to assert over which technologies are used, what data is allowed to be collected about them, and how this data is used? How transparent should the instructor or designers' use of data extracted through surveillance technologies to inform grades or other decisions be to the learner?

Surveillance in the Home

In the wake of the COVID-19 pandemic, educators sought to pivot their instructional practices to address the realities of "pandemic pedagogy." Residential instruction, in particular, moved into "emergency remote teaching" mode (Hodges et al., 2020), and instructors quickly sought to identify assessment alternatives that would translate existing proctored testing methods into the student's home. Of course, proctored tests at a distance were nothing new—but the scale and speed at which this shift took place seldom addressed issues of equity, student autonomy, and the translation of assessment context without taking into place other assumptions of how these inscribed values would impact the learner's experience. Articles in the popular press quickly decried this software as intrusive, and students' experience of the kinds of behaviors flagged by common software such as Proctorio and Examity that used face- and gaze-detection precipitated outrage.

What resulted could have been predicted based on prior literature on privacy and education (e.g., Arpaci et al., 2015). Students enrolled in higher learning institutions worldwide were required to download and install highly intrusive software on their personal devices. Software typically required access to a microphone and webcam. Many proctoring "solutions" also required the student to verify that the room was clear of other people and flagged instances where other voices were audible. One anecdote of this tracking at its worst was reported in The Washington Post:

> *"'A STUDENT IN 6 MINUTES HAD 776 HEAD AND EYE MOVEMENTS,' [the instructor] wrote [to a student], adding later, 'I would hate to have to write you up.'"*
>
> *[. . .]*
>
> *One student replied in a group chat with their peers: "How the hell are we [supposed] to control our eyes" (Harwell, 2020).*

This tracking occurred during a pandemic where families and friends were frequently locked down in close quarters. Many students did not have adequate access to physical privacy, others were ill while attending class remotely, and still, others were experiencing high levels of anxiety as the world seemingly was burning down around them in the biggest health crisis in a century. Adding in additional realities of the pandemic, such as the need to quarantine or isolate, rapidly shifting public health protocols, and uneven transition to remote learning pedagogies, the use of invasive proctoring software was a recipe for disaster.

While it is easy to view the particular socio-cultural and socio-technical tensions brought about by the pandemic as difficult yet peculiar—issues that could not have been foreseen or mitigated—the reality is somewhat different. Even before the pandemic, some learners did not have access to the types of technology and privacy that were assumed by the proctoring software (Gonzales et al., 2020). Characteristics of assessment that were unquestioningly supported by proctoring software providers, highlighting specific forms of rigor and validity in specific controlled assessment environments, resulted in inequitable impacts on students learning in the least hospitable environments. These socio-cultural impacts were felt most acutely by those who were intersectionally disadvantaged and disempowered: those living in shared living spaces with many family members and friends, those experiencing homelessness and living in their cars or other ad hoc environs, and those lacking up-to-date digital devices.

What values were in tension[3]? Values that are foregrounded in the design of instruction (or, in this case, assessment) are rooted in the beliefs one has about their discipline, their pedagogy, and the nature of student experiences that are deemed most beneficial. First, let us consider how these beliefs might emerge concerning the idea of testing as an assessment method[4]:

- Testing is the best mode of assessment for certain types of content knowledge.

- Testing is the most practical means of assessing student mastery of content knowledge in large classrooms.
- Testing is flawed, but there is no time to pivot to other assessment forms.
- Testing is the only common assessment method in my discipline.
- Students' inability to "cheat" or use outside sources of knowledge is a key criterion for assessment rigor and validity.
- Evaluation of external signals (e.g., audio, video, gaze) can be used to detect common drivers for cheating.

These beliefs point towards values that focus primarily on the pragmatics of instruction, focusing on issues of scale, consistency, and/or tradition. Second, we can consider beliefs from the perspective of a pandemic learner:

- I am just trying to survive
- I want to feel valued as a person
- I want to be judged by what I can do in an authentic setting

These beliefs point towards values such as authenticity, autonomy, or transparency. The values that were inscribed into the initial design decisions surrounding test-based assessment were potentially problematic—focusing on instructor-centric concerns rather than the student experience or the permanence of learning outcomes—but the intersectional harms of these decisions were potentially minimized due to the public nature of the residential classroom where access to technology devices was more readily ensured. However, when these public assumptions, including the minimization of individual student privacy, shifted and became translated into the student's home, bedroom, or other living environment, these inscribed values became evidently and transparently inequitable. Should a piece of software or proctor have the right to know the student's living situation? Should students not only submit themselves to mandated surveillance but also pay for the privilege of being surveilled (in many cases)? What types of privacy should the student have to give up to be able to participate in mandatory forms of assessment? What boundaries can or should exist in the liminal space between the instructor, instructional environment, and student?

Discussion

While I have provided two examples of explicit surveillance in this chapter to provide a point of focus, many other tactics commonly used by instructional designers to track and evaluate learner progress could also be viewed through a more critical lens. When does the use of learning analytics to track clickstream data at a profoundly detailed level in an LMS, app, or learning module shift from a primary purpose of providing value to the learner to the collection and modeling of data because the stakeholder can? How transparent are these data collection and use methods, and how much control does the learner have over how their data are collected and used? What forms of privacy should learners be guaranteed, and how would they know they had a choice in how their data were collected and used as part of their educational experience? How might deceptive techniques such as dark patterns be used to steer learner behavior and interactions with educational materials? And when might manipulative practices be used to overtly mandate surveillance in contexts where learners have no other recourse—consistent with prior definitions of “asshole designer properties” (Gray, Chivukula, et al., 2020)?

Learning technologies and other outcomes of instructional design practices are representative of few contexts where users do not have to consent meaningfully—where their engagement with instructors or mandated learning modules is already power-laden and where the learner’s voice can often be avoided or overtly ignored. What justice-oriented design practices (Costanza-Chock, 2020; Svihla et al., 2022) might be used to reassert learner autonomy, encouraging consideration of the potential harms and future abuses of educational technologies? How might the field of instructional design and technology consider—at its very core—issues of ethical impact? As Moore (2021) has recently written, the models that are commonly referred to as the theoretical foundation of our field do not adequately explain or support the everyday practices of instructional designers; further, these models rarely address matters of ethical concern, much less making these concerns central to the practice of design. In this sense, our field is far behind others. Papanek (1971) called for the centrality of ethics in industrial design in the 1970s, citing the damage being done in the name of disposable consumer culture. Garland (1964) decried the abuses of graphic designers when marketing to consumers in the 1960s, which Milton Glaser marked out through Dante-esque steps that a designer could consider along a “Road to Hell.”[5] Methodologies such as Value-Sensitive Design (Friedman & Hendry, 2019) and Values at Play (Flanagan & Nissenbaum, 2014) have also shaped fields adjacent to instructional design for decades. So, what do we need to do as instructional design scholars and practitioners to “catch up” and re-locate ethics at the center of our practice?

I will describe two foundational elements of ethics-focused practice that instructional design educators, students, and practitioners should consider: 1) identifying values and matters of ethical concern as always already existing as a part of instructional design work and 2) harnessing and languaging ethics to center design conversations on ethical concerns with attention to opportunities for action.

Values are Mediated by the Designer

The issues foregrounded through an analysis of surveillance technologies in instructional design allow initial access to the values implicit in all learning environments. Critical pedagogy scholars have described some of these facets of the learning experience as the “hidden curriculum” (Gray, Parsons, et al., 2020; Snyder, 1970; Volpi, 2020)—describing things that are learned even if they are not explicitly taught. Thus, reconstructive techniques such as those used in the vignettes above can be used as one entry point toward understanding the broader structural and socio-cultural implications of instructional design decisions at the broadest scales.

However, value inscription and ethical impact also shape the most mundane instructional design decisions. These tensions relate to what Vickers (1984) calls one’s appreciative system, which Schön (Boling et al., 2020) used to describe how designers frame the design situation, consider solutions, and then use the underlying appreciative assumptions of those solutions to iterate and move the design process forward. This reliance upon an appreciative system—that incorporates a set and hierarchy of values and a particular point of view—is an inescapable part of design work that can only be taken on by a designer who is acting based on their moral judgments and design character (Boling et al., 2020). To address this complex and ethically nuanced space, the designer must use their judgment to understand both the inherent complexity of the design context (what Stolterman, 2008 refers to as “design complexity”) and the ethical character of that space that makes some decisions more preferable to certain stakeholders under certain conditions (what Gray & Chivukula, 2019 refer to as “ethical design complexity”). Ethical design complexity foregrounds both the values that are “in play” as part of the design context and the role of the designer in manipulating these values as a core part of the design process—“complex and choreographed arrangements of ethical considerations that the designer continuously mediates through the lens of their organization, individual practices, and ethical frameworks” (Gray & Chivukula, 2019, p. 9). Instructional designers must be equipped to recognize this inherent ethical design complexity, and rather than scientize or abstract this ethical responsibility, embrace its contingency and subjectivity on behalf of the learners and society they wish to support.

Values (and Methods That Engage Values) Should Be a Key Element of Doing and Talking About Design Work

Even designers with the best and most altruistic intentions can design outcomes that are directly harmful to learners or produce societal impacts that reproduce inequities [6]. As an entry point to considering these harms, designers should consider using value-sensitive methodologies such as those proposed by Friedman and Hendry (2019) or broader and more flexible use of design methods that engage designers in considering ethical impact across various dimensions. My colleagues and I have collected and organized a set of ethics-focused methods (https://everydayethics.uxp2.com/methods), and further details about how we created this collection are available in a companion research article (Chivukula et al., 2021). As part of our collection and analysis process, we have identified multiple “intentions” that could drive more ethically centered practice, including I want to have additional information about my users, I want to identify appropriate values to drive my design work; I want to figure out how to break my design work; I want to evaluate my design outcomes; I want to apply specific values in my design work; I want to align my team in addressing difficult decisions; and I want to better understand my responsibility as a designer. Many of these intentions could be used to scaffold similar conversations to those raised in the vignettes above that relate to the ethical character of key design decisions, expectations of social impact, or identification of direct or indirect harms to learners or other stakeholders.

We have considered the case of the careful designer who is concerned about societal impact and might find substantial value in enhancing their practices through ethically-centered design methods. But designers—knowingly or unwittingly—can also inscribe harmful practices into their designed outcomes that take advantage of knowledge of human behavior. These tactics are commonly known as dark patterns—design strategies that provide more value to the stakeholder or shareholder than the user (Gray, Chen et al., 2021; Gray et al., 2018; Gunawan et al., 2021; Mathur et al., 2021). More hostile and transparent forms of manipulation or coercion have also been captured under the label of asshole designer strategies (Gray, Chivukula et al., 2020), which explicitly diminish user autonomy. As framed previously in the two vignettes that described the use of facial recognition to augment learning experiences, some harms can be directly traced back to beliefs about instruction or assessment that may be inequitable or otherwise ethically problematic. However, other deceptive tactics might be less easily identified initially, steering or nudging the learner but perhaps not forcing, manipulating, or coercing them. These learner and designer agency imbalances are an ideal space for further investigation by instructional design scholars. When is it acceptable for an instructional designer to use sneaking, nudging, nagging, or other strategies to subtly encourage learners to do things they might not otherwise do?[7] How is the designer's knowledge of learning conditions, learner profiles, and human psychology used to create more transparent spaces where autonomy and emancipation emerge as primary inscribed values? What commitments do instructional designers have to negotiate the complex tensions among different stakeholders, and what values should be central to the praxis of instructional design?

Conclusion

In this chapter, I have described two vignettes that reveal ethical tensions in the design of instructional experiences, identifying opportunities for competing sets of values to be articulated and used to make appropriate and ethically-centered design decisions. Leveraging these vignettes, I posit that instructional design educators, students, and practitioners should attend to the value-laden nature of design work by increasing their awareness of how the actions of a designer always already mediate ethics as a central part of the design context. Since this is the case, designers should attend to values as a key means of doing and discussing their design work.

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Footnotes

[1] https://www.class.com/

[2] For instance, see equity issues that emerged in relation to "camera on" policies during the pandemic that left some learners with limited ability to express their privacy preferences

(Castelli & Sarvary, 2021)

[3] See (Friedman & Kahn, 2003) for a further discussion of human values, including how values become part of the fabric of designer interactions through embodied, exogeneous, and interactional positions.

[4] Many of these beliefs were discussed and espoused by educators throughout the pandemic on the Facebook group "Pandemic Pedagogy," which at the time of writing has over 32,000 members.

[5] Glaser's original "road to hell" steps along with contemporary interpretations for digital product designers are available at https://dropbox.design/article/the-new-12-steps-on-the-road-to-product-design-hell.

[6] As a classic example in the context of educational technologies, consider the problematic legacy of the "One Laptop Per Child" initiative; (Ames, 2019; Warschauer & Ames, 2010).

[7] See (Gray, Chivukula, et al., 2021) for a description of deceptive roles that designers can take on when attempting to resolve tensions between user agency and design goals.

In Support of Ethical Instructional Design

Translation and use of the ethical choices with educational technology instructional design tool

Warren, S. , Beck, D. , & McGuffin, K.

Choices | Decision-making | Educational Technology | Ethical Thinking | Evaluation | Framework | Instructional Design

As technology solutions continue to grow in complexity, the choices facing those who wish to use them both effectively and ethically continue to grow more complex. The purpose of this chapter is to present the Ethical Choices with Educational Technology framework translated from K-12 setting use to instructional design practices in any setting (ECET ID). Two competing instructional design tool resources are compared and scored using the ECET ID framework to illustrate how it can help a designer choose a multimedia production tool that a.) meets the needs of their

idea, b.) is feasible to use by their clients in the time available, and c.) is deemed to have the best ethical outcomes from design through use.

Introduction

The goal of this chapter is to explain how the Ethical Choices with Educational Technology (ECET) framework (Beck & Warren, 2020) can be employed to guide an ethical decision-making process for instructional designers tasked with developing new tools for educators. This chapter will review the need for ethical thinking with educational technologies in K-12 and higher education environments (Spector, 2016). Then, we will explain the development and current components of the validated ECET framework available to instructors to guide their ethical decision-making process regarding new learning technology adoption. Using components of the instructor-focused ECET framework, we will then offer a practical guide for instructional designers for step-by-step use, followed by question prompts that support making ethical decisions about their overall design, individual technology decisions, and assessment methods. The primary goal of this piece is to adapt the thought process of the ECET framework into usable guidance for designers who want to perform their work ethically, with a core focus on ensuring the safety of the target users.

Ethics with Educational Technology

In this section, we examine big-picture questions about thinking ethically about the adoption (Palm & Hansson, 2006), learning use, and assessment aspects of educational technologies as a framing for the remaining sections in the background. Much of the literature covered here will be historical and often tied to other frameworks that inspired the one here (Schenk & Williamson, 2005). This will include issues that commonly arise with the use of or design of instructional systems, tools, digital curricula (Lucey & Grant, 2008), analytics (Pardo & Siemens, 2014), or created supports for education that are technology intensive (Warren & Lin, 2012; Lin, 2007).

In the past, ethics was not a focus of instructional technology design (Gray & Boling, 2016; Himelboim & Limor, 2008). The field of education has historically addressed ethics in terms of privacy and security, informed consent, data anonymity, authorship, and ownership (Chou & Chen, 2016; Papamitsiou et al., 2021; Klein & Jun, 2014). More recently, Steele et al. (2020) and Tzimas and Demetriadis (2021) expanded the discussion of ethical issues facing instructional designers, including physical, social, psychological, and moral concerns with immersive technologies and learning analytics. However, although these publications focus on relevant issues, they do not develop their findings into an easily usable form by instructional designers. On the other hand, more dated research provided by Warren and Lin (2014) provided specific questions that designers should consider as they design and develop educational technology interventions. Yet, their presentation lacks the benefit of integrating newer research on ethical issues facing teachers integrating technology into their classrooms (Warren & Beck, under review). The latter authored the Ethical Choices in Educational Technology framework (ECET) as a tool to help teachers make ethical decisions. This tool covered four sections: idea, feasibility, ethics, and evaluation. Unfortunately, no such tool currently exists for instructional designers. As a result, this paper attempts to integrate the approaches by Warren & Beck (under review) and Warren and Lin (2014) to create Ethical Choices for Educational Technology for Instructional Designers (ECET ID).

ECET Framework

This section explains the reasoning behind creating the ECET ethics question frameworks designed to help instructors think through their prospective technology ideas before implementing possible problematic technologies in classrooms. These frameworks include examinations not only of the ideas but also of feasibility given practical constraints in their local settings, as well as ethical questions about the tools they intend to employ, vendor business considerations tied to the creation and use of those tools, as well as their own classroom or training implementation practices. By allowing instructors to consider these questions before or during a planning process, a goal is that users can avoid negative ethical and practical outcomes. The first framework was developed for K-12 teachers (e.g., elementary and secondary) as the need was deemed high due to the compulsory nature of education at this level involving protected populations especially prone to harm because they lack the power to resist processes, tools, or approaches they disagree with.

Current ECET Framework Components

The existing K-12 ECET tool resulted from a five-stage development, validation, and revision process conducted with instructors and experts. The development, review, and revision stages included:

1. Brainstorm initial teacher framework components grounded in existing ideation, ethics, and praxis models. This step required a literature review to locate existing ethics frameworks for educational technology to identify commonalities and gaps in those models.
2. Gap analysis with existing components to identify needed ethics and praxis components. In this step, we identified formal components for inclusion in the draft initial framework to overcome gaps and supplement commonly identified aspects from existing models.
3. Create an initial framework for review by educator experts. The authors constructed the first version of the framework, ordering the nodes by their teaching practices while also seeking alignment with instructional design processes and models such as ADDIE and ASSURE and anchored instruction that can be used cyclically for revision to curricular development over time.
4. Review of the initial framework by instructors with a focus on improving content and linguistic structure contained in nodes to ensure readability and use value. At this stage, the authors asked five instructors working in elementary, middle, and high

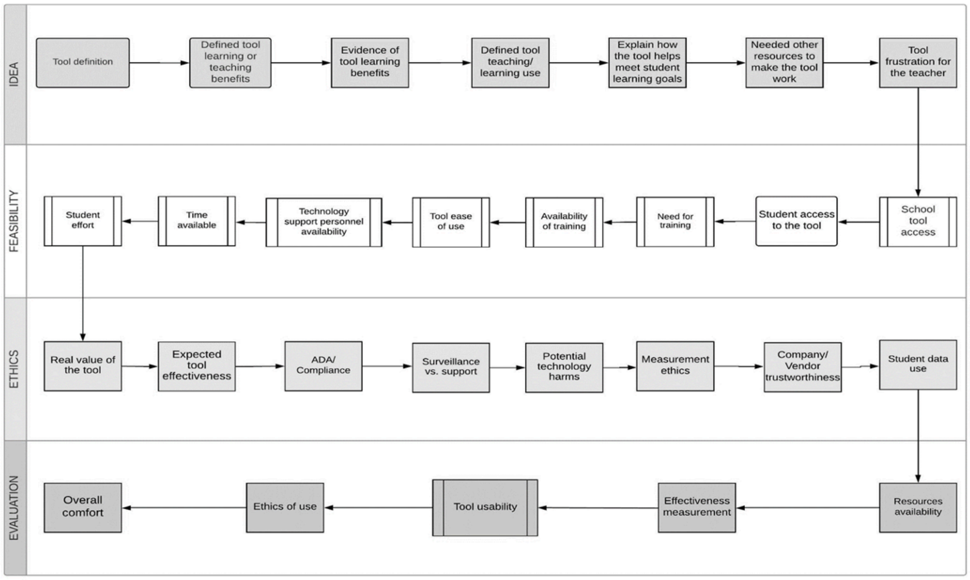
school settings to review the framework for feedback on its logical structure and order of questions and identify missing components.

5. Revise the initial framework and initial teacher guide using instructor feedback. In this phase, the framework was revised to ensure the logic followed teachers' common practices, and additional nodes were created while some were combined or eliminated.
6. Faculty expert review of revised framework. With the revised framework completed, it was presented for feedback to a faculty member from another institution with expertise in instructional design and past K-12 teaching experience.
7. Revise the framework (2nd). The framework was revised using the faculty expert's feedback to add two question nodes they felt were missing and another two combined. Some question language was revised to simplify them and ensure they more plainly communicated expectations. Further, the academic-aligned version of the framework used to explain underlying educational reasoning was revised to align with the teacher version.
8. Instructor review of revised framework and teacher guide creation (2nd). Another group of five instructors made up of different teachers from the first group then reviewed the twice-revised framework to provide additional feedback. Several minor edits were recommended to clarify question language, and two additional nodes were suggested for combination due to perceived redundancies, while one was suggested for addition.
9. Revision of the framework (3rd). The instructors' suggestions were reviewed and incorporated into the framework to improve its perceived clarity and usefulness.
10. Use application framework evaluation by instructors using think-aloud discussion protocol coupled with a sample educational technology. Seven instructors participated in the usability evaluation. Each instructor selected an educational technology product, employing the framework to evaluate and produce a score. The teachers explained challenges with question nodes as they applied the framework, highlighting any structural problems with the node ordering or clarity of language.
11. Revision of components to the current framework version. Using the teachers' feedback from the application evaluation, the framework was revised again to produce the current, validated version.

By engaging in a rigorous, cyclical design, review, and revision process, we intended to provide a tool that teachers can use daily, written in a language accessible to practitioners. Further, the ECET K-12 framework is intended to be flexible so it can grow as technology, ethics, or practical realities change over time; the ECET K-12 framework as it is presently constituted after the process is presented in the following figure.

Figure 1

ECET K-12



ECET K-12 (Beck & Warren, 2020)

The framework was initially more complex, with additional nodes in each of the four swim lanes (i.e., idea, feasibility, ethics, and evaluation), intending to support teachers' engagement with deep thinking about the potential problems. The tool was originally written in academic language/jargon, reflecting the perceptions and views of the framework's developers. These were revised based on instructors' feedback to ensure practitioner usability.

Idea Nodes

The eight idea components (nodes) in the first swim lane were developed to help instructors evaluate whether the tool they want to use and the purpose they have for it are possible to implement. These questions aimed to ensure that the reason for choosing an educational technology and its perceived learning affordances aligned with the teachers' purposes for adoption. The questions associated with these nodes ask them to think through the tool itself, how it is intended to meet specific learning goals, evaluate evidence of tool efficacy, and perform other thinking about whether their tool-focused learning idea is sound. Once teachers have determined whether the idea should move forward with this specific tool, they are asked to consider its feasibility, given other constraints.

Feasibility Nodes

The next set of swim lane nodes was created to ask teachers whether their idea could be implemented and integrated into their school day. Considerations are made relative to their or their students' available time, need for and availability of training, human and technology support resources, tool access, and other relevant factors. Once the idea and feasibility are deemed acceptable, the next set of components asks teachers to consider the ethics of the technology product through different lenses since if the idea is not sound nor feasible to implement, there is no reason to proceed to the next stage.

Ethics Nodes

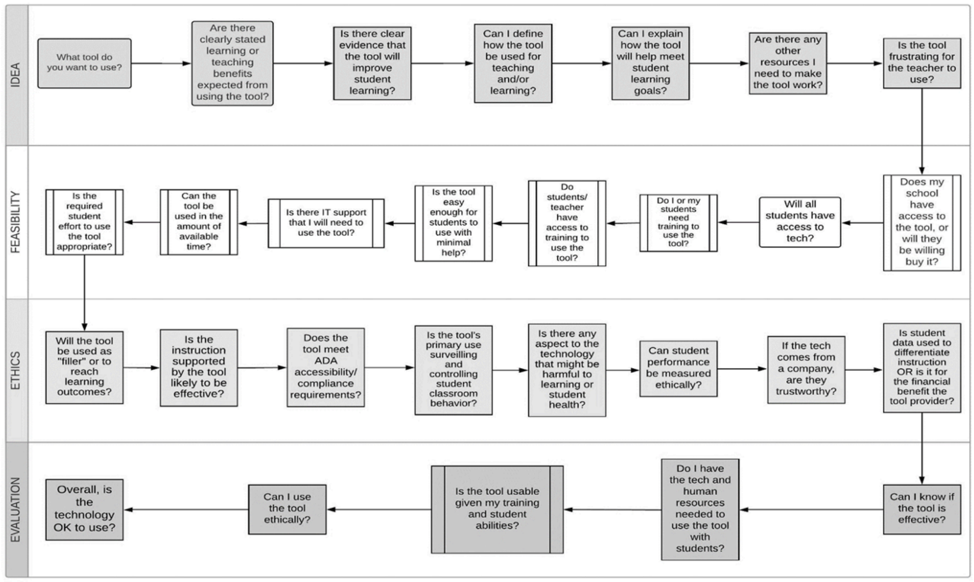
The ethics swim lane components were designed to take instructors on a short path from the feasibility of their idea and whether they can use it to whether they should use it. Because ethics is a consideration of whether a process, tool, or activity may lead to harm, the question of “Should I” is central to the components in this section of the ECET tool. The first question asks teachers to consider whether the tool will be used for educational purposes (ethical) versus to fill time in a school year without specific learning outcomes and lessons. This question is asked because some educators in classrooms commonly use educational technologies to avoid teaching, not to meet learning outcomes (e.g., show a movie). Once that component is reviewed, other elements, such as the present evidence of a tool’s effectiveness for their teaching purpose, accessibility, and questions about the technology’s vendor, help teachers think through whether it is ethical to use the tool. If a teacher finds the tool unethical at any stage in this swim lane, we recommend eliminating it to protect their students. Since the first three major components of the ECET framework walk teachers through 23 discrete questions, we find it helpful for them to conclude the process by revisiting their overall impression of the tool and their use plan.

Evaluation Nodes

When teachers complete their thought processes in the first three lanes, they are asked to conduct a final evaluation of the tool. This set of questions ensures that they feel comfortable using the tool based on their impression of the idea, the feasibility of successful implementation, and the ethics of a tool’s use before deciding to proceed. They are first asked to determine if they have the technology and human resources to implement the tool-supported lesson(s) successfully. Next, they consider whether they can ethically measure learning resulting from using the tool, followed by whether the instructor and students can successfully use it. Then, they are asked whether the tool can be ethically implemented based on a global consideration of items in the third lane. Last, they can consider their overall impression of a tool and their planning for use as a final opportunity to reconsider if they have any qualms about its use. Figure 2 presents the current version of the ECET framework tool for K-12 teachers with all associated questions.

Figure 2

ECET framework for K-12 teachers with questions



While the tool continues to be studied to determine its efficacy in classrooms as an ethics consideration model for teachers, the team realized that there are already many technology-based lessons teachers use today that were created by outside companies and instructional designers, which pointed to a gap in practice that was not currently being addressed.

Need for ECET Instructional Design Framework

Existing processes and models used to support instructional design (e.g., ADDIE, ASSURE, Backwards Design, etc.) commonly do not incorporate ethics questions into the thought processes of educational developers. Instead, they are commonly focused on the structural creation of lessons, courses, and other programs of study that often incorporate technology without the ethics of using these tools. Further, current instructional design models tend not to incorporate the practical and ethical perspectives or needs of instructors or students because instructional design typically focuses on expeditious development, not processes for determining whether that delivery mechanism is ethical. The framework can be employed with any instructional design processes or models during a step that asks designers to consider including a technology to support learning (e.g., analysis, design).

As such, a practical need exists to develop an ECET ID framework for professionals to guide their thinking in developing educational technologies. Instructional design textbooks and programs historically focus on the structural components of instructional design based on student and instructor needs from the perspective of learning related to specified outcomes (Piskurich, 2015; Warren et al., 2013; Warren & Lin, 2012; Reigeluth, 1999). The goal of the design of the framework for ECET ID was to support professional training in the field of instructional design. It is meant to support individual thinking or shared discussion regarding the ethics of choosing a particular technology under consideration for inclusion in a lesson or instructional module or to support a whole course. The purpose is broadly to give instructional developers questions that allow guidance on thinking through the consequences of their decisions from the users' perspective.

Translation Development Methods

In this section, we will explain the process used by the authors to translate the ECET teacher evaluation components into appropriate questions for instructional designers based on their differential tasks and specific needs.

Step 1

The beginning approach to development was to review each component of the K-12 framework and evaluate whether it applied. If a question component did not fit or was inappropriate based on the perspective presented (e.g., instructor instead of designer), it was targeted for elimination or adaptation. Further, if the instructional design thinking process suggested reordering, the component nodes were moved into a more logical order.

Step 2

Next, each component's guiding questions were revised so that they could be read from the instructional designer's perspective based on common audience analysis approaches (e.g., instructor and student). This was intended to aid a developer's ability to answer the component questions from the perspective of the individual lenses they should consider from an ethical perspective.

Step 3

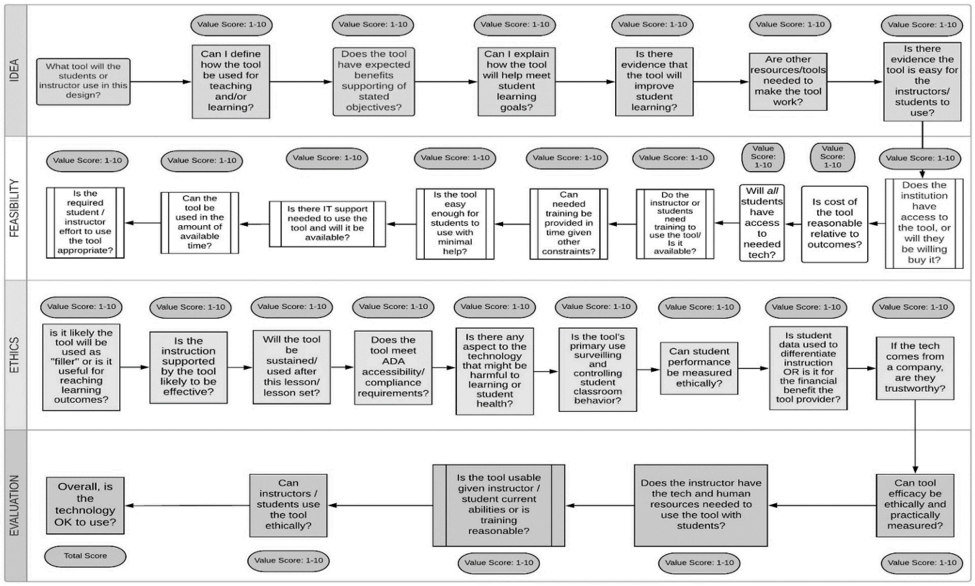
Third, the development team reviewed the components targeted for elimination or adaptation. Although none were removed after that discussion, the language was revised to inform the designer better. Two nodes were also added to focus on cost considerations.

ECET ID Structuring

This section describes the high-level structure of the applied ECET ID framework that resulted from this recursive design, review, and revision process. All components are intended for use during an analysis phase of any instructional design model that instructional designers or teams apply. The following figure presents the current ECET ID tool as it exists today.

Figure 3

ECET Instructional Design (ID) framework



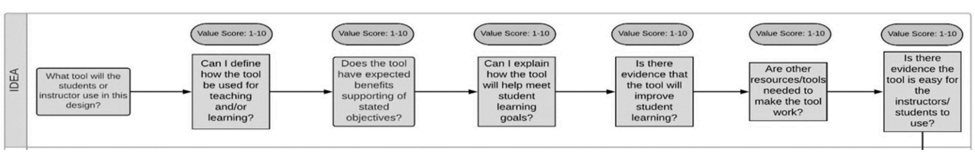
With the validation of the ECET K-12 framework tested, we revised those nodes from that tool to take the viewpoint of an instructional designer. However, to improve the use value of the tool, we also sought to maintain the perspective of the teacher and student needs as paramount, leading to the first swim lane including variations on the original seven question nodes.

ECET ID Idea Nodes

As presented in the following figure (reading left to right) and aligned with the ECET K-12 framework, the instructional designer first identifies and describes the learning tool they intend to use.

Figure 4

ECET ID *Idea* planning nodes to evaluate whether the tool meets desired outcomes



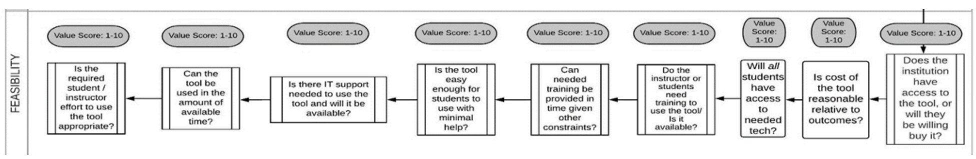
Once the tool is identified, the designer is asked to specify how they intend to use it for teaching and learning support. Next, they will describe the educational technology's expected benefits or learning affordances in detail, followed by the provision of logic as to why its adoption is valuable to meet the intended learning goals or objectives. Once these descriptions are provided, designers are asked to provide evidence that the tools should improve learning and consider other necessary technologies. For example, an interactive smart board may require an LCD projector, USB or HDMI connectors, and additional software installed on a local computer. Finally, the instructional developer is asked to consider ease of use with the tool in the context of their intended audience of students and teachers. In our experience in K-12 and higher education settings, even interesting tools with strong pedagogical affordances will remain unused if the use difficulty exceeds the intended audience's value or abilities. Once the idea for using the tool is deemed sound enough to proceed, the implementation's feasibility is evaluated.

ECET ID Feasibility Nodes

The feasibility review lane reads right to left and includes a possible 90 points. The first node in Figure 5 focuses on determining the tool's availability within the institution or the need to purchase.

Figure 5

ECET ID *Feasibility* swim lane containing question set to assess whether a tool can be used given available resources



There is already widespread technology adoption in some schools, so including a document camera that is already available in most university classrooms is a reasonable expectation. However, if the instructional design requires the purchase of ten sets of virtual reality headsets, checking whether this is a reasonable request is a good starting point if cost is a necessary condition for the educational plan to be accepted by stakeholders. This cost node was added to ECET ID because assessing and discussing whether the client can bear the cost of a tool adoption is required to build a successful learning design. Further, considering whether the cost of the tool is reasonable given the expected learning outcomes is an important next step because spending $50,000 on a set of tools that results in a 1% increase in learner engagement may not be considered reasonable and can stop an intended design from reaching implementation. Additionally, the lack of existing tools and the high cost to purchase them means most students will not have access to the technology, preventing the adoption of the learning plan.

The next two nodes (4-5) ask the designer to think about whether training is needed to use the tool, whether it is available, and if it can be provided in the available time. Given the time constraints in many educational situations and sometimes the high need for training before implementation, these questions are important to consider before moving forward. Further, human resources support based on ease of use and demand for information technology (IT) support is covered in nodes 6-7 because low usability and a need for high support can lead to failed instructional implementation. The final two nodes ask the designer to consider the feasibility of implementing the tool and related activities within time and effort constraints. In K-12 settings, there is often limited time to use new tools because of test software use and other school day activities, resulting in insufficient time on task to achieve learning gains promised by a tool. Further, suppose a tool requires a lot of cognitive effort to figure out and too much trial and error. In that case, the instructor may stop using and shift to lower-effort approaches to teaching that they are more familiar with, and students can complete with higher comfort.

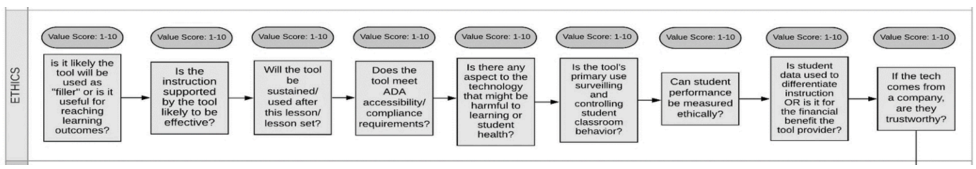
At this point, the ECET ID user has answered 17 questions focused on the practical reality of employing the tool as part of their design because whether to proceed is a complex consideration. Once the designer has considered these questions and found the tool feasible, they should consider the ethics of using an intended technology.

ECET ID Ethics Nodes

Like the feasibility question set, the ethics lane contains nine components read left to right. The first two questions in Figure 6 help designers consider their and educators' intentions for using the tool.

Figure 6

ECET ID *Ethics* question set with basic thought process regarding tool value/uses



More broadly, a challenge with instructional design and curriculum development can be a mismatch between what the tool's affordances can realistically provide and our intentions for them. When this mismatch exists, the tool's use can be a "filler" that takes up instructional time but cannot realistically support learning outcomes. As such, the tool asks designers to consider whether their intentions match the likely outcomes; failing to do so can result in lost instructional time, leading to educational harm (Warren & Lin, 2012).

The third node was added as part of the ethical consideration involved in the potential waste production generated by technology adoption. As instructional designs continue to grow in scale and given the potential e-waste involved in adopting educational technology tools, longer-term impacts are an increasingly important consideration when planning instruction (Warren et al., 2022). Next, we ask designers to consider the accessibility of their educational technology for students with any impairment as defined by the Americans with Disabilities Act. As schools, universities, and workplaces are increasingly held accountable for supporting their students and employees from a disability perspective, it is increasingly important to consider whether the technologies we adopt are designed in a manner that makes them usable by students with visual, auditory, and other challenges (Martín-Gutiérrez et al., 2017) to make sure all students and workers have what they need to be successful.

Designers are next asked to consider other potential harms from the project without consideration of potential benefits. This is because any harm, especially for children, is assumed to outweigh potential benefits. For example, untested products like learning games that lack research evaluation on their efficacy could teach poor mental models to students. When this occurs, the instructor and students lose significant instructional time due to reteaching by other means to eliminate the negative models and learn the correct ones (Warren & Lin, 2011). As a result, there may be insufficient time for students to learn other needed knowledge and skills, leading to minor or major student harm. With the increasing number of untested educational technology products in an unregulated commercial market, the likelihood of harm is increasing, so this question should be examined more critically than in the past. With no requirement that companies provide evidence of significant improvements from their products, coupled with lax regulations on marketing language in this area, instructional designers should be wary of educational technology effectiveness claims before recommending their adoption as part of an instructional plan.

Related to ensuring an ethical attitude towards the tools that students use, the next node asks designers to consider the purpose of the instructional tool. Increasingly, some vendors' tools are designed not to improve student learning or improve support for the learner experience but instead to surveil and control student behavior to punish perceived transgressions. Because of the need to deliver learning online or in alternative formats, there is increasing demand for products to address perceived acts of academic dishonesty by students during assessment; however, these products often have no other pedagogical value and can create significant emotional and psychological harms for students required to use them (Krutka et al., 2021; Andrejevic & Selwyn, 2020). As such, the next question asks designers to consider whether, using this product, student performance can be measured ethically. The increasing use of student metadata and inferential statistics to judge students, coupled with poorly designed online testing tools, increases the likelihood that negative conclusions about students and their performance will be made. As with other heuristics, the more transactional distance placed by technology between the learners and the instructor making judgments about students' performance, the more likely they are to be incorrect because context is removed. As such, instructional designers should carefully consider educational technology tools used for assessment or have assessment components that should be evaluated for ethics and efficacy. Maintaining the psychological and physical safety of the educational recipients is a complex task that falls within the purview of all educators, including instructional designers. Just as with research compliance expectations provided by institutional review boards, instructional designers have an ethical responsibility not to harm those that engage with our educational products, whether these be courses, games, or other technology products we choose to incorporate to support learning and teaching (Warren & Lin, 2012).

In the next node related to student assessment and data collection, the designer is asked to consider the vendor's purpose for gathering that information. Historically, student performance data was used to determine whether a student learned. In instances where they did not, it helps an instructor determine how to intervene, reteach, or differentiate instruction in later lessons (e.g., personalized learning). However, with the complexity and lack of transparency in vendor digital models today, it is increasingly difficult to determine how demographics, metadata about students, and performance data are being used and whether they are being sold for profit. As such, the designer should consider whether the data being collected is primarily for the benefit of learners and instructors or the financial benefit of the vendor.

Finally, designers are asked whether the tool vendor can be considered trustworthy. This determination can be made by examining reviews posted by past clients and, increasingly, journalism pieces and legal suits a company is involved in related to the ethics of their products, marketing claims relative to actual performance when available, and the company's decisions. With many companies today profiting from the sales of user data, it is important to consider whether that constitutes a privacy violation for your intended learners.

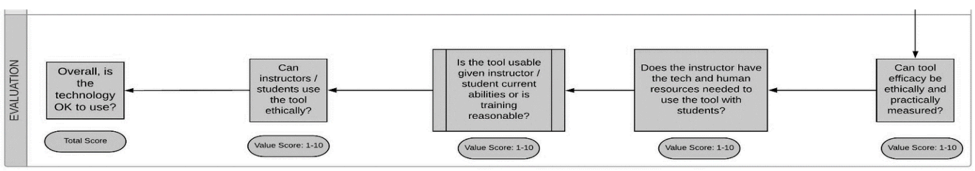
If they are only offered one option for technology interaction and that product may unethically collect data about the learners with no opportunity to opt-out, a better decision is likely to choose another product with similar affordances but without the surveillance and sales aspect or to offer multiple options. Our decisions about which educational technology companies to work with, especially companies that may be untrustworthy, may be viewed as the designer behaving unethically through their choices. As such, this question becomes important if a designer wishes to be viewed as ethical.

ECET ID Evaluation Nodes

The evaluation nodes match those in the K-12 teacher version and provide a final review of the three main elements of idea, feasibility, and ethics before using a tool in an instructional design.

Figure 7

ECET ID *Evaluation* components to summarize the designer's views of tool inclusion value



The first question (far right) asks designers to revisit whether an educational technology can be ethically and practically measured. Given the increasingly "black" box nature of complex technologies on the market that fail to disclose their designs, it is difficult to determine whether today's educational technologies were developed in a manner that instructors, students, and designers will agree are both effective and offered in a manner that leaves students and instructors with the power to resist negative applications. It is difficult to understand how positive or negative outcomes result if we do not know what a tool is doing to us. While corporate trade secrets are valuable and competition can be fierce, failing to disclose how a product's psychological structure is intended to support learning can make it difficult to trust, so designers should consider whether to recommend it.

Next, the designer is asked to think globally about whether the instructor will have the technology and other supports available to ensure all learners can benefit. This question may be situational and impact where an instructional design can be used. For example, in one setting where every student has access to a Chromebook, asking them to interact with a website for assessment daily is reasonable and efficient. In another setting where 35 students share computers with an uncertain internet connection, the answer to the questions in this node is different. This contextual difference continues in the third node, where the designer is asked to consider whether the learners and instructors have sufficient training to ensure successful implementation of the tool, process, or full learning design. In our experience, a lack of training can lead to a failed technology implementation as often as a poorly designed technology. With that in mind, the fourth node asks the designer to make one final judgment regarding whether they believe the educational technology can be used ethically. This opportunity to reconsider the ethics of the tool on a more global scope after answering more specific questions is intended to allow the designer to think through the relationships of all of these questions to get a broader impression of the tool's ethics component before moving to the final node and making a high-level assertion that a.) their idea for the tool is a good one, b.) it is feasible to use the tool, and c.) the tool can be used ethically in the setting intended and with these users.

To avoid unusable work or product development, the ECET ID tool ideally should be employed either prior to any design work or after learning goals and activities are planned to determine whether it is ethical to proceed. However, because the suggested approach to applying the ECET ID framework is not intended to be complex, taking less than 20-30 minutes for each review, it can be revisited at any time throughout an instructional design, development, or implementation planning process. At a minimum, we recommend that a review with scoring is completed once the design plan is complete but before development begins. Since changes often occur during learning product development, it is helpful to revisit the framework once the product and associated tool are ready for use as a final check to ensure the productive outcome of this process remains one that the designer and users feel meets their practical and ethical requirements.

ECET ID Application Example

To illustrate the use of ECET ID, we present simple evaluations as a use case from the perspective of instructional designers. As such, we next provide a model application of the framework in the context of developing an undergraduate or K-12 introductory multimedia development course. A major consideration will be to evaluate potential tool options to choose from and seek to make the best choice for our audience.

In this illustration of using ECET ID, we examine whether to adopt the GNU Image Manipulation Program (GIMP) 2.1 or the Adobe Creative Suite as an educational tool for an introductory multimedia development course. A consideration will be the identified learning objectives for this course. Since the course topic could be for either senior-level high school students or introductory students in undergraduate multimedia programs, the choice of instructional technology may differ based on various constraints and local needs, so the choice rationale in each context is explained. Other learning outcomes for the course are not linked to the educational product under review for adoption. Thus, the following table presents the multimedia-focused course goals and objectives.

Table 1

Multimedia-focused course goals and objectives

Component	Description
Course Goal 1.0	Employ industry-standard graphics software to create computer graphics for mediated learning/training.

Component	Description
Objective 1.1	The learner will develop an infographic to teach a simple concept for learner retention.
Objective 1.2	The learner will develop a training handout to support a set of 1-2 learning objectives.
Course Goal 2	Apply common graphic design principles using a common industry tool.
Objective 2.1	The learner will employ color theory in a manner that makes their educational media appealing to users.
Objective 2.2	The learner will employ consistent visual design principles in each educational media course outcome.

The scores for each component should be generated to give the designer a sense of how the technology performed for each component. This approach can help designers compare scores between possible instructional technology products when making a tool selection choice that will most likely be effective for the target users.

In this section, we present the scores for each product as rated by the authors as an illustration of the process. While it is not required that instructional designers have more than one scorer, it is a stronger practice from a qualitative research paradigm to have multiple analysts review the products to increase the credibility and trustworthiness of the review outcomes (Ravitch & Mittenfelner Carl, 2016). All scores for each item were capped at 10 points each, except the overall evaluation component. As such, the total number of possible points is 200 to make comparison across potential educational technology products easier for users. While all scoring includes an element of subjectivity, the guidelines for each node are the following, though they vary somewhat by item as specified in the user guide because some are yes (10 points) or no (1 point) questions:

- Score of 1: Construct is not at all present and described, or the answer to the node's question is an unequivocal "No." For example, when determining whether there is evidence of the product's educational efficacy, the designer reviews the product's website and public research sources (e.g., Google Scholar); no research studies are available that support the company's assertions that the technology's use supports student learning.
- Score of 3: Construct is noted but not described. For example, when reviewing the product's efficacy, the website says, "Parents and teachers tell us they learn a lot from our product!" and user quotes do not reflect formally conducted qualitative studies to support the claim.

- Score of 5: Construct is present but remains vague and abstract. The designer reviews the website, and the company claims, “We protect student and teacher privacy!” but there is no explanation as to how the company does this, and further review of public data sources indicates the company may sell certain data if the product is adopted without notifying the users.

- Score of 7: Construct is present and described but could benefit from stronger evidence or concreteness. The designer reviews the product’s website, and there are two or three small-scale qualitative research studies done by the company rather than independent researchers. These findings support the claims, but with the lack of significant numbers to bolster the findings, the score remains lower.

- Score of 10: Construct is fully present, concretely evident, and well described, or the answer to the node’s question is an unequivocal “Yes.”

Scores not listed above provide the reviewers with a range they can use, depending on the strength of evidence provided during their reviews, allowing analysts to provide. Further, to simplify scoring, a table was created to align each component, question, and scoring outcome with simplified language representing the questions in each node to allow these to fit in the corresponding cells (see Figure 8).

Figure 8

Ethical Choices with Educational Technology Instructional Design framework blank scoring table

ECET ID Component	1	2	3	4	5	6	7	8	9	Total
Idea	Define tool use for learning?	Tool benefits align to objectives?	Explain tool's use for goals?	Evidence that the tool is effective?	Other resources needed?	Tool ease of use evidence?				
Score	__/10	__/10	__/10	__/10	__/10	__/10				__/60
Feasibility	Tool access at institution?	Is the cost reasonable?	Do all students have tool access?	Instructor/ student training access?	Time or other resources needed for training?	Tool has strong ease of use?	IT support available?	Enough time to use tool?	Student/ instructor effort is appropriate?	
Score	__/10	__/10	__/10	__/10	__/10	__/10	__/10	__/10	__/10	__/90
Ethics	Tool is useful to reach learning outcomes?	Tool will likely support instruction?	Tool will be used beyond this design?	Tool is ADA compliant?	Are there potential tool harms?	Tool main use controlling and surveilling?	Learner performance can be measured	Learner data used to differentiate instruction or	Is the tech vendor trustworthy?	
Score	__/10	__/10	__/10	__/10	__/10	__/10	__/10	__/10	__/10	__/90
Evaluation	The tool's efficacy can be practically/ ethically	Instructor has tech/ human resources needed to use.	Tool is usable or training is available.	The tool can be employed ethically.	Overall, from global perspective, is the tool OK to					
Score	__/10	__/10	__/10	__/10	__/20					__/60
									Total Score	__/300

The items in Figure 8 follow the path listed in the Figure 3 diagram, but because of the need to follow the logic of the table, each is listed from left to right. In the following section, we apply the framework first to the GNU Interface Manipulation Program (GIMP) 2.1 digital tool and then to the Adobe Creative Suite because these two have media affordances that may be appropriate to the course’s learning goals and objectives.

Product Evaluation 1: GIMP 2.1

The GNU Interface Manipulation Program (GIMP) is a photograph or other image tool allowing graphic design with many line, erase, and other common media development tools found in many of today's online and software-based products. According to the product's website (gimp.org), the photo editing tool has existed since 1998 (v.1.0), though it was publicly released in 1996 (v. 0.54). Some of the other tools that are part of Adobe Creative Suite/Cloud, which we compare to GIMP, are older, originating in the mid (Illustrator) and late 1980s (Photoshop) or later with InDesign [1999] (Hoang, 2019). With a similar length of time in development, the GIMP tool is as stable as its main competitors from Adobe and other companies, making it a reasonable option from that perspective for consideration in this course. In the next section, we provide an example of how a designer may vet the idea of whether to use it for an introductory multimedia development course using ECET ID by reviewing the website and downloading the product for consideration. The scores in Figure 9 and indicated in parentheses in the following discussion reflect the reviewers' assessment and include suggested cutoff scores. However, each design team can create their own.

Figure 9

Ethical Choices with Educational Technology Instructional Design framework scoring: *GIMP 2.1* completed scoring table

ECET ID Component	1	2	3	4	5	6	7	8	9	Total
Idea	Define tool use for learning?	Tool benefits align to objectives?	Explain tool's use for goals?	Evidence that the tool is effective?	Other resources needed?	Tool ease of use evidence?				*Cutoff=50*
Score	10/10	10/10	10/10	7/10	7/10	6/10				50/60
Feasibility	Tool access at institution?	Is the cost reasonable?	Do all students have tool access?	Instructor/ student training access?	Time or other resources needed for training?	Tool has strong ease of use?	IT support available?	Enough time to use tool?	Student/ instructor effort is appropriate?	*Cutoff=65*
Score	10/10	10/10	10/10	10/10	10/10	7/10	5/10	9/10	7/10	78/90
Ethics	Tool is useful to reach learning outcomes?	Tool will likely support instruction?	Tool will be used beyond this design?	Tool is ADA compliant?	Are there potential tool harms?	Tool main use controlling and surveilling?	Learner performance can be measured	Learner data used to differentiate instruction or	Is the tech vendor trustworthy?	*Cutoff=65*
Score	10/10	10/10	7/10	4/10	10/10	7/10	5/10	9/10	7/10	81/90
Evaluation	The tool's efficacy can be practically/ ethically	Instructor has tech/ human resources needed to use.	Tool is usable or training is available.	The tool can be employed ethically.	Overall, from global perspective, is the tool OK to					*Cutoff=50*
Score	10/10	7/10	8/10	10/10	16/20					51/60
									Total Score *Cutoff=50*	260/300

Idea Planning

With GIMP as the tool under consideration, the first three question nodes are addressed concurrently because the technology will be taught as the means to create educational media (10) and is therefore expected to directly support the stated learning objectives (10) by allowing them to create educational media as course end products (10). While there is no direct evidence GIMP will improve learning, allowing students to learn to use it and build successful media artifacts, which achieves the learning goals for the course (7). Besides a mid-range computer, we assume no other tools are needed (7), though a large monitor may help make use easier. The wide adoption of the tool in industry and education settings, according to our examination of public reviews, is evidence that the tool is easy for students and instructors to use for the course (6). With the idea vetted with a passing score of 50 out of 60 points, we then examine the feasibility of using GIMP to meet our learning design intentions.

Feasibility Planning

Since the software is freely available for PC, GNU/Linux, or Mac operating systems (10), unless students are using Chromebooks, the tool will be fully available. Since it is free to download and use (10), there is no cost to students, faculty, or institution (10). A review of the GIMP website indicates 17 available training sessions of various levels, with more available on YouTube, so adequate training can supplement what is created by the instructor or designer (10). Two limitations are limited evidence of ease of use (7) and the expected lack of IT support at the target institution (5) because it is outside of the scope of provided services as no media editing tools have been adopted institution-wide (5). Since the goal of the instruction is to provide training on the tool, while not guaranteed for every student, the available time (9) and expected effort (7) should be appropriate to meet learning objectives. With this review complete and a score of 78 of 90 points, whether it is ethical to adopt the tool into the design is next considered.

Ethics Planning

The GIMP tool is central to achieving the learning objectives for the course (10). Therefore, the tool-supported instruction will likely be practically effective (10) and available for future courses at no cost (10), making it a financially sustainable choice. According to GIMP’s provision of information using the Voluntary Product Accessibility Template (VPAT), the product meets some accessibility compliance requirements. However, for visually impaired students, it is an open question as to whether it is usable relative to available time and individual student needs leading to the assignment of a low score (4). However, the visual nature of the course and tools will make choosing a compliant tool challenging. We do not believe the tool’s technological or psychological aspects are likely to harm student health (10) nor that there are surveillance or control aspects embedded in GIMP (10), allowing student performance to be ethically measured through students’ designed formative and summative media products (10). We found no evidence that the GIMP tool stores learner data (10) nor that challenges result from the vendor’s trustworthiness (10). With a score of 81 out of 90 possible points, GIMP appears to be usable ethically, leading to the final review and evaluation.

GIMP Product Evaluation

Based on our global review of GIMP as a possible tool for course adoption, its efficacy appears to be an aspect that can be practically and ethically measured through student and instructor feedback (10) rather than decontextualized metadata. For our purposes, the instructor will have the available tech needed. However, the needed human resources required to implement GIMP with students in the course remain somewhat questionable, leading to a score of 7 for this component. The tool appears usable according to available reviews and public information about the tool’s use and potential training sources (e.g., videos, PDFs, etc.). However, there remains some uncertainty since our target instructor has only used Photoshop in the past (8). Since the tool is used for creation rather than assessment or other purposes, we believe it can be used ethically (10). The product was given a global score of 16 out of 20 because the various ECET components left designers with the impression that the idea is reasonably sound, the product implementation is feasible, and it is an ethical choice. Still, because of unknowns with the instructor and IT support resources, there remain questions we cannot answer. Next, we use ECET ID to review the second product under consideration, the Adobe Creative Suite/Cloud product that tends to be the industry standard for media editing and development.

Product Evaluation 2: Adobe Creative Suite or Cloud

The Adobe Creative Suite has multiple components that may be useful for the multimedia course, including Photoshop (photo manipulation), Illustrator (illustration), Premiere (video), and InDesign (publishing). This makes the paid tool more robust than GIMP, which only includes options for photo manipulation and some illustration support. However, the cost is also high at $240 a year for students and instructors or $20 per month versus GIMP, which is free. In the following sections, we modeled the thought process of an ECET ID user examining the Adobe Creative Suite for later comparison with GIMP 2.1. The associated scores are shown in Figure 10.

Figure 10

Ethical Choices with Educational Technology Instructional Design framework scoring: *Adobe Creative Suite* completed scoring table

ECET ID Component	1	2	3	4	5	6	7	8	9	Total
Idea	Define tool use for learning?	Tool benefits align to objectives?	Explain tool's use for goals?	Evidence that the tool is effective?	Other resources needed?	Tool ease of use evidence?				*Cutoff=50*
Score	10/10	10/10	10/10	8/10	7/10	7/10				52/60
Feasibility	Tool access at institution?	Is the cost reasonable?	Do all students have tool access?	Instructor/ student training access?	Time or other resources needed for training?	Tool has strong ease of use?	IT support available?	Enough time to use tool?	Student/ instructor effort is appropriate?	*Cutoff=65*
Score	7/10	7/10	7/10	10/10	8/10	7/10	4/10	9/10	7/10	66/90
Ethics	Tool is useful to reach learning outcomes?	Tool will likely support instruction?	Tool will be used beyond this design?	Tool is ADA compliant?	Are there potential tool harms?	Tool main use controlling and surveilling?	Learner performance can be measured	Learner data used to differentiate instruction or	Is the tech vendor trustworthy?	*Cutoff=65*
Score	10/10	10/10	8/10	4/10	10/10	10/10	10/10	10/10	10/10	82/90
Evaluation	The tool's efficacy can be practically/ ethically	Instructor has tech/ human resources needed to use.	Tool is usable or training is available.	The tool can be employed ethically.	Overall, from global perspective, is the tool OK to					*Cutoff=50*
Score	10/10	5/10	8/10	10/10	18/20					51/60
									Total Score *Cutoff=50*	251/300

Idea Planning

Adobe Creative Suite and Cloud would be taught to students as tools to develop their own media and multimedia projects in support of the primary learning goals for the course. Since the course goals include creating new educational media using such tools, and the tool was used for similar purposes in other departmental courses, though at the graduate level providing evidence of efficacy to improve student learning. A challenge in the idea is that the tool can require a higher-end computer and is only usable on Mac and Windows operating systems, so it cannot be implemented with Chromebooks. As such, it may not work in the high school environment. While it is a complex tool, new students exposed to it in graduate courses have been able to use it successfully, and instructors are already familiar with it. The overall evaluation for the idea components was 52 out of 60 points. This indicates the tool should meet the course learning outcomes and basic audience usability; next, the feasibility of implementation with the Adobe Suite is examined.

Feasibility Planning

Starting with access, the university does not currently offer the tool to students, but educational pricing is available that would cost them $80 for the course duration. This is about the cost of a textbook, and since it is an industry-standard tool, the cost-to-benefit ratio appears reasonable. A department chair or principal scheduling instructors to teach the course must ensure that anyone teaching it has sufficient skills to deliver a course that uses the Adobe Suite successfully. Students will learn the tool as a course goal, so that component is achieved through related materials and learning activities. As a common media development tool used in the field and industry, it is easy to use for development in this course. One challenge may be that the institution offers uncertain information technology (IT) support, so any instructor must also serve as technology support. The tool should be able to be learned and used in the available class time, and the effort appears to be appropriate. With the soundness of the idea and tool use feasibility established, the ethics of implementing the technology is next examined.

Ethics Planning

Because the Adobe tools are central to what students are learning, they will be directly tied to learning outcomes and will support the identified instructional aims of the course. Since other courses in the department also use the tool, it should be sustainable in case students want to do a yearlong subscription that covers more than one related media development class. A challenge with the tool is its visual nature, so there are questions about ADA accessibility that should be followed up on with institutional teams responsible for this component. Since this is a tool for creating media, there do not appear to be inherent potential harms to student health, and no surveillance aspects appear that are present in some testing software. Since student performance is measured based on the quality of their media products supported by the tool, the ethics of this aspect are acceptable. No student use data is collected by the tool we can determine. Further, the technology company has a history of being trustworthy relative to users. With the ethics evaluation indicating a passing score, we conduct a final global product review before comparing Adobe Creative Suite and GIMP for this educational media development course.

Adobe Product Evaluation

Since Adobe Creative Suite is used to create educational media, the instructor should be able to ethically and practically measure the tool's value based on how well it supports student learning. Measures related to course outcomes can be developed about products the tool helped students create. The instructor should have the necessary technology if the institution pays for Adobe Creative Suite or Cloud. A question remains whether they will have local human technology support if questions arise they cannot answer. Instructors should be selected based on having prerequisite knowledge of Photoshop, Illustrator, and other Adobe Suite tools. Further, since part of the course goals are to teach these technologies, training is included in the course. There do not appear to be significant ethical challenges with the tool or the vendor, and overall, Adobe Creative Suite/Cloud could be practically and ethically used for the proposed media course. The following table provides the shared scoring for Adobe Creative Suite as a potential tool for the media development course.

Final Product Score Comparison and Decision Making

Once the evaluations are complete for each product, we can compare them based on the total score or on component criteria that are most important to the designer or end-users. Table 2 can be used to break out and compare scores and look at the components in aggregate.

Table 2

Ethical Choices with Educational Technology Instructional Design framework scoring: Product comparison for final selection

ECET ID Component	***GIMP***	***Adobe Suite***	**Best Choice**
Idea Score	50/60	52/60	*Adobe*
Feasibility Score	78/90	66/90	*GIMP*
Ethics Score	81/90	82/90	*Adobe*
Evaluation Score	51/60	51/60	N/A
Total Score	260/300	251/300	*GIMP*

While the Adobe Suite was the best choice for supporting the idea and ethics components, the overall scoring was higher for GIMP, partly because of its higher cost and availability in the feasibility section. Otherwise, the digital affordances of each tool were similar enough with minor scoring differences that either could be selected to meet the course needs. Note that in most regards, we say the tool should meet the needs of instructors and students because our evaluation views are naturally subjective, meaning there will be times we will come to incorrect determinations of the right tool in a particular situation. However, by completing this thought process, an instructional designer can have clearer logic to support and explain the choice of tool to the client or a manager who would need to pay for or implement the technology adoption. This approach allows designers to forecast and explain their decision-making clearly, reducing the risk that a poor technology or design decision will be made while acknowledging this risk cannot be eliminated.

Limitations

There are several limitations to this work. First, a tool like those in the ECET portfolio should be validated to accurately measure what it aims to do, regardless of the respondent. Valid instruments help to collect better quality data with high comparability, which reduces the effort while increasing the credibility of collected data. Although ECET K-12 was subject to an extensive qualitative validation process (Beck & Warren, 2020), it will continue to be quantitatively and qualitatively validated every few years to ensure it achieves its intentions. By using the ECET tool actively with instructional designers each year and incorporating feedback from surveys and interviews cyclically to improve the instrument, the acceptance of ECET should improve and be maintained. This adapted ECET ID instrument has not yet been validated by designers. As such, we will follow a similar validation process as was conducted with ECET K-12 noted earlier, so the team expects significant changes to the terminology used in questions and nodes included/excluded in the framework to ensure the views and needs of designers are accommodated. This current state of the instrument also means that initial usage of ECET ID may provide less accurate results than the ECET K-12 tool for teachers.

Additionally, the current version of our framework places more weight on feasibility and ethics (90 points each) compared to 60 points for Idea and Evaluation. These differences in weighting reflect our current understanding of the comparative relevance of these areas for instructional designers. With that said, we plan to conduct user testing of ECET ID with multiple instructional designers in multiple contexts (e.g., K-12, higher education, adult, etc.) and update these weightings resulting from testing.

Implications

Student Loss of Learning Time Due to Ineffective Tool

As stated earlier, current instructional design models and textbooks (Piskurich, 2015; Warren & Lin, 2014; Reigeluth, 1999) do not utilize ethical questions to aid instructional designers in their design process (e.g., ADDIE, ASSURE, Backwards design, etc.). Additionally, current instructional design models do not include practical and ethical perspectives on the needs of instructors or students. Using the ECET ID framework should help instructional designers focus on ethical concerns while designing high-quality instruction. Ethical questions are integrated into ECET ID along with concerns about ideation, feasibility, and evaluation, thus helping instructional designers to address ethical concerns in their proper context. As reflection and discussion are the intended outcomes of ECET ID, it is expected that using this framework will improve quality instructional designs that clearly match designers' intentions with likely outcomes and thus reduce educational harms to end users (Warren & Lin, 2012).

Next Steps

Our next step with ECET ID is a rigorous validation process similar to the process followed with ECET K-12 designed for teachers with a multi-step design-based research approach to improve the tool's components based on feedback followed by new participants that could ensure changes were effective and then point out other needed revisions. Additionally, work is being done to put both tools into a branching, online format that will scaffold users in using the tool and provide recommendations based on their answers. Finally, a version of ECET is being developed for software developers through a partnership with INESC TEC, a private non-profit research association dedicated to scientific research and technological development, technology transfer, advanced consulting and training, and pre-incubation of new technology-based companies. Once the tool is deemed effective and ethical to implement, it will be released broadly to determine whether it is useful to instructional designers at scale.

Conclusion

As technology choices for instructional developers, educators, and students continue to grow more complex in their designs, our choices regarding which to use are based on the quality of the idea, whether it will work with the time and other resources we have, and whether it is ethical to implement them at all. Moving forward with our use and study of the tool, we intend to release it broadly to gather user views about whether it supports their needs and to gather information about additional needs for framework improvement that exist (e.g., carceral technologies/surveillance as assessment, environmental ethics) and should be addressed in future versions. We hope to slightly slow down our design processes with the tool to encourage designers to ask relevant questions about whether we should use a technology. This needs to slow down and consider our decisions regarding whether to use any technology is increasingly important in a world focused on surface-level, rapidly produced outcomes. Instead, for instructional designs to meet the needs of an increasingly diverse world, mindful designs are important for ensuring the journey instructors and learners take is one they can feel good about and meets their educational needs. Our primary goal in designing the Ethical Choices with Educational Technology Instructional Design framework was to support an instructional designer's decision-making process to help improve the user's final learning product and technology interactions. It is meant to go beyond simple questions regarding whether a tool meets minimal performance outcomes and positively supports learner and instructor experience. In the future, we will rigorously test the tool, making improvements along the way, always asking whether the framework improves the ethical choices made by designers and users in a manner that both improves learning and fosters an experience they look back upon favorably.

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Towards Socially-just Design Through Ethical Decision-making

Stefaniak, J. E.

Decision-making Ethics Instructional Design Social Justice

The deficiencies of instructional design models are that they do not explicitly provide guidance on how to address systemic implications of design decisions and activities. Decision-making is an activity in which instructional designers engage continuously throughout their design projects. The purpose of this chapter is to provide an overview of an ethical decision-making process. Recommendations are offered on how instructional designers can address ethical decisions and their consequences in their design practices.

Introduction

Decision-making is an activity in which instructional designers continuously engage throughout their design projects. Studies examining instructional designers report that they make decisions involving how best to deliver instruction, instructional sequencing, and assessment strategies (Kenny et al., 2005; Kumar & Ritzhaupt, 2017; Rowland, 1992; Wedman & Tessmer, 1993). While these examples are somewhat generic, upon deeper examination, they become more complex depending on several factors that may influence the learning environment.

Most situations in which instructional designers will find themselves involved are ill-structured (Jonassen, 2000). Ill-structured problems may have multiple possible solutions, and these solutions, in turn, may require several interrelated decisions (Jonassen, 2012). Depending on the complexity of the problem and the amount of time allowed for instructional designers to make decisions, they may follow two primary decision-making processes. Normative decision-making involves an individual considering multiple options and weighing the advantages and disadvantages of each option before arriving at a decision(Jonassen, 2012). Naturalist decision-making processes are often referred to as dynamic processes as they are contextually embedded and often require individuals to make prompt decisions (Klein, 2008; Stefaniak, 2020).

Recognizing the complexities inherent in decision-making for ill-structured problems, opportunities for gray areas emerge, posing questions about whether the decisions made and implemented are optimal and equitable (Lin, 2007). When we consider designing instruction that is socially just, we must ask ourselves:

- Am I designing instruction that provides examples that are relatable to my students?
- Is diversity reflected in instructional materials? Do my students see representations of themselves?
- What are the expectations for students accessing instructional content? Do they have access to the content?
- Do my students have the same opportunities to practice inside and outside the learning environment?
- Have I addressed learner accessibility?

The extent to which questions like the ones mentioned above are addressed is often determined by the time allocated for a project, access to appropriate technological resources, money, and the design team's expertise. While studies have been conducted to gain a better understanding of how instructional designers manage constraints and make decisions during their projects (i.e., Boling et al., 2017; Hoard et al., 2019; Zhu et al., 2020), little emphasis has been placed on the extent to which an ethical lens has been applied to their design decision-making.

In recent years, there has been an increased push among scholars in educational technology to place learners at the forefront of our design practices to promote inclusion, equity, and accessibility (Bradshaw, 2018; Gray et al., 2022; Kimmons, 2020; Moore, 2021). Upon further exploration into the deficiencies of current instructional design practice, there is opportunity for the field to shift its focus to address the overarching question: Are we doing what is best for our learners?

In a paper examining how needs assessment strategies need to be reevaluated to promote equity in instructional design, Stefaniak and Pinckney-Lewis (in press) note that several instructional design models suggest a paternalistic approach in which instructional designers identify problems and determine which needs are worth exploring. This approach suggests that designers impose solutions on the learning audience with little consideration given to their actual needs. These challenges are further exacerbated in other phases of the instructional design process, as noted by Moore (2021). By adopting a more empathetic approach to designing assessments and considering the conditions that influence our learners, instructional designers are better able to collect contextually relevant information that can inform updates to the design process.

Purpose

Ethical decision-making models have been proposed throughout the past several decades to support individuals as they engage in decision-making. The fields of medicine and human counseling have placed importance on how these models can support practitioners as they interact with patients and clients. It is important to note that ethical decision-making models are not intended to make ethical decisions for individuals. Instead, they are meant to lay out a process to guide individuals through decision-making to help them identify areas of ethical concern (Keith-Spiegel & Koocher, 1985).

To advance this question with our learners in mind, several scholars have raised concerns that our field has ignored socially just practices (e.g., Benson et al., 2017; Bradshaw, 2018; Dickson-Deane et al., 2018; Gunawardena et al., 2019; Moore, 2021). Moore (2021) suggested that existing instructional design models are not the ones we need. With most models being developed in the 1970s, many of them lack specific guidance to address accessibility, equity, and inequalities that are prevalent in learning environments. Rieber and Estes (2017) noted that accessibility is minimally addressed or ignored altogether in our instructional design models. In a paper examining the instructional design and technology timeline through a social justice lens, Bradshaw (2018) calls for more attention to be placed on critical gaps in the field that hinder learner performance.

Looking at issues related to inequities and oppression in our field raises the question of whether these issues could be mitigated if designers had the tools that they need, such as training in design practices that account for multiple stakeholders of a project, learners with diverse needs, and strategies to modify instruction to meet the individual needs of the learner audience. Could some of these issues be avoided if we teach designers to approach their design through an ethical lens? As Moore (2021) notes, ethics are not addressed in our instructional design models, which often lay the foundation and guide the instructional practices of novices in our field. While she has called upon the field to take deliberate action to examine our design practices through an ethical lens to support learners across a variety of contexts, further attention is also needed to explore how designers engage in ethically sound decision-making processes.

It is important to note that instructional design models are not inherently bad. They provide guidance on the fundamental mechanics of the instructional design process (Dousay, 2018). However, the deficiencies of these models in our field lie in their failure to explicitly provide guidance on addressing the systemic implications of design decisions and activities (Stefaniak & Xu, 2020), ethical approaches to solving instructional problems (Moore, 2021), and inclusive and accessible design practices (Bradshaw, 2018; Rieber & Estes, 2017).

Our field can ameliorate these challenges by helping instructional designers become more cognizant of their decision-making practices. If instructional designers are taught how to become more self-aware of the decisions they make throughout their projects and emphasize the importance and need of ethical decision-making, they can still benefit from using existing instructional design processes and models to guide their design work.

This chapter provides an overview of an ethical decision-making process. The various types of ethical decisions are reviewed in relation to instructional design practices. Recommendations for future research on instructional design practices support continued discussions on how instructional designers can intentionally integrate ethical decision-making into routine design tasks.

The Process of Decision Making

Decision-making is the process of making a choice by identifying a decision, gathering information, identifying possible solutions, considering the advantages and disadvantages of each option, and selecting a resolution to move forward (Skyttner, 2001). “A ‘decision’ is a commitment to a course of action that is intended to yield results that are satisfying for specific individuals” (Yates, 2003, p. 24). There are a variety of decisions an individual may make. These include choices, acceptances/rejections, evaluation, and constructions (Yates & Tschirhart, 2006). Table 1 provides an overview of what these types of decisions may look like in instructional design, as depicted by Stefaniak (2020a).

Table 1

Decision Typologies as They Relate to Instructional Design

Type	Example of Instructional Design Decisions
Choices	An instructional designer has been asked to help a local museum develop learning materials for their patrons. During their brainstorming meeting with the museum staff, they discussed the possibility of using audio headsets, mobile learning, QR codes, online learning modules, and face-to-face training programs as training options.
Acceptances/ Rejections	An instructional designer submits a proposal to present their project at a national instructional design conference. Reviewers responsible for reading the proposal must decide whether to accept or reject the conference proposal.
Evaluation	An instructional design firm in a metropolitan city meets with a not-for-profit organization to discuss their training needs. During a few initial conversations, the firm realized that their client would not be able to pay the typical fees they charge for their instructional design services. The CEO of the instructional design firm sees the impact that the not-for-profit has made in the local community and decides that they can offer a few of their services pro bono.

Type	Example of Instructional Design Decisions
Constructions	An instructional design program discusses the options for offering two special topics courses to their students in the upcoming year. Program faculty discuss possible topics and discuss which ones might be of the most interest to their students. During their discussions, they identify potential course instructors and look to see how this might impact regular course offerings and instructor assignments.

Decision-making, regardless of the type of decision, can be categorized according to two processes: rational or dynamic. Rationale processes typically take more time as an individual engages in eight steps (Jonassen, 2010; Klein, 1998):

1. Identify the problem
2. Establish decision criteria
3. Weigh decision criteria
4. Generate alternatives
5. Evaluate the alternatives
6. Choose the best alternative
7. Implement the decision
8. Evaluate the decision

A dynamic decision-making process is often more time-sensitive, where an individual makes decisions quickly based on contextual factors influencing a particular situation (Klein, 2008). When engaged in dynamic decision-making, individuals are more apt to conjecture and make decisions based on their knowledge and expertise, the information they have available at that particular time, and within the constraints inherent in the situation (Murty et al., 2010).

A majority of instructional design problems are ill-structured (Jonassen, 1997) and call for dynamic decision-making. Upon examining how instructional designers engage in conjecture, Stefaniak et al. (2018) have offered the following definition for design conjecture in instructional design:

the ability to form an opinion based on constrained information and resources to design solutions that take into account systemic factors influencing an environmental context (p. 59).

While there is growing interest in studying how instructional designers engage in decision-making (e.g., Boling et al., 2017; Demiral-Uzan, 2015; Gray et al., 2015; Korkmaz & Boling, 2014; Stefaniak et al., 2022), very few have examined the ethical nature of decision-making (Tzimas & Demetriadis, 2021; Gray & Boling, 2016; Lin, 2007).

Ethical Decision-Making

Moore and Ellsworth (2014) express concerns that the field of educational technology has approached ethics in instructional design from a peripheral view. While educational organizations such as the Association for Educational Communications and Technology have a code of ethics, there is a paucity of research examining what these ethical practices look like in the field nor mechanisms for how ethical practice can and should be carried out in instructional design activities (Moore, 2021).

In a review examining ethical decision-making models to support counseling practices, Cottone and Claus (2000) identified nine models that address ethics within their process. While there are slight differences in the number of steps, the common processes inherent in these models include identifying the problem, defining potential issues, consulting ethical guidelines, considering possible consequences of each decision, estimating the probability of desired outcomes, and deciding on the best course of action (Correy et al., 1998; Keith-Spiegel & Koocher, 1985; Steinman et al., 1998). The steps outlined in these frameworks suggest a linear approach that aligns with rational decision-making processes (Klein, 1998). Recognizing that the majority of instructional design decisions are dynamic in nature (Jonassen, 2012), guidance is needed to understand how steps toward ethical decision-making can be woven into existing dynamic decision-making processes inherent in instructional design.

Ethical Decision-Making in Instructional Design

In her paper, *The Design Models We Have Are Not the Design Models We Need*, Moore (2021) calls for members of our field to explore possible solutions that deliberately address ethics (and the current lack thereof) in our current design practices. While I agree with Moore (2021) that there is a clear absence of the acknowledgment of ethics in our existing instructional design models, I want to proffer an approach that does not call for the development and plethora of new instructional design models.

Rather than proposing the conception of a new instructional design model, I want to offer the suggestion that we keep our instructional design models intact and instead provide an overlay model that supports ethical decision-making to guide instructional designers through their activities. In doing so, the overlay model would support the non-linearity and iterative nature of instructional design (Jonassen, 2008). Therefore, I propose that instructional designers be guided through how to integrate the following ethical decision-making process into their design activities:

1. Interpret the situation
2. Establish the parameters of the problem
3. Identify potential issues
4. Consult ethical guidelines
5. Generate possible solutions
6. Consider possible consequences of each decision
7. Choose a course of action
8. Implement the decision
9. Evaluate course of action

Taking into account that instructional designers make decisions throughout the instructional design process, these suggested steps for engaging in ethical decision-making may be applied at multiple decision points. The following sections briefly overview these nine steps and offer examples of how they may be woven into various decision points. It is important to note that these guidelines are not meant to be interpreted as a linear process. Instead, various steps may be revisited as the instructional designer undertakes a recursive and iterative approach to design.

Interpret the Situation

Most practice-based ethical decision-making models recommend that the first step in decision-making is to identify the problem (e.g., Corey et al., 1998; Forester-Miller & Davis, 1996; Steinman et al., 1998). In Tarvydas' (1998) decision-making model, project identification is framed as an interpretation of the situation. I have intentionally followed Tarydas' (1998) approach to interpreting the situation because it suggests a broader view of the situation and context. This approach supports the discourse that has discussed the relationship between the designer, their learning audience, and the situation.

Tymchuk's (1986) model refers to this initial phase as determining the stakeholders. I resonate with this phrasing because it is common practice to identify the stakeholders when conducting a needs assessment in instructional design (Kaufman & Guerra-Lopez, 2013; Selmer, 2000; Stefaniak, 2021a; Watkins et al., 2012). Determining the stakeholders entails considering all individuals or groups who may be involved or impacted by the decisions made and solutions implemented within the community.

While this step in the decision-making process should be iterative throughout the project as decisions are continually made, it is most likely that interpreting the situation would occur during the needs assessment phase. It is also important to note that needs assessment should be implemented as a means of validating the identified or perceived problem (or need). This process should extend beyond the learner analysis to support a more comprehensive understanding of the situation (Stefaniak, 2020b).

Establish the Parameters of the Problem

Instructional designers inherently establish parameters of their projects, whether consciously or not. We are accustomed to navigating our design process to accommodate design constraints imposed by our learning audience, additional stakeholders, and the overall system. An instructional designer embarks on designing their solution during these initial decision-making phases. Their process is often described by the design field as a co-evolution (Maher et al., 1996; Dorst & Cross, 2001). The co-evolution involves the designer continually "re-interpreting a design problem in the light of an exploration of possible solutions" until a good fit emerges (Dorst, 2019; p. 60). While I labeled a step in the ethical decision-making process as generate possible solutions, the process of establishing the parameters of the problem initiates this co-evolution process.

Within this step, it would be beneficial for an instructional designer to acknowledge the realities of the situation. Based on the information obtained while interpreting the situation, the instructional designer should identify the relevant constraints that impact their project.

This practice essentially involves the instructional designer establishing a bounded rationality to progress with their design (Stefaniak et al., 2020).

Establishing a bounded rationality is the process of utilizing available information, one's cognitive abilities and limitations, and time to make decisions (Simon, 1969). Within bounded rationality, individuals make decisions while recognizing that optimization may not be feasible (Cuofano, 2021). Instructional designers can benefit from establishing bounded rationality when approaching their design and ethical decision-making by acknowledging their design environments' inherent limitations, risks, and uncertainties. By doing so, they can effectively manage their design space.

Identify Potential Issues

Within this decision-making phase, instructional designers should identify any anticipated challenges that may arise in the environment. These challenges may include issues or limitations initially identified during the needs assessment phase when interpreting the situation and identifying key stakeholders associated with the project. Examples of potential issues could include members of the learning community having inadequate access to learning materials, socioeconomic issues impacting a learner's ability to participate fully in an instructional experience, or a lack of resources that hinders the implementation of suitable solutions to address needs.

Consult Ethical Guidelines

Most practice-based ethical decision-making frameworks in the counseling field recommend that practitioners consult with the profession's ethical guidelines while engaging in decision-making. The same expectations should be adhered to by instructional designers. While instructional designers do not have to go through maintaining certifications and licensures the same way counseling or medical professionals have to, they should consult ethical guidelines to inform their decisions. The Association of Educational Communications and Technology (AECT) developed a Code of Professional Ethics (2020) designed to inform design practice.

Moore (2021) notes that why a code of professional ethics exists, not all designers know how to integrate these standards into their work. She notes that this is largely due to the absence of ethical considerations in our existing design models. I echo Moore's (2021) sentiments and add that a lack of ethical decision-making frameworks to guide instructional designers is another area of concern. This paper aims to join Moore and suggest that instructional designer preparation include an intentional focus on AECT's Code of Professional Ethics (2020) and provide them with strategies to ensure these standards are addressed in their design praxis.

Generate Possible Solutions

Once the instructional designer establishes a bounded rationality to support the management of their design space and consults with ethical guidelines, they should generate multiple possible solutions before selecting one to implement fully. This approach also supports the concept of ideation recommended in the design thinking philosophy

(Razzouk & Shute, 2012). Considering the realities that instructional designers regularly engage in design uncertainty (e.g., Jonassen, 1997; Tracey & Hutchinson, 2016), the need for ideation is even more prevalent as an instructional designer establishes a bounded rationality to address design optimization.

There is a scarcity of studies examining ideation in instructional design (Stefaniak, 2021b). It is important to note that other studies have demonstrated that instructional designers often face challenges with generating ideas when confronted with uncertainties and design constraints (i.e., Hoard et al., 2019; Stefaniak et al., 2018, 2022). These findings highlight the importance of supporting instructional designers in navigating the co-evolutionary process of negotiating between the problem space and solution space (Dorst, 2019).

Consider Possible Consequences of Each Decision

As an instructional designer engages in ideation and generates multiple possible solutions, they consider the possible consequences of each decision. The level of their understanding of the environment and situation will greatly drive their awareness of consequences. Examples of some ethical consequences that an instructional designer may face while identifying an optimal solution may include, but are not limited to:

- Implementing a solution that knowingly does not meet the needs of a group of learners
- Being aware that the implementation of a solution is not going to address the needs identified during a needs assessment
- Ostracizing learners through failing to address social inequities that exist in the environment
- Relying on technologies imposed by others in the environment that are not conducive to the needs associated with the project.

At this stage, an instructional designer fully becomes aware of the ambiguity associated with ethical decision-making. This further reiterates the need for instructional designers to approach bounded rationality with an understanding that optimization is often out of reach when decisions are needed (Gigerenzer & Selten, 2001). Economists have suggested that emphasis on achieving optimization should be abandoned, and a bounded rationality should be assumed (Laville, 2010).

Choose a Course of Action

Upon considering possible consequences of each decision, the instructional designer should finalize their decision. Ideally, their decision is grounded in sound design principles, adheres to ethical standards, and poses limited risks to the learners and the learning environment. The instructional designer can then proceed with planning once they have committed to moving forward with a particular course of action.

Implement the Decision

Implementing the decision could mean several things in the instructional design space. It could mean moving forward with designing interventions as well as moving into the delivery and facilitation of instruction. What is important to note is that decision-making does not stop once a course of action has been decided upon or enacted. Dynamic decision-making is iterative and recursive (Jonassen, 2008; Klein, 2008).

When implementing the decisions, instructional designers should continuously survey the environment where decisions are being implemented to respond accordingly and promptly should modifications to any decisions be warranted. While dynamic decisions require continuous surveillance of the environment and local affordances, attention must be given to how this impacts a focus on ethics. Further exploration is needed to understand how instructional designers are modifying decisions in situ.

Evaluate the Course of Action

The instructional designer should evaluate the success of their decision upon implementation. At this time, they should scan the environment to determine the extent to which the solution meets the needs of the learners and other stakeholders associated with the project (Stefaniak, 2021a). Evaluation of ethical design decisions should not be completed at the end of a project; rather, it should be ongoing as the instructional designer engages in iterative design. When evaluating the course of action, the instructional designer should examine the extent to which the solution addressed the needs (or problem) initially identified at the beginning of a project, the extent to which there may be ethical consequences with the implemented decision, and whether the current course of action needs to be modified.

Future Explorations and Conclusions

The purpose of this chapter is by no means intended to provide a definitive solution for addressing ethical decision-making in instructional design; rather, it is intended to contribute to the discussion to support the momentum of efforts exploring socially just design practices. Gray and Boling (2016) examined ethical commitments instructional designers make as part of their design work through the lens of several case studies published in the International Journal of Designs for Learning. The scholars looked for instances where instructional designers noted or demonstrated their ethical commitments and values in everyday practice. More case studies are needed to understand how instructional designers engage in ethical decision-making, what types of instructional strategies support socially just learning, and what types of support are needed by professional organizations to guide ethical development among instructional designers.

As more emphasis is placed on the role ethics plays in instructional design, research is required to better understand how ethics integrates into interactive design processes. The following questions should be considered to continue the discussion and exploration of how developing an awareness of ethical decision-making can support instructional designers:

- How do instructional designers address ethics in their design decisions?

- What challenges do instructional designers encounter when striving to adhere to ethical design practices?

Developing an understanding of how instructional designers incorporate ethics into their decision-making will contribute to advancing research on ethical design practices. It will also help to identify areas where support can be provided to instructional design students in their professional development.

I am skeptical that additional instructional design models are needed; rather, I think we should place more emphasis on training instructional designers on how they engage in ethical decision-making models within various decision points in the instructional design process. While helping disciplines (e.g., counseling, medicine, allied health, social work) have several practice-based ethical decision-making models, the field of learning, design, and technology warrants similar attention. If a primary goal of instructional design is to facilitate learning and improve performance (e.g., Richey et al., 2011), then it is imperative that we have the necessary infrastructure to guide ethical development among instructional designers.

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Ethics Issues in Learning, Instructional Design, & Technology

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Educational Technology and its Environmental Impacts

Ethical considerations in the adoption of technology at scale using life cycle cost analysis and total cost of ownership approaches

Warren, S. , McGuffin, K. , Moran, S. , & Beck, D.

Educational Technology Consequences
Environmental Ethics
Scaling Up Technology Use
Technology Adoption
Total Cost of Ownership

As climate change driven by human consumption in capitalist economies continues to increase, instructional designers must be aware of the consequences of their technology acquisition decisions for the environment. Much of our ecological impact hides behind product ordering interfaces with simple pricing; however, the costs are present from the moment we select tools. This chapter aims to depict educational technology decisions made by instructional designers and educators as ones infused with ethical questions and consequences in the globalized supply chain and throughout the life cycle of each device *employed. Taking an indigenous worldview towards sustainability, coupled with an engineering life-cycle cost analysis that incorporates environmental considerations, we illustrate the questions facing instructional designers who seek to consider their technology choice impacts more ethically regarding the environment and those involved in the process of computer manufacture. Finally, we offer recommendations for mitigating ecological harm after the decision to acquire new learning technologies.*

Introduction

In 2015, an international team of 18 researchers claimed that "four of the nine Planetary Boundaries have already been crossed [. . .] the climate has already changed, the biosphere has lost its integrity, the land-system has been altered and the biogeochemical cycles have been corrupted" (Steffen et al., 2015, as cited in Saratli, 2017). Planetary boundaries are the ecological constraints on human development, such as freshwater use, chemical pollution, and climate change (Clift et al., 2017). Exceeding these boundaries is likely to lead to agricultural, environmental, and civilization collapse over time, meaning we should attend to how we can reduce our impacts on each, especially since energy use negatively impacts many (Sovacool et al., 2022), mining pollution (Flexer et al., 2018; Phillips, 2016), transportation (Su & Sun, 2019), and other aspects of information technologies acquisition and use (Levinson, 2009).

As humans, we often seek technological solutions to common social challenges, such as the need to foster critical thinking in members of a society or educate a future workforce. Further, we must be mindful of our impacts on the world around us as we cope with new global challenges in an ever-changing world under threats from climate change and political unrest resulting from an unsustainable economic model. Our energy-intensive, capital-intensive, global supply-chain-focused distributive business approach resulted in adopting technology at a scale the world has not previously experienced. With a focus on lowest cost and highest efficiency production models, there remains a failure to consider the environmental and ethical concerns that arise with the rapid adoption and intensive use of information technologies that require additional scrutiny ranging from surveillance capitalism to misapplication of digital assessment (Krutka et al., 2021). This chapter aims to explore an increasingly important aspect of technology adoption largely unexplored in ethics of educational technology discussion; that is, the environmental costs to the planet resulting from adopting learning technologies at scale.

For example, 1:1 laptop initiatives that provide a personal device to each child for learning value also carry environmental costs with their manufacture, transport, use, and later elimination (Warren et al., 2022). Total cost of ownership calculations do not commonly include these expenses made by organizations (Ellram, 1995). Further, increased energy use from device adoption and associated pollution (e.g., carbon dioxide, methane, etc.), related toxic e-waste (Kitila, 2015), and other related negative consequences from climate change (Crimmins et al., 2016) are an increasingly costly outcome of technology use. Today's economic model is "dependent on resource exploitation that is structured so that such exploitation seems the only means of survival [. . .] however, we must also recognize that the earth has an inherent value, beyond human needs" (Alfred, 2009, p. 85). Failure to recognize this inherent value noted by Alfred, leads to unsustainable mindsets wherein there are no resources available for future generations and an uninhabitable planet as the air, water, and soil become increasingly destroyed through mining, transportation, energy use, and other exploitation that benefit only current generations. This exploitation and harm often extend into the creation and disposal of the educational technologies we use. However, it is rarely discussed in many articles today that propose using more new tools. Such hardware devices are made of processed materials extracted from the earth and often powered by energy created by burning polluting fossil fuels. Our positive intention as educators for a tool's use does not reduce their inherent harms because technology manufacturers use the same methods rooted in a linear, globalized, largely opaque supply chain for both office and educational technologies.

It is equally important to consider other ethical needs, given that educators are responsible for making good choices about the tools they adopt to ensure strong learning outcomes and no harm to students. With today's climate, it becomes increasingly important to consider the environmental impacts of our technology choices as part of that ethical responsibility to provide students with a sustainable future. This chapter examines the environmental impacts on communities from the manufacture, transport, use, and disposal of educational technologies individually and in aggregate as deployed at scale in different learning contexts. From these findings, we propose there is an ethical need to use the market power of educational institutions at scale to pressure manufacturers to engineer devices to be upgradable and longer lasting, use less environmentally harmful production techniques, lobby for a right to repair existing devices, while also being more mindful about the consequences of our educational technology choices from the mining of raw materials needed to construct them through disposal phases of the supply chain. In addition, we provide guidance regarding how to mitigate the environmental harms of educational technology once chosen by designers or instructors.

Background

The field of educational technology is increasingly aware of ethical issues related to how our tools impact student and instructor privacy, create imbalanced power relationships created with big data and surveillance, and other issues that have not been discussed significantly in the past (Krutka et al., 2021). However, as the complexity of these tools grows, the need to be aware of their use consequences and develop an ethical attitude towards them is an increasing focus of discourse in instructional designs that require technologies to support teaching, learning, and training (Moore, 2013). However, much of the current focus is on using technologies already produced and their psychological impacts on learners. However, few studies focus on the antecedents of use, especially regarding the environmental impact of these technologies, starting from the acquisition of raw materials to the disposal of devices at the end of life. At every stage of the supply chain and use, there are human and environmental impacts that we are often unaware of because they hide behind brands, delivery companies, and impressive packaging. However, the actual costs are not transparent and, therefore, not part of our technology expense calculation. Unfortunately, as the earth's climate continues to change, if we are to behave ethically as social scientists recommending the use of technology and as practitioners implementing them, then improved awareness is necessary of the impacts of our educational tools on the environment and the people who produce them.

Human Contributions to Climate Change

A major contributor to climate change is the creation and use of today's technologies, ranging from fossil fuel-propelled ships and cars to computers of all sizes (Hill, 2017; Phillips, 2016; Joshi, 1999). Because today's capitalist economies and organizations are focused primarily on consumption, the operations of companies that lead to the technology in front of us tend to be hidden along with their environmental impacts. Building a computer requires mining raw materials that require high amounts of polluting energy use (Valero & Valero, 2020; Farjana et al., 2019), leading to greenhouse gas emissions (Liu et al., 2016) and toxic metals released, such as mercury and cadmium that can damage local groundwater (Birch, 2016; Sankhla et al., 2016), and soils (Jeong et al., 2021; Wang, 2015; Glodek et al., 2010). Every stage of the computer manufacturing supply chain that provides schools and students with devices has environmental consequences, contributing to climate change partly because of the economic philosophy that drives today's consumption-based culture.

Ethics and the Environment

In this section, we discuss the ethics of the environment from the perspective of economic philosophy and how human choices impact the world. In addition, we present examples of consequences of policy decisions (e.g., globalized technology production and reclamation) on human health in both local and distant countries. We frame the ethical considerations of technology, educational or otherwise, from the context of two different views of environmental ethics used to guide decision-making: exploitation and stewardship.

Different concepts of justice: Exploitation or responsibility to the land and its people

Alfred (2009) explained that the most common form of distributive social justice supported by sovereign states and their economies is rooted in capitalist worldviews. This conception focuses on growing businesses and industries to provide people with jobs as financial support. Capitalist philosophical and economic approaches tend to focus on natural resource extraction (e.g., fish, rocks, trees) to produce commodities with a value calculated only in dollars, with little consideration of the consequences of resource exploitation for the earth or the people in communities where it takes place (Birch, 2016). The earth's value to those ascribed to this capital extraction-focused philosophy is based primarily on aspects of the planet to exploit and distribute resources to humans. While generally useful for this purpose, capitalist societies commonly measure these resources as monetary gains provided through use or non-use to those who control natural resources in terms of total economic value with stated preference methods (Harris & Roach, 2018). In this context, business organizations only value and are designed to generate knowledge that supports environmentally extractive work practices; as such, managers tend not to choose environmental policies, technologies, and processes with long-term sustainability, focusing instead on building supply chains for short-term profits (Long, 2021) and risk avoidance (Er Kara et al., 2021). The language of business philosophy in this perspective commonly employs the words explore and exploit, dating back to the 1960s (Levitt, 1965), and natural resources mining continues to do so (Long, 2021; Dino et al., 2020; Tutak, 2019). With this colonialist exploitation mindset, environmental sustainability is, at best, a secondary consideration. Today's social and business viewpoint is rooted first in achieving a profit or seeking solutions to environmental problems framed in government funding that mitigates possible financial losses for companies responsible for environmental harm, rewarding them for participating in cap and trade or green bond schemes (Long, 2021). However, these approaches provide little evidence that they reduce environmental damage, redistributing the harms from one region to another (Chan & Morrow, 2019); this approach often helps companies further exploit the climate crisis (Long, 2021).

The capitalist economic approach to justice contrasts with that of indigenous philosophies rooted in the view that "the earth was created by a power external to human beings, who have a responsibility to act as stewards, since humans had no hand in making the earth, they have no right to possess or dispose of it as they see fit – possession of land by humankind is unnatural and unjust" (Alfred, 2009, p. 84). In the capitalist perspective, Alfred noted at the outset of his earth-focused manifesto that the earth's exploitation is viewed as ethical by society because it supports the distribution of its resources for the benefit of humans, though unevenly. By contrast, the traditionalist indigenous view "recognize[s] a responsibility to participate in the economy with the intent of ensuring the long-term health and stability of people and the land; in this context, development for development's sake, consumerism, and unrestrained growth are not justifiable" (Alfred, 2009, p. 85). We assert that the sustainable, indigenous view is more in keeping with the efforts of today's instructional designers who believe in the inherent value of their learners and instructors.

This chapter is further grounded in an idea of shared justice offered by the 20th-century Indian subcontinental philosopher Vinoda Bhave, a student of Mahatma Gandhi. The bhoodan, or "land gift," movement espoused the idea that the land belongs to all people and that no individual should own it (James, 2013). As such, the earth and its limited resources should benefit everyone, not a chosen few with power and wealth who may damage it for their own profit while harming others through their actions. For the field of instructional design, what some call instructional engineering (Simmons, 2015), it would be wise to consider how we use the earth by transforming its raw materials into educational tools just as environmental engineers and scientists do by understanding the complexity of decision, action, and consequence for impacted environmental ecosystems (Kahl, 2016). The issue of whether the tools can cause harm to other humans or the environment, as well as whether or how we should use learning tools made of natural materials, raises this to the level of an ethical question no different than whether we should create a learning game relative to its impacts of students (Warren & Lin, 2012). However, the environmental impacts of educational technologies are not a common part of our field's considerations as they are not commonly thought of in the same vein as physical, psychological, or emotional harm. Because of this separation, instructional designers and educators commonly have little knowledge of the impact of the manufacturing supply chain on our shared land or its people.

Ethics of Educational Technology and the Environment

In recognizing that the computer manufacturing supply chain makes a computer purchase a decision that is not ethically neutral, it is important to have models that consider additional costs and risks beyond the immediate purchase of the device. As we seek tools to foster learning improvement, the ethical question of “should we” becomes central to decision-making when starting to consider the environment and our responsibility for maintaining and protecting human health (Song & Li, 2014) as stewards of the earth’s natural resources (Alfred, 2009). There are always trade-offs understood between the environmental impacts compared with potential learning gains relative to the immediate financial costs of these technologies. As such, we propose building a differentiated total cost of ownership (TCO) model (Zachariassen & Arlbjørn, 2011) resulting from a life-cycle cost analysis (LCCA) approach offered by Farr et al. (2016). This combined model goes beyond simple educational outputs to help decision-makers better consider the environmental impacts of the whole computer manufacturing supply chain rather than using an end-point financial calculation that oversimplifies the externalities of climate and ecosystem impacts and unaccounted for global cost drivers that should ethically complicate their purchase choices (Ellram, 1995).

Methodology

This section will explain the methodology used to estimate the e-waste, energy, and C02 production from technology adoptions at scale in U.S. public schools and higher education institutions. These research methods come from supply chain and operations management analytic approaches (Meindl & Chopra, 2010) to build aggregate, long-term models of current and long-term outcomes from resource uses. From these, we will also incorporate other financial costs to build out a total cost of ownership planning model from Farr et al.’s (2016) life cycle cost analysis (LCCA) that is modified to incorporate environmental impacts as part of the ethical responsibility of educational managers to consider.

Modified Life Cycle Cost Analysis: Incorporating Environmental Costs

Farr et al. (2016) provided a useful research process for creating a cost model with technology. This process is our starting point for a modified life cycle cost analysis incorporating environmental costs not commonly captured in business models. The following are the stages with descriptions that include our changes to accommodate environmental considerations:

1. Life cycle cost analysis requirements: This phase includes understanding stakeholders, which in our model includes a) instructors, b) students, and c) the environment. It also includes examining the technologies and the processes associated with their creation, from raw materials extraction through disposal.

2. Formalize the study: Collect and normalize data, including cost estimates. Create likely scenarios for modeling that reflect the reality of environmental impacts from technology manufacturing, acquisition, use, and disposal. Develop output metrics reflective of all forecast costs.
3. Conduct study: Formally estimate acquisition costs (i.e., basic financial aspects) and environmental costs (i.e., raw materials mining impacts, transportation-related pollution, manufacturing-related environmental costs, etc.) Create related financial and environmental cost risk profiles—detailed bottom-up cost estimate.
4. Document study: Develop risk analysis profiles for different settings/systems of interest. Locate needed data sources, conduct analysis, and report results for financial and environmental costs.
5. Stakeholder feedback: Explore whether the degree of financial and environmental risk will change the technology choices of your clients/instructors/institutions.
6. Life-cycle cost estimate: Calculate total cost of ownership, including environmental costs, risk profiles, and recommendations to mitigate the risk of harm.

The following section presents our approach to using life-cycle cost analysis that incorporates considerations of the environment and includes the creation of equations that can be employed to better understand the ecological impacts of an educational technology's choice from beginning to end of the supply chain, considering how a computer's materials move from idea to mining, manufacturing, use, and disposal.

Findings

Our results illustrate the environmental impacts of educational computing and give readers a model for studying the impacts of a potential adoption on their local setting. The findings are structured in alignment with Farr et al.'s (2016) LCCA stages to offer a coherent linear process. Environmental impacts resulting from each stage are estimated based on current costs reported in conservation-focused engineering research reports from researchers with expertise in calculating waste and pollution effects from manufacturing and use.

Stage 1: Life cycle cost analysis requirements for the environmental impacts of computer production and use

The first stage of the process establishes the basic requirements for performing the life cycle cost analysis regarding the environmental costs of producing a common educational technology requirement for institutions: the laptop computer. Understanding these costs begins with a review of the computer production process and supply chain. The device manufacturing process starts with the mining and refining raw materials needed to make computer parts. Stations refine materials into usable forms, and large trucks transport loads from one facility to the next, generating air pollution and distributing waste in local soils and water (Marjovvi et al., 2022; Brodny, 2020; Zhang et al., 2015; Glodek et al., 2010) Further, analysis requires including the significant energy (Lenhardt, 2017; Williams, 2014), water (Agana et al., 2013), and human resources (Mmereki et al., 2016; Han & Liao, 2010) required to manufacture these devices. Once constructed, a modern, low-cost laptop (e.g., Chromebook) tends to rely on internet connections, adding energy and environmental pollution risks resulting from the use of large, energy use intensive, heat generating datacenters (Sovacool et al., 2022; Lenhardt et al., 2017). However, server farms' exponentially growing energy needs (Lenhardt et al., 2017) require electricity, often from polluting sources like coal or gas. The environmental impacts of technology choices commonly hide from the users behind dashboards and computer screens that display our educational applications.

Stage 2: Formalize the study

The study in our model is motivated by needing to understand the impacts of educational technologies from the perspective of the environmental costs beyond the simple financial calculations to buy needed devices (e.g., a new laptop costs USD $300). A driver for this study is the continued global growth of capitalist economies that rely on extractive industries to manufacture and transport new devices. However, there is likely little awareness on the part of instructional designers and other educators regarding negative short or long-term environmental impacts resulting from the computer manufacturing supply chain's energy and pollution on environmental and human health. For example, growing cases of asthma and other lung diseases due to air pollution implicate the materials and energy production needed to power computers (Sivaramanan, 2013), plastics are increasingly detected in the food supply (Lusher et al., 2017), along with human endocrine disrupting phthalate esthers used as a flame retardant in devices being present in the soil, vegetables (Wang et al., 2015), and marine ecosystems (Baloyi et al., 2021).

Stage 3: Conduct the study

The study is intentionally broad in its focus on computers to give readers a sense of the total costs of ownership beyond the simple financial calculation regarding whether needed devices are affordable. For most technology solutions, the determination results from knowing whether one has a large enough budget to afford the number of desired devices. For our example, in his or her planning, an instructional designer seeks to purchase a rolling laptop cart and 32 Chromebooks, which are necessary for a class to play a series of educational science games. The Tripp Lite CSC32AC Multi-Device Charging Cart priced from Newegg.com currently costs USD $1,268, including shipping. From the same vendor, an 11.6-inch display Chromebook (2 GHz, 32 GB SSD) from HP or Lenovo costs USD $250. For 32 units, the total financial cost for the devices is $8000, and they commonly have a lifespan ranging from 2–3 years, depending on use intensity. The total financial cost of purchase, including the cart, is USD $9,268. This cost does not include the energy use of the devices during an estimated 3-year period or associated pollution, nor the financial or environmental costs of disposal at end-of-life. It is important to be good stewards of the environment and have a better sense of the real life-cycle costs of our educational devices when making decisions.

Computer production: Ethics of resource use and human costs in manufacturing

To better understand the life-cycle cost of a computer, it is important to start with the educational requirements and how those become technological ones that potentially require the manufacture of new devices. As with other complex physical products, computer production relies on a similarly multifaceted supply chain process starting with raw materials mining. Once materials are acquired, they must be processed into usable forms, eventually leading to the creation and transport of the finished product (Caddy & Helou, 2007) to an educational institution for instructors and students. These devices are then disposed of when they reach the end of their natural, usable life cycle (Jayaraman et al., 2019). Each aspect of the supply chain has different impacts on the environment and the humans involved in gathering, processing, assembling, transporting, or disposing of the products (Ekener-Petersen & Finnveden, 2013). The first aspect of the supply chain needed to produce our educational technologies, which is the mining of the raw materials, tends to harm the communities where the mines exist and the miners themselves (Kasulaitis et al., 2015).

Computer manufacture: High resource and human costs

There is often the assumption in the field of educational technology that the tools are neutral because our educational design intention is to support positive learning outcomes. However, it is important to recognize that our intentions are not divorced from the physical realities of computer manufacturing and transportation to our classrooms. The natural resource use (e.g., water, chemicals, fossil fuels) for even a single computer results in a loss for the communities in which they extracted for production or once the device reaches the end of its life cycle (Wang et al., 2012), is associated with industrial pollution (Jeong et al., 2021; Levinson, 2009), and has lasting effects on the environment far past the end of a device's usable life (Babu et al., 2007). To be good stewards of the earth's resources, we must behave ethically with our technological choices. Understanding and documenting the resources used and their environmental costs is important.

Stage 4: Document study

At this stage of the LCCA process, we use available research study data from engineering and conservation journals to build estimates for the environmental costs associated with device manufacture to understand the ethical aspects of our choice betters when using technology to support educational outcomes. Doing so gives us an idea of the impacts of technology use at scale in educational institutions. It also helps better frame the ethical questions regarding the impact on the earth and the humans directly or indirectly impacted by our choices.

Device Production Calculated Simply, but High Environmental Costs

Due to restrictions on the length of this piece, we will continue to focus on the environmental impacts of computers since they are the most common educational hardware technology employed in schools, universities, and corporate settings. Implementing tools at scale does not commonly consider the environmental materials involved in their production. As a starting point for what is needed from the environment to make a single computer, the following table provides an estimate of the raw materials required to make a single computer (Bridgen & Webster, 2007). While this is an older number, it is one of few available and remains commonly used in information technology engineering to estimate computer production materials costs, although due to some efficiencies gained over time in manufacturing, the water use may be as little as 1.8 tons today (Agana et al., 2013).

Table 1

Materials used to produce one personal computer (Generic)

Material Used	Unit	Amount used
Water	Tons	1.5
Chemicals/ Raw materials	Pounds	48
Fossil fuels (for energy production and transportation)	Pounds	530

This table only estimates the natural commodities needed to manufacture a machine and does not consider additional costs for mining equipment, energy use (e.g., diesel fuel), or pollution. The water involved in manufacture must be fresh groundwater to avoid contamination during the industrial processing of materials, reducing available clean drinking water in the communities used for computer manufacture (Bretzler et al., 2017; Sankhla et al., 2016). To produce enough machines for a 32-student classroom, we aggregated the environmental resource costs indicated in Table 2.

Table 2

Materials used to produce enough computers for one classroom (Generic)

Material used	Amount per unit	Calculated resources needed per classroom (32 units)
Water	1.5 tons	48 tons
Chemicals	48 pounds	1,536 pounds
Fossil fuels	530 pounds	16,960 pounds (@ 8.5 tons)

This natural resource use is high, and the freshwater and chemicals are often not recoverable in the manufacturing process (Agana et al., 2013; Baloyi et al., 2021; Ekener-Petersen & Finnveden, 2013). For example, computer manufacturing may harm the environment and people in it when flame retardants make their way into aquatic ecosystems due to synthetic organic chemicals like phthalate esters found in computer plastics (Baloyi et al., 2021), releasing propylene into the atmosphere (Morgott, 2018), and dispersing sediments when transporting by truck (Jeong et al., 2021). To mitigate this problem, companies increasingly seek to capture chemical residues in wastewater and other sources, though this process is difficult and expensive (Agana et al., 2013; Dino et al., 2020). To better understand the impacts of using these materials on the environment and the people mining them, it is important to break them down into finer parts and understand their impact on the environment and the humans in it.

Raw Materials: Measuring Mining Impacts, Transportation, and Refinement

When engaging with a laptop computer, instructional designers, instructors, and students likely think of it as a whole machine rather than the sum of its parts. However, each component of that machine started its life as separate raw materials, often mined in countries with minimal worker safety protections (Phillips, 2016). Companies transport bits of the earth like crude oil for plastics, sand used to make glass, and precious metals for circuit boards to manufacturing plants for transformation into processed, usable forms. However, moving these components also deposits toxic elements into soils and the air through vehicle exhaust (Marjovvi et al., 2022). Once moved to the new location, the raw materials are made into plastic, lead, glass, and other processed materials. Then, these potentially toxic elements (PTEs) are released on their way to a location for assembly by a manufacturer of computer components. When such pollutants enter the air, soil, and water, they are inhaled, ingested, or enter the body through the skin, negatively impacting human health (Jeong et al., 2021). Table 3 presents the kinds of materials present in computers (Bridgen & Webster, 2007).

Table 3

Estimated amount and kind of materials present in a 3.7 pound Samsung Chromebook 4 (Samsung Group, 2022) 7 lb. device

Material	Precious metals	Plastic	Iron	Glass	Lead	Aluminum	Copper	Other (Chromium Mercury, etc.)	Totals
%	.02	23.0	20.47	24.8	6.3	14.17	6.93	4.3	100%
Translated weight (lbs.)	.00074	.851	.757	.918	.233	.525	.256	.156	3.70 lbs.

Although highly toxic materials such as cobalt or chromium are present in a computer only in small amounts, they remain harmful in low concentrations (Sankhla et al., 2016). However, other materials, such as plastics, are present in high amounts. They become more harmful when treated with flame-retardant phthalates that function as human endocrine system disruptors released in higher amounts when heated during use, harming human reproductive systems, especially in children (Kasulaitis et al., 2015; Babu et al., 2007). Each material has specific uses in computers that allow them to function (Babu et al., 2007); however, each material also has health impacts shown in Table 4 that remain little discussed in the field of learning technologies.

Table 4

Computer materials, uses, and related potential adverse health impacts (Babu et al., 2007)

Hazardous material	Computer use	Health impacts
Antimony	Semiconductors; flame retardant	Long-term impacts include lung and heart disease
Arsenic	Circuit boards, LCDs, chips	Carcinogen-causing skin, liver, and other cancers
Bromine	Flame retardant	Thyroid problems, neurobehavioral disorders, liver tumors, and immune system disruption
Cadmium	Chip resistors, semiconductors, infrared, cables, wires, circuit boards	Kidney disease, liver, heart disease, bone loss
Chlorine	Used to make PVC and PCB plastics	Inhalation can lead to vomiting, coma, and possible death
Chromium (hexavalent)	Corrosion inhibitor on circuit boards	Nasal and sinus cancers, kidney and liver damage
Cobalt	Rechargeable batteries, disc drives	Causes asthma-like diseases, shortness of breath
Lead (Pb)	Soldering to join chips and components	Anemia, weakness, damages kidneys, brain, and nervous system, and is fatal at high levels
Mercury	Batteries, circuit boards	Toxic to the central, digestive, and peripheral nervous systems, lungs/kidneys, possibly fatal
Phthalates	Power cable coating	Toxic to human reproduction; changes in sex hormone levels, altered genital development
Polyvinyl chloride plastic	Computer casing	Congenital disabilities and damage to the brain, heart, liver, kidney, and skeletal system

Each toxic material can cause negative health consequences for those mining the materials, those transforming the materials in factories, during use, and again once the device reaches its end of life during the recycling and disposal process (Sankhla et al., 2016; Nuss & Eckelman, 2014).

Human Resource Costs in the Device Supply Chain

Beyond the direct impacts of mining and secondary effects on the environment, the manufacturing supply chain impacts humans living in resource-rich areas (Leuenberger et al., 2021; Amaral-Zettler, 2019). When natural resources are discovered, especially in indigenous and low-political power communities with few legal protections, companies historically work with local and national governments for access to raw materials (Alfred, 2009) following a neocolonial model (McKenna, 2011), engaging in forced relocation so they can access fossil fuels and other needed manufacturing resources (Birch, 2016). This approach meets the needs of the capitalist economic system and its ethics; however, it creates health, environmental, and economic harm to communities when extreme weather events later destroy homes, natural resources, and agricultural areas with increasing floods (Er Kara et al., 2021; Crimmins et al., 2016), soil and water pollution (Amaral-Zettler, 2019), and fires (Marjovvi et al., 2022). Further, the economic and political precarity of many people living in areas with natural resources means they are at elevated risk of receiving little financial benefit from exploiting the material in their region or may be exploited through low wages or slavery (Esouimeme, 2020; New, 2015). In addition, many mining operations in countries with high levels of political corruption and low regulation lead to unsafe working conditions and non-sustainable mining and processing practices that have caused considerable harm to human health, ranging from high exposure to carcinogens to increases in greenhouse gas emissions (Liu et al., 2016), in addition to other significant air, water, and land pollutants. With the growing need to mine lithium for computers and other electronic devices we use in educational technology, it is important to recognize that mining practices are chemically intensive and associated with high amounts of waste that are difficult to dispose of safely (Flexer et al., 2018) and the batteries are commonly non-recyclable. Considering the need for batteries in all laptops, instructional designers should plan to incorporate this disposal as an environmental ownership cost. Further, the energy needed for these batteries is associated with pollution because most of today's energy production systems still rely on fossil fuels such as coal and natural gas (Bakhshi & Sandborn, 2018).

Transportation on a Global Scale: Energy and Pollution Outputs

Every stage in the supply chain process involves using energy to power the extraction of natural resources, their transformation into usable forms, their manufacture into devices, distribution globally to the locations of use, and transport once a tool reaches its end-of-life. Each stage in computer manufacturing has different energy intensity levels that require accounting for environmental use costs (Williams, 2004). Such consideration is needed because the financial models that produce the price educators see tend not to account for social and environmental costs. Under the pollution haven hypothesis (PHH), this situation exists because of lax environmental legal frameworks in countries where such work occurs and the reality that low-priced products rely on highly polluting, low-cost energy sources for manufacturing and transporting goods (Rezza, 2013). A computer's life-cycle energy use tends to be much higher during production (81%) than during active use (19%) locally (Williams, 2004), hiding this negative environmental impact from most technology adopters. Significant carbon emissions occur in the transportation of products, resulting in negative environmental impacts tied to climate change (Er Kara, 2021; Bazan et al., 2015). However, while a smaller component of energy use and pollution, it is important to consider the energy intensity of these devices throughout their lifecycle.

Energy and Pollution Impacts from Computer Use

The environmental impacts of using computers relative to energy use and associated pollution are presented in this section to illustrate the impact of choice to increase technology adoption. CO_2 emissions per KwH, an average of 1.4 tons of CO_2 per kWh for non-renewable sources, inform pollution estimates (Belkhir & Elmeligi, 2018). The following equation determines power consumption (kWh) per number of computers (n=32) included in the planning for the educational technology implementation example of a laptop cart and commonly available Chromebooks.

Where:

n_1 *= Number of computers per school campus per period*

E_c *= Energy use per computer unit*

Table 5 provides energy use and CO_2 estimates for a modeled single classroom 1:1 laptop implementation based on current power use and pollution statistics from the U.S. Energy Information Administration's (2021) estimates to create both one- and three-year profiles, with the latter being the expected life of a well-maintained laptop.

Table 5

CO_2 increase estimates for all campuses in a sample Chromebook cart implementation

Computer type	Power use by 32 computers per year (kWh)	CO_2 lb./kWh)	Annual estimated CO_2 pounds per machine	CO_2 tons per model implementation (32 devices)
One year	30	.85 CO_2 pounds	42 pounds	1,344 tons
Three years	90	.85 CO_2 pounds	156 pounds	4,032 tons

Environmental Impacts of Computer Disposal

At the recycling and computer disposal stage, there are additional ethical concerns. Here, we discuss the policy challenges related to computer disposal at end of life, how e-waste impacts water, air, and earth (Brigden & Webster, 2007), and past or current impacts of recycling in countries like China that have been responsible for taking waste for processing from the U.S., Europe, and elsewhere for the last 15 years or more. While the U.S. recently proposed a recycling plan (U.S. Environmental Protection Agency (2021), it is likely with current weak state and federal laws that devices will not be recycled safely, and electronic waste will end up in landfills locally and in those of other countries with limited environmental protections (Marjovvi et al., 2022; Jeong et al., 2021; Levinson, 2009). Educational institutions should seek sustainable solutions to mitigate the negative impacts of e-waste by managing and minimizing their intake of new equipment, maximizing the life-cycle of devices by purchasing more sustainable products, and measuring their environmental impacts annually and over the lifetime of a technologies' use relative to learning gains to determine if their technology purchase and use plan leads to more effective learning outcomes achieved with greater environmental efficiency (Singhal et al., 2019; Park et al., 2018). However, stakeholder feedback is important before moving on in the decision-making process.

Stage 5. Stakeholder Feedback

At this phase of the life-cycle analysis, it is important to ask stakeholders whether they are comfortable with the situation and its environmental impacts if the learning plan and related technology adoption go forward. Questions should include whether impacted users believe the expected learning outcomes outweigh the likely environmental impacts of purchasing the tools, whether there is an adequate sustainability plan for maximizing the learning value and life-cycle of needed devices, and whether they see ways to minimize the need for new technologies. After using stakeholder feedback to capture feedback and make changes to the plan, build a total cost of ownership model with environmental considerations.

Stage 6. Life-Cycle Cost Estimate: Build a Model of Total Cost of Ownership with Environmental Considerations

Using the resulting data and the Total Cost for Society framework (DeClerck et al., 2018), the following is a total cost of ownership model that adds environmental costs for manufacturing and school energy use and projected pollution from different levels of technology adoption, as well as safe disposal costs (Groot et al., 2014). The most complex stage, total cost of ownership, starts with accounting for simple financial costs for purchase. Most immediate to the educational user, we include the number of devices and their energy and pollution costs directly impacting the institution. The model then asks for a calculation of immediate environmental extraction impact assessment (i.e., mining energy use and associated pollution, unrecoverable mining waste, transportation, etc.) followed by the analysis of long-term extraction community costs (i.e., community health impacts from pollution, environmental damage, clean-up costs, climate impacts from flooding, fire, etc.) Next, planners should consider environmental impacts resulting from energy use and pollution during manufacturing and production phases, including transportation (i.e., energy use, soil, air, and water pollution). Next, one should consider point-to-point product transportation environment impacts for each other supply chain stage where materials or finished products are moved (i.e., manufacturer to distribution hubs to users' institution). Finally, the total cost of ownership incorporates the environmental and financial costs for safe recycling or disposal. The following mathematical calculation includes many environmental costs, though it is not exhaustive.

Where:

n_1 = Number of computers

E_c = Energy use per computer unit

P_c = Annual C02 generate per computer unit (est. .87 tons)

C_{ee} = Immediate environmental extraction costs

C_{el} = Long-term community environmental extraction costs

C_{em} = Immediate environmental extraction costs

C_{elm} = Long-term community environmental extraction costs

C_t = Immediate environmental extraction costs

C_{et} = Long-term community environmental extraction costs

C_{df} = Financial disposal costs

C_{de} = Environmental impact disposal costs

Once the total costs are determined, the instructional planner should compare these costs with expected learning gains. This approach allows a determination of the trade-offs between environmental impacts, financial costs, and possible learning gains. If a designer or educational manager determines that the benefits outweigh the costs, moving forward with technology adoption is deemed justifiable.

We recognize this is a complex calculation that is likely daunting to employ for an instructional designer or educational manager. While it may be too challenging to use, our purpose in providing it is to illustrate the high complexity of the supply chain and the commonly hidden environmental impacts that result from it. A simpler calculation for everyday use to get a sense of one's likely impact from educational computer acquisition is as follows:

Where:

n_1 = Number of computers

E_c = Energy use per computer unit

P_c = Annual C02 generated per computer unit (est. .87 tons)

C_{se} = Total supply chain environmental impacts

C_d = Environmentally safe disposal costs

Again, compare this estimated total cost of ownership with the estimated educational benefits of the tool over its entire lifetime. While it will not be exact, the goal is to help educational designers and managers make better decisions as to whether to purchase computers and in what quantity to balance the costs with possible benefits.

Discussion

The capitalist philosophy responsible for creating today's linear, consumption-driven economy is a primary driver of environmental harm today (Alfred, 2009). As such, we offer a technology planning strategy for instructional designers and educators based instead on indigenous views of social justice in which it is ethically necessary to "recognize that the earth has an inherent value, beyond human needs" (Alfred, 2009, p. 85). Therefore, our recommendations recognize that our devices start as raw materials mined from the planet. Each phase of the device life cycle, including manufacture, transport, use, and disposal, has additional environmental costs that we, as designers and educators, have an ethical responsibility to minimize.

Incorporating the Environment in Technology Adoption Planning Using Stewardship Philosophy

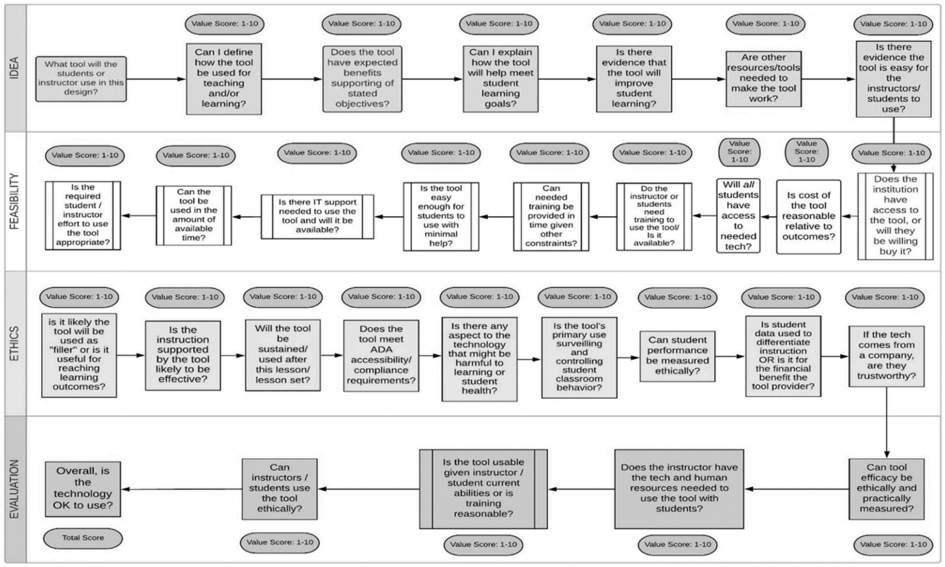
In this section, we provide a recommended planning model that incorporates total cost of ownership to help make the estimated environmental and financial costs transparent to managers before adopting technologies at scale. Knowing these costs can help designers, instructors, and managers make more informed decisions regarding their environmental impacts relative to evidence-based projected learning outcomes. As with other instructional design process models, a strong analysis is important for deciding to proceed with a plan.

Analysis

The analysis process to follow when determining the impact of a technology choice on the environment and humans is complex. It is important to determine the audience for the tool and whether it is appropriate to the intended learning tasks by evaluating the soundness of the idea, the feasibility of implementing the tool, and whether it is ethical to use it based on several factors related to students. The Ethical Choices with Educational Technology (ECET) Instructional Design (ID) technology evaluation choice framework (Beck & Warren, 2022) is one such tool for making this determination before choosing to use a tool (see Figure 1).

Figure 1

ECET Instructional Design (ID) Technology Evaluation Framework



Note the third component of the Ethics lane. This question helps instructional designers determine whether the application uses the tool once or if a sustainable plan exists to continue its use beyond the planned, current lesson. The framework should help instructional designers think through ideas, especially ethically. The addition of the environmental consideration is one small effort to drive sustainability thinking during the educational planning process and to help recognize that ethics should incorporate the environment as a stakeholder if we are to be good stewards of the earth, as proposed by Alfred (2009).

Further, before determining the potential environmental or human harms of adopting technology, designers must know what tool faculty and students will use and at what scale to achieve intended learning outcomes. Each chosen technology will have a different environmental impact depending on its size, raw materials and their source location, manufacturing processes, transportation costs, energy consumption, expected usable tool life, and other variable factors (Su et al., 2019).

Units needed to achieve learning outcomes

Another consideration with the tool choice is the number of units needed to achieve the expected learning outcomes, which can vary significantly based on the scale of the intended learning project. Historically, our educational technology field has pushed for a 1:1 device-to-student ratio because this is the best possible choice for learning outcomes (Stone, 2017). However, this idea fails to consider the environmental costs that result from manufacturing, using, and disposing of devices once they reach their end of life (Yi & Zhang, 2018; Williams, 2004). Each machine that we can avoid making and adopting reduces myriad environmental harms, so minimizing the number needed to achieve learning outcomes should be the first consideration a designer or educator makes.

Consider Environmental Harms from a Device

When considering the technology choice, it is important to consider device construction and the harms in mining, refining, manufacturing, and disposing of a device. Some companies think through reverse logistics with their devices to determine how to reclaim, reuse, recycle, or dispose of a device's materials at its end of life (Sovacool et al., 2020; Rahman & Subramanian, 2012). This information may be found on a manufacturer's website, though not all include it, requiring additional research work on the seeker's part. However, other companies fail to incorporate this thinking in their development planning or intentionally choose materials to make the device as cheaply as possible. Educational environments tend to choose these devices because of the price point. Such practices often result in materials that are more harmful to the environment at some stage in the supply chain.

Additionally, manufacturers intentionally prioritize compacted designs that are harder to break down for recycling or prevent upgrading and to extend usable life, increasing the number of units sold and growing profits at the expense of the environment. Designers and instructors should spend time examining each company's approach to manufacturing devices and look at the materials composition when possible to find and include machines with materials that have the lowest long-term environmental harm at each stage in the mining, manufacturing, transportation, use, and disposal life cycle (Su & Sun, 2019). Even if the immediate cost may be higher, the financial total cost may be lower because of an extended life cycle, or the environmental costs are fewer thanks to reusing, reclaiming, or disposing of safely.

Plan for the Entire Life Cycle of Each Device

Instructional designers and instructors tend to think through what they want from devices and how many will help them achieve instructional outcomes. However, to maintain an environmentally ethical attitude, one's planning should consider the entire life cycle of the device from the moment we choose to use it to how we will lengthen its life and how it will be disposed of safely.

- What are the learning affordances/benefits of the tool?
- What are the material characteristics of the technology?
- How can I minimize my needs with the tool (e.g., energy consumption)?
- How can I use this tool in a variety of ways that provide maximum benefits to the users?
- How can I maximize the life of the tool?
- What is my plan for disposing of these tools (e.g., recycling, safe disposal)?
- What is the plan for ensuring transparency in tool disposal at end-of-life?

If a major goal of taking an ethical attitude is to minimize our environmental impact as educational tool users, only strong planning to reduce our impact can result in reduced harm. These questions act as a starting point for the planning process and ask us to conduct research to identify the consequences of our decisions and actively take steps to mitigate harm. However, as you work through your educational systems and processes, you will likely find new questions. Shifting one's mindset to balancing the benefits with the total costs provides a designer or educator with a fuller perspective on the environmental impacts relative to possible learning improvements. This view considers real-world trade-offs necessary for a holistic ethical view.

Implications, Limitations, and Next Steps

This section reviews practical implications for ethical thinking using an environmental stewardship philosophy during technology planning. From this perspective, we offer practical recommendations for engaging in ethical thinking and active environmental harm reduction. Finally, we note limitations to the stewardship approach and future research that can test the model in the real world.

The First and Most Persistent Question: Should I?

From an ethical perspective, the first question we should ask ourselves before creating a learning plan that requires technology is “Should I?” (Warren & Lin, 2013). Too often, our interest in novel or everyday technologies and what we think they afford drives us to adopt them when less technology-intensive options may be as or more effective. Therefore, a necessary question is whether it is possible to implement the instruction and learning activities without a tool or with one already present. Asking this essential normative question at the outset of our technology and learning planning process can help eliminate potential environmental and human harm.

Practical Recommendations for Environmental Harm Reduction

Before choosing to use a technology, it is important to recognize that there will be some real, measurable harm related to technology adoption. With any device, these may be hidden behind digital ordering walls that obscure them, making them hard to recognize. However, these harms will negatively impact the environment or the people who make them at various points along the supply chain, during transportation to your location, and while using the device. There will be additional quantifiable effects at its end-of-life disposal. As such, we have some recommendations for instructional designers to consider in reducing the harms of technology adoption in any organization, especially educational ones.

Once choosing to adopt new technology as part of a learning plan, we suggest taking steps you may be familiar with from experience, starting with the 3Rs recommended by Mmereki et al. (2016). The first approach is reducing the number of technology units needed or selecting one with a lower pollution footprint. Next, we recommend finding ways to reuse the technology and maximize its value for educational projects throughout the educational setting. Once a technology is no longer usable for its intended purpose, the next strategy should involve recycling materials feasible for repurposing or safe disposal of anything unusable.

Harm Mitigation Strategy 1: Reduce

When deciding how to move forward with an instructional technology implementation that is responsive to reducing negative environmental impacts, it is important to start by forecasting the minimum number of units needed to achieve learning outcomes successfully. As part of this planning process, one might also consider calculating the environmental impacts of different numbers of units to achieve the required learning outcomes. The goal of this approach is to constrain negative outcomes resulting from technology production, use, and disposal phases (Mmereki et al., 2016). Next, the designer or instructor should consider reducing the need for technology in the plan.

For example, a pure unit reduction approach can work if not all students require laptops concurrently in a social constructivist-based team activity where one student takes notes or records findings, reducing the 37 required units to seven by organizing students into five groups. An added benefit to educational organizations is that this approach reduces implementation costs. By contrast, a lower total environmental cost approach might work if all 35 units are needed. In this case, select options for technology with the lowest energy use and associated pollution and the best physical materials from the lowest impact mining while ensuring units can perform adequately to achieve learning outcomes. A mix of approaches also works; seeking the lowest environmental impact units combined with a unit minimization approach should significantly reduce the project's environmental impact. Once the technology is acquired, the second strategy implemented should ensure that a tool is used for as long as possible so that the environmental impacts from the technology choice have educational benefits for the longest possible period.

Harm Mitigation Strategy 2: Reuse

Three increasingly popular approaches to minimizing the negative impacts of technology on the environment are 1.) repurposing end-of-life electronics equipment (Coughlan et al., 2018) or 2.) taking part in a robust but challenging global shift in mindset to the whole economy and the role of educational institutions in it by adopting the concept of an in-spiral supply chain that complements a circular economy (Valero et al., 2020). The first approach, repurposing equipment, can be done by taking older laptops and using them minimally for activities such as web browsing (i.e., "thin clients"), like how Google Chromebooks are used today (Dino et al., 2020). Another option is to find ways to cheaply improve the internal components of machines that can be modified to extend system life (e.g., add RAM, new hard drive), providing them to students with lower computing needs, such as elementary school children aged 5–12. If the machines are not usable within the institution, participating in the circular economy is another option to reduce negative impacts (Burneo et al., 2020).

Sariatli (2017) explained that "The natural consequence of cheap material / expensive labor is the common neglect of recycling, reusing, and putting much emphasis on waste" (p. 31). Put simply, the take, make and dispose model has had "consequences for society, a negative impact on health and contributes to climate change [. . .] we need a system that functions properly – in which the circular economy replaces the linear" (World Economic Forum, 2019, p. 6). Contrasting with the linear economy, Geng et al. (2012) wrote that the circular economy is "an economy based on a 'spiral-loop system' that minimises [sic] matter, energy flow and environmental deterioration without restricting economic growth or social and technical progress" (p. 281). In the circular economic model, shared value redefines the functions of the world's corporations, for "the purpose of the corporation must be redefined as creating shared value, not just profit per se. This will drive the next wave of innovation and productivity growth in the global economy" (Porter & Kramer, 2018, p. 4), which requires integration of what Ekholm et al. (2016) defined as an ecosystem service-dominant logic. Using this mindset requires considering where any purchased technologies will go next in the economic or educational system, ensuring they have practical, maximized use value for society until they reach a point at which the materials must be broken back down and repurposed safely again. Another common environmental harm reduction strategy involves recycling as an individual strategy or combined with circular economy participation.

Harm Mitigation Strategy 3: Recycle with Planning, Tracing, and Measuring Impacts

A common recycling strategy schools, universities, and businesses have employed over the last two decades involves selling computers and other technologies that reach their end-of-life at low prices to private companies expected to recycle them (Gavronski et al., 2012). However, as we find in our institutions and others contacted, once selling these devices through an organization's facilities surplus unit or online partner, the chain of custody for that device ends. This problem results from a lack of recycling policy coordination across global supply chains among companies or governments (Sovacool et al., 2020) and couples with minimal transparency in the e-waste supply chain at end of life (Chen et al., 2019). In other words, we cannot trace these devices' locations and whether they are disposed of safely when they reach their final destination (Kumar et al., 2017). Further, even pyrolysis may not successfully reclaim plastics most commonly recycled, as common mechanical treatments do not work on plastics found in computers (Qureshi et al., 2020). As such, the instructional designer or instructor should work with their institution and community to develop a robust plan for recycling that includes a chain of custody extending to where the device is successfully recycled or disposed of without environmental harm.

Harm Mitigation Strategy 4: Plan to Dispose of Non-Recyclables Safely

There is little evidence that most educational institutions have plans for effective, safe disposal of non-recyclable components of electronic devices, meaning many devices end up in landfills. Further, well-intentioned technology planners know there are parts of even the most environmentally friendly computers that end up as pure e-waste that must be disposed of safely. Current laws in many countries fail to account for this challenge, so there is no guarantee of minimized harm when disposing of a machine that cannot be recycled. As a result, people in countries like India, China, Vietnam, and some African Countries (Tran & Salfhofer, 2018; Sivramanan, 2013; Gaidajis et al., 2010), who are involved in the process of stripping electronics for valuable metals, are harmed through informal end-processing of e-waste (Sankhla et al., 2016; Song & Li, 2014). Those countries often have few resources for mitigating environmental damage to the local earth, water, and air (Dino et al., 2020). However, China instituted its National Sword policy in 2018, reducing the amount of technology imported for recycling (Tian et al., 2021). This change has had consequences for countries like the U.S. and the U.K., where our recycling strategy for the last two decades has primarily been to ship our e-waste to other countries, leaving many communities and organizations with poor sustainable waste disposal strategies. It was only at the end of 2021 that the United States Environmental Protection Agency (EPA) announced a national recycling strategy focused on growing markets for waste, increasing material collection, reducing materials contamination, improving policies and programs nationally and internationally, and standardizing measures of recycling performance in communities, especially those carrying an unfair burden of the environmental costs of waste (United States Environmental Protection Agency, 2021). In the waste disposal and recycling planning domain, the field of conservation engineering spent the last two decades seeking to understand and model solutions for the safe disposal of toxic materials left over from technologies once they reach the end of usable life (Sovacool et al., 2022; Su & Sun, 2019; Williams, 2004; Joshi, 1999); however, that will be the focus of future studies.

Future Research

In the future, the field should research the growing problem of electronic waste left behind by instructional technology users and how successful educational institutions plan and operationalize their safe disposal strategies. For example, a single K-12 school district that adopts a 1:1 laptop initiative generates a minimum of 55 tons of e-waste every three years from the computers alone (Warren et al., 2022a). Further, there is no research on the e-waste and energy consumption of the many higher education institutions in the U.S. or globally, which leaves a gap in our knowledge about how we can reduce their likely negative environmental impacts through restructuring of educational facilities and technology used in support of their educational missions through the adoption of sustainable planning and energy production (Warren et al., 2022b). We know little about the environmental impacts of current K-12 or higher education sustainability policy on real-world ecosystem outcomes. Given this need, scholars should focus on how school districts cope safely with the waste generated from these initiatives. Such plans should address increased rising financial costs of technology and energy that continue to increase in response to global supply chain challenges due to cyber threats, climate impacts, decreased access to natural resources, high shipping costs, skilled worker shortages, and competition for labor (Er Kara, 2021; Crimmins et al., 2016; Manuj & Mentzer, 2008). In addition, it is important to understand whether instructional designers and educational managers (e.g., principals, higher education administrators, etc.) believe they have an ethical responsibility to consider the environment in their development planning, along with considerations of learning outcomes. Better understanding designers' perspectives can guide how we develop future training on how to incorporate an environmentally ethical perspective in the technology adoption planning process of which we are a part, helping shift mindsets from that of perceived neutral tool users to stewards of sensitive global resources with intrinsic value that should be protected.

Limitations

While centered on instructional designers and their ethical decision-making, this chapter rapidly covers highly complex manufacturing, environmental philosophy, and conservation engineering concepts. As such, we simplify concepts to help instructional designers and managers of technology become broadly aware of environmental and technological challenges; however, future work, communication, and ethical behaviors will benefit from exploring each topic.

Further, exploration of the supply chain's environmental impacts was limited to a single, small classroom to illustrate the principles. The framework requires testing in many contexts to determine its applicable value. We do not advocate for generalizing the framework to other settings or provide precise mathematical equations for calculating the total cost of ownership. A single laptop device has many variables (e.g., laptop construction materials, power use, energy source type, etc.), so our equations aimed to illustrate the complexity inherent in making an environmentally ethical choice about whether and what technology to adopt in education settings.

Conclusion

Having an ethical attitude towards the environmental impacts of technology requires understanding the complexity involved in their creation, transportation, use, and disposal chain. As such, there is value and a need to understand the environmental impacts of adopting a new technology beyond immediate use and potential learning affordances. As Hill (2017) explained, an ethical attitude toward educational technology can be conceived of by understanding that "[E]nvironmental protection means – or should mean – reducing pollution, making sustainable choices, and distributing the burdens and benefits of industrialization fairly among all populations, considering their current situations, their contribution to the harms being addressed, and the resources available to them" (p. 3). A major goal of this chapter was to illustrate the environmental harms inherent in our technologies and model how we can consider systematically reducing them during our instructional development process. By viewing environmental and human costs as part of an educational technology's total cost of ownership, instructional designers and educational managers should have a better sense of unaccounted-for costs that go beyond the immediate financial ones central to everyday decision-making. Using these models that integrate costs hidden behind ordering screens, whether for a single computer or a university-wide device adoption from a new vendor, we can better understand the complex outcomes of seemingly ethically neutral choices and make better decisions for now and the future.

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Black Children at Play: The Cultural Practices of the ILLEST Lab

Edouard, K.

Access Creativity Equity Maker Movement Makerspace Play

Imagine a makerspace deliberately designed to maximize creativity and inspire racially minoritized participants, especially Black children, where they can freely explore all levels of creativity. At the heart of the chapter, we are looking to address the open nature of makerspaces and allowing Black students the flexibility to iterate, prototype, and fail without While equity and access in makerspace environments have begun to be areas of focus within the informal learning research community, more research is needed that investigates the types of engagement. Particularly for Black students, discussions of equitable access are followed by the interrogation of tools, curriculums, and design of the learning environment. However, there is very little around the creative exploration *and collaborative relationships fostered by participation in the makerspace. In this chapter, I am looking to address the open nature of makerspaces and allowing Black students the flexibility to iterate, prototype, and fail without consequences.*

Imagine a makerspace deliberately designed to maximize creativity and inspire racially minoritized participants, especially Black children, where they can freely explore all levels of creativity. At the heart of the chapter, we are looking to address the open nature of makerspaces and allowing Black students the flexibility to iterate, prototype, and fail without While equity and access in makerspace environments have begun to be areas of focus within the informal learning research community, more research is needed that investigates the types of engagement. Particularly for Black students, discussions of equitable access are followed by the interrogation of tools, curriculums, and design of the learning environment. However, there is very little around the creative exploration and collaborative relationships fostered by participation in the makerspace. In this chapter, I am looking to address the open nature of makerspaces and allowing Black students the flexibility to iterate, prototype, and fail without consequences.

In this study, I describe cultural practices at the ILLEST Lab that support creative play and exploration for the Black student participants. The ILLEST, which stands for Informal Learning Linking Engineering Science & Technology, is a university-housed makerspace open to both university and school-aged residents of West Philadelphia, which is a Promise Neighborhood. The ILLEST was designed as a call to action where students in the West Philadelphia community could collaborate and engage in STEAM practices through a multigenerational environment, free of expectations and assessments, allowing them to be stewards of their STEAM engagement.

The ILLEST houses 3D printers, turntables, power tools, 300 pairs of sneakers, a flight simulator, and a 10-foot poster of Kermit the Frog wearing a Supreme box-logo T-shirt. The creation of this space is part of a purposeful accumulation of culturally responsive and curated resources set to become the foundation for a cornucopia of maker projects. The activities in the ILLEST were designed to provide students with flexibility and creativity to produce projects such as designing and engaging a 3D printer to create prosthetic limbs, testing the latest sneaker technology, or designing a chemistry experiment based on the optimal combination of coconut and essential oils to provide the maximum level of hair-moisturizing protection against humidity on a warm spring day. The centralized goal of the ILLEST is to support culturally responsive creative thinking (CRCT) that embraces Black students' social contexts as a foundation for the transfer of STEAM competencies and their project-based activities.

Transgenerational Counter Space

The ILLEST was designed to function as a counter space to the accepted traditions of makerspaces and making cultures. The foundation of the ILLEST was based on a desire to dispel the many examples of cultural bias documented by women and racially minoritized participants. A power dynamic exists between the creators and participants of makerspaces (Vossoughi et al., 2016), where curriculum, projects, and tools are used to set cultural norms (Halverson & Sheridan, 2014). The benevolence of STEM opportunities can subjugate participants, which in turn perpetuates and continues an uneven power dynamic (Sengupta-Irving & Vossoughi, 2019). This power dynamic can be referenced as an unspoken or invisible power over participants and the environment. The design of a STEM environment reveals a great deal about its creators' values and potential aspirations (Martin, 2014).

By not providing Black participants with an environment that embraces creative and design flexibility, makerspace creators are trafficking in the benign neglect of resources and power (Sengupta-Irving & Vossoughi, 2019), using this group's conditions to reinforce a single direction of power that ultimately fosters a deep lack of creative empathy. Makerspaces are not frictionless environments, but in this research, I integrate the tensions of the cultural practices of established makerspaces and the latitude of racially minoritized participants to be creative and simply play.

The ILLEST Lab is a transgenerational learning makerspace integral to building upon youth-centered cultural practices. It is defined as transgenerational because of the fluid generational leadership found within the lab. The intentional design of transgenerational participants is so that knowledge and creativity are accessible to all participants within the space. Experts with advanced knowledge and skills and newcomers with limited knowledge and skills all become contributors to the construct of a learning community with members from various levels of STEAM experience, knowledge, and skills. At any point, middle school students can be mentored and led by a high school student, who then seeks the advice of undergraduate engineering students supervised by Ph.D. or postdoctoral students.

According to previous studies, the benefits of generational differences heighten retention and creativity for participants (Sánchez & Kaplan, 2014; Tillinghast et al., 2017; Bers, 2007). The differences in participants' generations can also expose variations in attitudes and life experiences. For a makerspace designed for a particular minoritized group, it also highlights nuances that ultimately dismiss the monolithic identity that has been attributed to Black students. The ILLEST welcomes these differences and builds on the transgenerational dynamics in teaching and learning, which builds a creative and interaction-rich learning environment, a key component of community building and learning (Sánchez & Kaplan, 2014).

Theoretical Framework

Play as a Form of Resistance

At the heart of play-based learning is the opportunity for young people to explore and experiment not just individually but in a collective learning environment (Yahya & Wood, 2016). Early childhood education research frames of play-based learning around experimentation and reflection (O et al., 2014) but falls short of the discussion around the cultural practices and norms for minoritized participants (Yahya & Wood, 2016). The belief that all children have an equal opportunity is problematic, especially when Black students are less likely to be allowed to do play-based learning compared to their white peers (Ford et al., 2008). Allowing Black students the flexibility to engage freely with new objects, concepts, and project-based activities provides a critical lens on play-based learning. Black students have voiced frustrations with not being given opportunities for unstructured interactions with STEM learning tools and objects. Research on cultural practices of white students in STEM environments yields a different reality, where students are allowed unstructured play to engage and master new tools and resources without restrictions (Shmukler & Naveh, 1985). My position is that allowing Black students the opportunity to engage in unstructured play is an act of resistance against the traditional practices of play-based learning. There is potential for identity alignment and harnessing creativity for Black students.

As active learning environments (Bean et al., 2015) in which students use an array of learning expertise to shape skills in real-world design applications, makerspaces have galvanized educators and research (Hira et al., 2014). Yet, a tension for makerspace design ethos is the neglectful application of foundation-inclusive and culturally relevant principles to help support a diverse population (Vossoughi, 2014). Cultural modeling sits at the nexus of design and cultural practices within makerspaces.

Dr. Carol Lee's cultural modeling supports the direct discussion of encouraging students' everyday knowledge in content-specific learning spaces (Lee, 2003). At its core, cultural modeling (CM) allows researchers and educators to create a routine inventory of students' practices during out-of-school activities and engagements (Lee, 2007). This curation provides beneficial insight into students' cultural and cognitive practices, specifically in their community settings (Lee, 2014). The key to CM is creating an opportunity for educators to map students' lived experiences and skills onto domain-specific content areas, topics, and procedures across the learning setting (Lee, 2008). Cultural modeling was designed using research on student learning, expert-novice studies, and human development. Dr. Lee used CM to inform the interdisciplinary field of learning sciences while making a persuasive case for the inclusion of culture and cultural practices in the understanding of human learning.

Informal out-of-school makerspaces are a popular resource, providing students an opportunity to learn and engage in both active learning and building community (Bowler, 2014). Yet, empirical research around makerspaces has found the collaborative and learning narratives to be rife with continued biases and equity concerns (Halverson & Sheridan, 2014), particularly for racially minoritized participants (Sengupta-Irving & Vossoughi, 2019). In a 2013 presentation at a FabLearn conference at Stanford University, Dr. Leah Buechley declared: "The Maker movement has grown large enough and influential enough that it's time to turn a critical eye to the culture of the community, what we want it to be and what it really is." Critiques of makerspaces and the movement are increasing in both the academic and classroom communities, with the stated purpose of making sure that the community looks inward and fulfills the stated transformative promises (Sheffield et al., 2017).

The research critically examining makerspaces beyond the disruptive narrative and dismantling force has been led by critical pedagogists and social justice-minded academics who firmly believe in the potential of these informal spaces. Yet, makerspaces have never been portrayed as counter spaces to the hegemonic powers that govern STEM special interests (Vossoughi, 2014). Counter spaces present themselves as alternatives to the mainstream philosophies of learning, engagement, and production (Ong et al., 2018). Many makerspaces have a running ethos around competitive success and computer-integrated activities, which often reflect the normative behaviors of white male scientists or engineers (Edouard & Kim, 2017). The counter-narrative around makerspaces relies on assessing students' activities, where testing takes a back seat to the activities' learning and project-based creation. Each is the selling point in the test- and data-heavy education landscape that has presented itself over the last 40 years. Makerspaces counter data and testing norms by providing an evangelist-style unifying language around disruptions, innovation, and technological tools (Dougherty et al., 2016).

However, role power, time, and unstructured play in the makerspace are missing in the research narrative. For many who have found themselves on the outside of the makerspace, there is this question: Who specifically defines the ethos of creativity and engagement in a makerspace? Interdisciplinary critical pedagogists and learning scientists have zeroed in on the power dynamics surrounding the design and formation of makerspaces (Sengupta-Irving & Vossoughi, 2019).

Methods

Participants

Included in the study were five Black high school students from the West Philadelphia area, with one being female and four males. The participants were all juniors and attended five different high schools. Each high school had the distinction of being a magnet school with access to a makerspace, science, and vocational labs. Participants learned about the study by word-of-mouth recruiting conducted by one primary participant. This student, Alan, had attended previous sessions at the university for three years prior. Alan indicated that he knew of other students he could recommend that would benefit from participating in activities in the ILLEST Lab. After two weeks of emailing and contacting each of those students, the five students were assembled. The group initially met at the lab, where they met with faculty who explained the space and asked if they would like to attend weekly. Upon agreement with the weekly attendance aspect, students were given consent forms and asked to get permission from parents to be in the lab space for participation and research. Students attended open lab hours at the ILLEST Lab from October to April. Each arrived at the space, taking public transit from their high schools around the city.

The students attended an open lab session for two hours, from 3:30 p.m. to 5:30 p.m. At the lab, two Black female graduate students, one Black male engineering student, one Middle Eastern engineering undergraduate student, and one Black assistant professor supported the participants during the open lab hours. These students also have engaged in multiple formal and informal STEM and makerspace experiences. They also created various makerspace projects and entered into competitions for scholarship opportunities. We selected these five students because they exhibited a high drive and technical proficiency in makerspaces.

Research Method

This empirical study primarily used observation and journaling of the participants within the ILLEST, a university-based makerspace. These observations focused on how students self-organized within the group, made decisions and selected potential projects. Upon arrival, students were asked to give interviewed reflections on their activities during the day at their respective school sites, with questions focused on activities in their local makerspaces. We looked at observations of group interactions, how they demonstrated content knowledge, and the selection of projects.

Our observation was centered around each Wednesday session, where the five participants and the five mentors interacted with each other. The first month was a collective meetup, where the conversations around ordering the pizza allowed each lab member to build a deeper connection with one other within the space. The first month let the mentors identify some of the making competencies the participants knew. They did this by asking probing questions about the tools and activities each of the five engaged in at their respective makerspaces. These non-structured questions were positioned to allow the students to openly share their experiences with a larger group to see if there were commonalities, allowing the researchers to pinpoint if there were through lines and reoccurring themes. As the relationships with the group began to develop over time, the decision was made over the following two months to pair each participant with a mentor. These pairings were decided by how the students began to ask direct questions to particular mentors and build affinities for their works. Ultimately, the goal was to pair participants with mentors who inspired them. We also collected data by providing students with a journal to use on and off-site. The goal was to have students document ideas, inspirations, and personal feelings. We initially kept a strict journal writing requirement upon arrival to the lab to document the day's goals and write for five minutes at the end of the day. The key was to combine the observations, interviews, and journaling to achieve a wider picture of their activities within the ILLEST Lab.

Part of our observation was to better grasp how the participants brought prior knowledge from their makerspaces and how it was being integrated with the interactions at the ILLEST Lab. One of the first things done was to map their language around the tools within the space. We observed if they correctly named the tools and if they could correctly reference the tools within the lab. We also paid close attention to how the participants were teaching each other about the correct usage of the tools and if there were alternative ways of using the tools within the lab. Through observation and journaling, we set out to find if the students could connect the scientific and mathematical foundations with the activities in the makerspace. For example, when building the circuits, we observed how the students used Ohm's Law correctly to engage in a project. Our observations also allowed us to monitor how students looked up new vocabulary and terms using internet searches to help them better understand a particular science or engineering concept. We only used observation to get at the heart of the competencies because early on in our interactions with the students, they expressed that they felt uncomfortable answering questions they felt were trying to expose their lack of knowledge. Asking interview questions on concepts posed a challenge as the students made it clear that in their respective makerspaces, they were consistently being quizzed and felt singled out as opposed to their white counterparts.

Part of the open nature of the ILLEST Lab for this group of participants was giving them free rein to select, design, and construct a project for their six-month duration. This was a considered option, primarily based on the early interactions with the students, where they made it evident that they were not allowed to have a voice in the overall project selections at their respective makerspaces. The students expressed that not being able to select or have a voice in the selection of their maker projects made them feel unvalued at their respective makerspaces. Using observations and curating their produced artifacts, we began to map how long each mentor-mentee group would think about a project, design, and create an order list. We documented the conversations across the various months and took photos and videos of the paper prototyping of their initial project designs. Each pairing began the process of creating a parts list, which would be ordered through the ILLEST Lab and delivered for them to begin their projects. We also documented the emails and digital conversations between the pairings while the participants were off-site as they continued to prepare for the projects. Ultimately, due to the winter and spring holiday breaks, there were gaps in the ordering and completion of the projects. However, the main part of the data collection was surrounded by the creative process of the pairings, focused on the participants themselves and their agency toward their maker project.

Findings

As the year ended, some participants expressed joy in being in a space that provided them an open family-style environment to engage in science and engineering. For many participants, continuing to attend the after-school program became difficult due to other commitments. As we sorted through the data, we realized that two particular students stood out as having 100% attendance and provided a thoughtful insight into their feelings and what took place at the ILLEST Lab. The difficulty of getting all of their voices shared in our findings came down to the difficult decision of picking the two dominant voices to help provide insight into our findings. Each student provided a clear discussion about gender and racial barriers that they found in their respective makerspaces and how the ILLEST Lab provided a space to help explore and navigate these tensions.

Unstructured Play in the Role of Social Interaction

Darius, a participant, would come into the ILLEST expressing the need to rest and recover from a long day at school. Ultimately, he wanted an opportunity to relax, engage, and be open, which was one of the fundamental things missing at the makerspace in his school. "Yo, they just always pressuring me, and I don't know how I feel." At his school's makerspace, Darius explained that they discussed his need to be in some form of leadership, as few racialized minority students participated. He did not want or feel comfortable starting in a leadership role and wanted first to be a part of the community and learn. "I just never was given an opportunity to kind of just you know, find myself and really be able to understand my role." This sentiment was a constant theme from Darius when discussing his struggles with being placed in a leadership role.

When asked if he felt he was being pushed or singled out, his answer was very direct: "I think they just want to give me some type of opportunity to say something. But that's just not me." In his interview, Darius talks about how his identity formation had not yet flourished or been given the opportunity to grow.

When asked how his experience at the ILLEST differed, Darius provided a contrasting set of realities, stating, "When I come here, I can just chill. Maybe get something to eat and then think a little bit with my friends." A community was starting with the four other participants. Darius, who was familiar with the other four participants before coming to the ILLEST through other communities in and around Philadelphia, felt it was important that he started to build community with his peers.

Multiple times throughout the months, Darius was found discussing music, comic books, and the latest sneakers he wanted to buy. Seldom Darius was asked to get back on task or asked to produce a deliverable. During an interview, Darius highlighted this engagement: "It seems that in this space, you guys don't sweat me as much. You allow me to kind of figure things out." There is a particular discussion around the flexibility of the space to give him time and opportunity to feel confident at the ILLEST.

Darius was allowed to develop and create some ideas for a group project. One such project was designing and creating an electric bicycle. Particularly, Darius wanted to design a mode of transportation that had a sustainable energy approach. He explained that in his other classes, they talked about sustainable energy and access to sustainable resources to help better the planet. Darius immediately thought about his commute and how potentially all the buses he would ride emit toxic chemicals. If he could transport himself to and from school using an electric bicycle, he could add to the discussion of a sustainable and healthy planet.

These discussions continued to be generative as Darius discussed building a better community in Philadelphia. He saw the makerspace and all the tools within it as an opportunity to engage in these developments. Using the lens of bettering his community, Darius found himself at the center of not only the making community but also being able to use the tools, processes, and content knowledge he gained within the space to design and create products to help better his outside community.

On many occasions, while talking with his peers at ILLEST, Darius applauded his access to plentiful resources. "At our makerspace at our high school, we actually have to check out certain amounts of resources, but I sometimes think it might be unfair because some of the white kids they get to check out more than me. And I don't think that's cool." Darius addressed the potential inequity between the access to resources at his high school and the ILLEST. He felt that while he was asked to be a leader at his school's makerspace, he was still not given the same flexibility as his white peers regarding access to resources. It is important to observe the language around identity and the potential identity to be developed in the makerspace when the participants are positioned or charged for engaging in the makerspace when it comes to time and access to resources.

Play that Allows for Creativity

“Really, sometimes I don’t feel that my opinion matters. And most of the time, people just keep speaking over me.” Jessica was the only female participant. She is one-half of a twin. Her twin sister was supposed to be a participant in the ILLEST but was given another opportunity. She recommended that her sister, who was also heavily interested in engineering practices, take her place at the ILLEST. Initially, Jessica was apprehensive and resistant to joining the group as she would be the only female within the space. She expressed concern that her voice would not be given an ample platform to share and engage in any activities.

Jessica was given time to meet and acclimate to the environment. Her observed behaviors began to show some of her previous struggles and feelings while at her school’s makerspace and other informal spaces before being at the ILLEST. In an interview, Jessica shared the following,

> *A lot of times, we are asked to rush through our activities, and I'm not given enough time to be able to just think about what it is I want to do. So what happens a lot of times is that my group members forced their opinions on to me in order to meet a deadline. I become uncomfortable and just agreed to get along.*

Jessica made it very apparent that this kind of atmosphere at her school was not conducive to her being creative and developing ideas within the makerspace.

As her time at ILLEST went on, she highlighted the differences in her peer groups and the overall energy within the space, stating, “What I noticed here with all these guys is that they don’t feel pressure and therefore they’re not giving me pressure. We just kind of sit here, play and laugh, and talk about music and food. I like that.” Jessica highlights how the environment and the atmosphere allow her to build with her peers and lower anxiety when designing and creating projects within the makerspace. She chose different activities to engage in to better familiarize herself with the tools and some of the technical competencies required to navigate throughout the ILLEST. She shares, “Honestly, what’s cool here is that we can play, and it just helps me think of random things.” Being able to navigate the ILLEST openly allowed Jessica to piece together possibilities and options to create afforded to her peers at her school’s makerspace. It would seem that Jessica, as an African-American young woman, found a peer group and an environment that allowed her to have a voice and develop an identity within the space where she could be the steward of her own making potential.

Discussion

In this study, we explored how Black students were provided the opportunity to engage in a learning-focused makerspace without the constraints of time and a mandate for deliverables. We selected high-achieving students and placed them in a low-stakes environment with access to an infinite amount of college resources to see how they would engage with space and each other. Our research found that the students were initially intimidated by the opportunity to navigate openly and explore the environment and tools.

Over the three months, five students effectively self-organized and self-taught on the machines and tools in the makerspace. Students had minimal access to instructor scaffolding and were allowed to use cell phones, laptops, and tablets to search and lookup any technical expertise required to run a machine or design a project.

Observation within the Space

Observing the language and the physical movement using tools and resources allowed the researchers to see how an open, unstructured makerspace can be relevant to forming identity and sparking creativity. The students clarified that race and gender played roles in how they felt and saw their identity development in the makerspaces. Darius explained how using resources was inequitable compared with his white peers. Jessica raised gender concerns as the pressure to complete tasks and engage in activities pushed her voice further to the side, as the boys in her group were dominant in shaping projects to reach deadlines.

For our research, we looked to create and facilitate discussions around allowing Black students to engage in a culturally relevant makerspace environment freely. Our findings call on makerspaces to prioritize Black students' experiences to join in unstructured play. Unstructured play within makerspaces requires further investigation to understand different cognitive and cultural practices needed to maximize the experiences and creativity of Black participation in makerspaces.

Conclusion

At the heart of this chapter, we aimed to understand better what drives creativity and agency for Black student participants in a makerspace. What was ultimately uncovered was that the design of the environment was the most important aspect. Things like the type of background music the mentors available to them who had roots in the local community. This approach was a fundamental part of design where you have to make underrepresented students feel that their presence is not only welcome but at the center of the design and creative process that takes place within a makerspace.

One of the first recommendations was to ensure Black mentorship was visible and present to give the participants something to aspire to. The mentors were specifically from the academic and career pathways the students aspired to participate in. We were also intentional in having gender representation within the space so that the Black female participants could feel a sense of connection in a male-dominated space.

What we observed from conversations, journaling, and the project artifacts was that when we created an open, non-competitive environment, the students' anxiety levels decreased, and they felt like there was less likelihood of punitive consequences of iterations of their project. Two students made it clear that at their school, having a finite set of resources did not allow them to prototype as often as they would have liked, and it became a competition for who had the best idea voted on by the group to move on to the prototyping stage.

At the ILLEST Lab, students were encouraged to prototype and not take access to resources as a barrier. What was surprising was asking students to select their projects did not yield a completed design. The trouble from our observations was that the students were not used to having so much freedom and say in their projects. Multiple times, participants would explain that they were happy and welcomed the agency to select their projects. But at the same time, they could not produce a final product.

The researchers concluded that 1) time on task was limited due to the once-a-week nature of the lab, and 2) the students had high expectations of themselves and wanted to impress their mentors. One student expressed that she did not want to disappoint or let down their mentor, so the participant wanted to think of the perfect project to express gratitude. It seemed the anxiety built up from the students' prior interactions in other makerspaces still played a role in how they engaged at the ILLEST Lab. It was as if their unsuccessful participation in other settings still presented a barrier, even in a supportive environment. A recommendation would be for designers of makerspaces to consider participants' anxieties and past traumas when selecting and designing projects. Doing so should help make the students feel empowered. The hope is that this chapter provides nuance when having discussions around the participation of Black students in makerspaces and that at the forefront, creativity and agency are at the center of providing generative opportunities for participants who have been traditionally shut out of STEAM fields.

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Deep Assumptions and Data Ethics in Educational Technology

Greenhalgh, S. P.

Assumptions Data Educational Technology Ethics

Deeper assumptions frequently shape the ways educational technology stakeholders collect and use data. This influence of assumptions on data decisions makes it critical that educational technology stakeholders engage with deeper assumptions as part of ethical considerations; indeed, they are key to ensuring that stakeholders engage with structural issues in education and educational technology rather than use ethical compliance as a superficial nod to questions of justice, harm, and power. In this chapter, I illustrate the relationship between deep assumptions and data ethics by considering assumptions related to four broad questions about the purpose of education, the purpose of educational technology, the determination of quality in educational (technology) research, and who has what say in these domains. Debates about data ethics are often better understood as debates about these

deeper assumptions, which must be surfaced to consider data ethics in our field thoroughly.

Introduction

In the opening chapter of his book *Language and Power*, Fairclough (1989) argued that because language had become increasingly important worldwide, people were not paying it enough attention. In particular, Fairclough sought to draw the reader's attention to two relationships: first, the "extent to which their language… rest[s] on common-sense assumptions " (p. 4), and second, the ways in which those assumptions might reflect undesirable social organizations and power imbalances. As a French teacher turned researcher of data-rich technologies, it is perhaps fitting that my purpose in this chapter is to echo Fairclough's arguments about language in the context of data. That is because data have become increasingly important in educational settings, educational technology stakeholders are not paying them enough attention. Such attention, I suggest, will reveal that the ways that we—and others—approach data represent deeper assumptions about our work that often go unquestioned or unchallenged—but that often create or maintain unjust power relations between involved parties.

To illustrate this point, consider an exchange I once had with the help desk for the Canvas Learning Management System (LMS). I was frustrated with Canvas's use of *cookies*—small chunks of data stored on computers to track internet users—to welcome first-time users of the LMS. Because companies often use cookies for undesirable online surveillance, I use a web browser that blocks most of them. While it was possible to use Canvas without consenting to this particular cookie, it created considerable annoyance—every time I opened Canvas in a new tab, I received a pop-up welcome message, despite the many hours I had logged in the LMS. I explained the situation in pleading tones to the Canvas help team only to receive a discouraging reply: "I totally get that… However, with Canvas being an educational software, it does have to be tracked." I was struck by how this employee described this use of data not as defensible in and of itself but rather as a natural conclusion of how things work: because Canvas is educational software, it must engage in tracking. For this employee, it followed that users like me should consent to that tracking or be prepared to deal with disruptive consequences. This "common-sense assumption" that educational technology must engage in tracking (and is therefore unconditionally justified in doing so) is frighteningly far-reaching—indeed, the employee seemed to overlook that this particular use of cookies was not actually tracking educational performance outcomes. Some data must indeed be collected and analyzed for teaching and learning to happen, but if educational software is therefore given a pass for all forms of tracking, where are the limits for intrusion into personal and private lives?

Throughout this chapter, I elaborate on my argument that the ethical and just collection and use of data in education partly depends on acknowledging, evaluating, and even challenging often-unspoken assumptions about education, educational technology, and research in both of these umbrella disciplines. After establishing the purpose and scope of this chapter, I illustrate how deep assumptions about education inform data ethics by considering four questions:

- What is the purpose of education?
- What is the purpose of educational technology?
- What determines quality in educational (technology) research?
- Who has what say in these domains?

In addressing these questions, my purpose is not to answer them myself but to demonstrate how different answers might change the ethical calculus involved in data decisions in our discipline. Nonetheless, before concluding the chapter, I provide one example of how these questions might inform educational technology stakeholders' ethical decision-making.

Purpose and Scope

In this section, I clarify my intended purpose for this chapter. One genre of papers on data ethics in education is the checklist for ethical data use (e.g., Drachsler & Greller, 2016). However, it is important to emphasize that data-rich technologies raise difficult issues that defy simple approaches (boyd & Crawford, 2012); although a checklist may be genuinely useful, it is important that stakeholders not get locked into a simplistic, rote view of ethical compliance. For example, while compliance with legal and institutional frameworks is important, it does not represent the sum of one's ethical responsibilities (Beardsley et al., 2019; Drachsler & Greller, 2016; Mandinach & Gummer, 2021a). Indeed, stakeholders must recognize ways in which ethical and just action may even stand in tension with those frameworks (Corrin et al., 2019; Fiesler et al., 2020). In this vein, other authors (e.g., Corrin et al., 2019; Hakimi et al., 2021) stop short of specific steps, instead articulating or synthesizing guiding principles that have informed or can inform individual, context-dependent decisions about ethics.

However, some authors argue that ethics may be the wrong focus when making these considerations. For example, Green (2021) suggests that an ethics perspective is incapable of adequately addressing social justice issues related to data-rich technologies and methodologies—and that it even runs the risk of "deploying the language of ethics to resist more structural reforms" (p. 250). boyd and Crawford (2012) complicate things further, suggesting that the mere acceptance of the *big data* phenomenon entails accepting new ethical perspectives, demanding a thorough evaluation of not just ethics *within* data-rich approaches but also the ethics *of* data-rich approaches. In response to these challenges, D'Ignazio and Klein (2020) suggest that a commitment to *data justice*—beyond individual decisions and particular technologies to interrogate deeper, structural issues—is more appropriate than a commitment to *data ethics*. Educational technology needs such interrogation; for example, in a feminist autoethnographic treatment of her experience as an Afro-Latinx woman, Romero-Hall (2022) describes several ways in which the field of educational technology has privileged White, male perspectives at the expense of others (see also, e.g., Donaldson, 2016). Even a deep commitment to ethical decision-making will not necessarily compensate for these structural influences.

Thus, even when I refer to "ethics" in this chapter, I intend to go deeper (and invite my reader to go deeper) than checklists or principles. Nevertheless, although some of my own opinions will surely be clear from my writing, I also stop short of offering a specific theory or framework of justice that should guide our collection and use of data in educational technology. In diverse disciplines—such as our own—Green (2021) argues that perfect consensus is less important than a willingness to surface debates between perspectives that often remain implicit. Therefore, my purpose in this chapter is to illustrate how educational technology stakeholders' unspoken assumptions (and the perspectives and structures they are informed by and inform) guide specific decisions about data. My hope is that readers will respond by not only identifying the ways that their assumptions inform their approach to educational data but also questioning those assumptions in a way that invites further ethical reflection.

Given this purpose, the scope of this chapter is necessarily broad in some ways and necessarily narrow in others. In the first respect, I understand the word *data* broadly—not just as the digital or so-called "big" data that have brought additional prestige to the term (see boyd & Crawford, 2012), but rather as "any type of information that is systematically collected, organized, and analyzed" (D'Ignazio & Klein, 2020, p. 14). Likewise, I follow Molenda (2008) in using the term *educational technology* to refer broadly to many disciplines that are interested in how learning and teaching intersect with technology (compare with Romero-Hall's [2021] similar use of *learning design and technology*). Furthermore, I acknowledge that stakeholders in educational questions of ethics and justice relating to data and technology are not limited to even this broad collection of disciplines. Indeed, to truly consider the deeper, structural issues that I privilege in this chapter, it is necessary to consider questions more traditionally associated with other disciplines related to education.

In the second respect, the breadth and importance of this phenomenon make it impossible to address every possible assumption held by any possible stakeholder—or even to address a single assumption held by a single stakeholder at the level of detail it deserves. I have chosen four broad categories of assumptions that stood out to me as I wrote this chapter, but I am confident many other such categories merit our attention. I begin my description of each category with an example of unethical collection and use of data before describing how stakeholders justified it by underlying assumptions and other assumptions that may also justify the collection and use of data. After addressing each category, I provide an extended example of how identifying and questioning assumptions associated with these categories can inform additional ethical reflection related to educational data. Although an extended example still cannot address all of the ways my central thesis may apply to practice, it will serve as a model for applying these considerations.

What is the Purpose of Education?

Between August 2014 and June 2016, an officer of the Brigham Young University Police Department regularly accessed data from Utah law enforcement agencies to conduct surveillance on students of the private, religious university (Miller, 2019). This access—which nearly led to the Utah Department of Public Safety decertifying BYU Police (Miller, 2021)—was "part of a de facto system, with university employees in several school departments asking him for information and welcoming his reports" (Miller & Alberty, 2021, para. 9). In one case, the data retrieved by BYU Police was used by the associate dean of students (since promoted to dean of students) to ask a woman detailed questions about a sexual assault that she had reported to city—not university—police. The associate dean questioned whether the woman was responsible for the assault and eventually told her she "wasn't welcome to sign up for classes again" (Miller & Alberty, 2021, para. 42).

Understanding assumptions about the purpose of education at BYU lends insight into how such an invasive and degrading use of data could be seen by educators as justified. Like other religious universities, BYU has been keenly aware of tensions between its academic goals and religious convictions throughout its history (Simpson, 2016). In the 1960s, the then-president of the university established a strict student code of conduct (known as the Honor Code) intended to ensure that students met not just academic standards but moral ones, suggesting that the latter were more important for this educational institution (Waterman & Kagel, 1998). Indeed, the previously-described use of police data to press a BYU student about her sexual assault was part of Honor Code-related concerns (Miller & Alberty, 2021); if—as the associate dean appears to have believed—the sexual contact were, in fact consensual, university rules would allow the student to be disciplined independent of academic performance. Thus, this aggressive surveillance of students was influenced by (though not necessarily an inevitable result of) a particular understanding of the purpose of education at this institution.

Less extreme examples also demonstrate the ways in which assumptions about the purpose of education drive the collection and use of data in educational contexts. Speaking broadly, our expectations about what schools, teachers, students, and others should accomplish necessarily inform what data we collect and how we use it. This is largely obvious and often justified; however, because these expectations do not provide any incentives to limit the scope or intensity of such collection and use, even good intentions can inspire ultimately unethical data collection and analysis. Thus, Crooks (2019) describes the definition and measurement of educational outcomes as a driving factor behind "the proliferation of surveillance" (p. 486) in schools. Even when assumptions about the purpose of education are sound, they must be weighed against other ethical considerations instead of used as the sole justification for decisions about data.

However, it is rare that our assumptions about the purpose of education do not merit further scrutiny. Consider, for example, something as seemingly benign as the content areas emphasized in formal curricula, which obviously affect how educational data are collected and how educational technologies are developed and employed. For example, world language education was once considered important enough that standardized testing in New York in the early 20th century included assessments of students' understanding of French, Spanish, and German; in turn, the importance of these data collection mechanisms led to inquiries about whether machines could be developed to score the assessments automatically (Watters, 2021). Likewise, transactions on the modern educational marketplace platform TeachersPayTeachers are dominated by materials related to English Language Arts and Math, reflecting the importance of these subjects in the U.S. Common Core State Standards and related assessments (Shelton et al., 2021). In contrast, because the *baccalauréat* (a French assessment of secondary students) emphasizes philosophy, a tweet sharing philosophy notes to a hashtag related to the 2018 baccalauréat exams received over 23,000 retweets (Greenhalgh, Nnagboro, et al., 2021).

The need for further scrutiny in these examples is not because any of these content areas is unworthy of attention. However, even deeper assumptions about the purpose of education may be present in the emphasis on particular content areas. For example, while mathematics and literacy are undeniably important, Smith and Greenhalgh (2017) contrasted a Deweyan focus on the democratic aims of education with the Common Core State Standards' implicit suggestion that "the primary purpose of education is utilitarian: Students should master the standards so that they are positioned to achieve greater economic success in knowledge-based work" (p. 115). The tension between these two visions of the purpose of education is not new. In the throes of post-Sputnik concerns about education, Dewey's contemporaries criticized his influence on schools, which they suggested were ill-prepared to help the United States compete scientifically with the Soviet Union—another assumption about the purpose of education (Watters, 2021; see also Nichols, 2021).

This is particularly important because an emphasis on certain purposes of education necessarily de-emphasizes others, shaping data collection and use accordingly. Bradbury (2019) describes how an increased emphasis on mathematics and literacy in English early childhood education has drastically increased data collection about young children in England, creating tensions between teachers' obligation to collect data and their ability to build relationships or provide a more holistic education. In contrast, schools across the Channel in France do not collect data related to race and ethnicity because they stand in tension with French ideals of a color-blind Republic (Raveaud, 2008; Simon, 2015). The deliberate decision not to collect this data implicitly de-emphasizes the importance of racial or ethnic educational equity; Cuban (2003) provides a brief U.S. example of this danger, and Watters (2021) makes a similar observation that narratives about educational progress (or the lack thereof) tend to sidestep questions of race. However, the decision to collect data about such disparities is not itself the solution to them: D'Ignazio and Klein (2020) suggest that despite the potential of data to address issues of social justice, even well-intentioned collection of such data can do harm in propping up deficit narratives that "reduce a group or culture to its 'problems,' rather than portraying it with the strengths, creativity, and agency that people from those cultures possess" (p. 58). Indeed, Au (2016) applies this criticism to standardized testing regimes in the United States, arguing that although they are cloaked in superficially anti-racist arguments, they actually exacerbate structural racism by assuming their own objectivity and thereby providing an empirical basis for the argument that "low test scores and the educational failure of working class, children of color is due to their own deficiencies" (p. 46).

One important concern about modern educational technology platforms is that their design and use of data may stand in tension with long-standing Western values of public education, "such as *Bildung*—the ideal to teach children to become not just skilled workers but knowledgeable citizens—and equality" (van Dijck et al., 2018, p. 117). As important as this concern is, it is based on the understanding that these values are indeed held within the broader educational system. The previous paragraphs have demonstrated that other assumptions about the purposes of education are alive and well in the U.S. and other contexts, and this only exacerbates van Dijck and colleagues' concern that assumptions about data and technology determine education values rather than the other way around. For example, Bradbury (2019) speculates that it is in part because it is relatively easy to collect data about mathematics and literacy that these content areas have received so much attention in England—that is, the perceived necessity of data is driving the purposes of education rather than the other way around. Likewise, Corrin and colleagues (2019) note that more adaptive learning platforms are developed for the STEM disciplines (partly because of their relatively well-structured nature) than for other content areas. Therefore, a decision to value adapted and personalized learning may lead to the preference of certain disciplines over others, for knee-jerk practical rather than thoroughly considered philosophical reasons.

What is the Purpose of Educational Technology?

In April 2019, an article in Kentucky's *Lexington Herald-Leader* described how social media monitoring efforts by Fayette County Public Schools (FCPS) helped the district intervene with two students needing help. (Spears, 2019). While the stories celebrated in the article are undeniably positive developments, they also raise questions about the scope and effectiveness of this surveillance. These two interventions were the result of a third-party company's review of over 60,000 social media posts, which flagged 60 posts subjected to further scrutiny by "a team that included mental health and law enforcement staff" (Spears, 2019, para. 1). In short, only one of every 30,000 posts subjected to surveillance warranted intervention. This situation raises questions about the costs to privacy imposed on other people—although the company exclusively surveilled public posts, many internet users "operate in public spaces but maintain strong perceptions or expectations of privacy" (Markham & Buchanan, 2012, p. 6; see also Fiesler & Proferes, 2018; Gilbert et al., 2021). Furthermore, the article mentions (almost as an aside) that one of the two people who received help was no longer an FCPS student but was attending college outside of Kentucky; how far did the scope of this surveillance reach in the name of helping local students?

A particular understanding of the purposes of educational technology drives this surveillance. As reported in the article, the monitoring efforts were part of a broader response to safety concerns over the previous academic year. However, this does not dismiss concerns voiced by the Electronic Frontier Foundation (among others) that "a growing number of schools across the country [are] conducting mass privacy violations of kids in the name of 'safety'" (Wang & Gebhart, 2020, para. 1). Indeed, the social media monitoring contracted by FCPS is not dissimilar to efforts by other companies to use social media data to surveil Black Lives Matter protests in cooperation with law enforcement agencies (e.g., Biddle, 2020).

Although this example compellingly demonstrates how assumptions about the purpose of educational technology shape data collection and use, it may also invite an objection that should be addressed before discussing this subject further. Watters (2018) noted that proponents of *educational technology* are unlikely to see safety-oriented technologies like metal detectors, school shooting simulators, and social media surveillance software as falling under this category. Instead, educational technology's purpose is understood to be to advance (or even revolutionize) teaching and learning. Technologies like social media surveillance software are dismissed as irrelevant to our field because they do not fit neatly into this narrative. Nevertheless, persistent concerns about whether educational technologies achieve this purpose call into question the appropriateness of this assumption; research over the years has repeatedly questioned whether advancements in technology have fundamentally changed the ways teaching and learning happen (e.g., Cuban, 2003; Crooks, 2019). Indeed, the same logic also applies to less-obvious educational technologies: The 2022 school shooting in Uvalde, Texas, has invited scrutiny about whether school safety technologies work in the first place, raising the possibility that they merely serve as expensive “security theater” (e.g., Faife, 2022; Gordon & Rose, 2022; Rose, 2022). If stakeholders’ assumptions about educational technology’s purpose—and success—are invalid, this obviously raises questions about whether the collection and analysis of data about students and other stakeholders are justified.

Yet, even when these assumptions are valid, they risk validating the use of educational technologies without considering data ethics and justice. To illustrate this point, consider Cuban’s (1986) examination of film, radio, and television as educational technologies. Each was held to have considerable promise and was introduced with fanfare, only to largely go unused (see Molenda, 2008, for a similar discussion). Cuban (2003) later suggested that personal computers followed a similar pattern. However, contemporary educational technologies differ from their predecessors in at least two respects. First, although data collection has long been a feature of educational technologies (see Watters, 2021), contemporary technologies allow for collecting more kinds of data at greater volumes (Corrin et al., 2019; Mandinach & Gummer, 2021b). Second, if previous generations of educational technology ended up going largely unused, contemporary educational technologies are pervasive. For example, the COVID-19 pandemic has required the use of educational technology at a scale never before seen; this not only increases the importance of validating claims and assumptions about technologies (Reeves & Lin, 2020) but also exposes students to more surveillance than ever before (Hankerson et al., 2021).

The combination of these two differences suggests that data collection and use in educational contexts exist at a greater scale than ever before. Put simply, contemporary educational technologies may allow for the continuing collection of data about students rather than targeted and constrained efforts (Beardsley et al., 2019). Because students and other stakeholders’ “sharing of personal data carries with it risks.” (Beardsley et al., 2019, p. 1019), this scale of sharing—which is more often compelled than volunteered—increases the scale of associated risks (e.g., the virtual impossibility of anonymizing data; Drachsler & Greller, 2016). This is especially so given that advancements in data collection often outpace the development of legal and ethical frameworks for data collection (Corrin et al., 2019). Furthermore, while it is true that some of these “increasing risks” are related to “inadvertent and innocent misuses of data” (Mandinach and Gummer, 2021b, p. viii), it would be unwise to ignore risks associated with bad (or at least self-interested) actors. Consider the example of a graduate program that encourages or requires its students to engage with each other and their instructors on Twitter. While this could serve genuinely important learning purposes (Greenhalgh et al., 2016), there is no denying that such a requirement supports social media platforms’ use of digital labor, “in which value is created from the unpaid action of online audiences” (Selwyn, 2019, p. 53; see also D’Ignazio & Klein, 2020; Drachsler & Greller, 2016; Krutka et al., 2019).

Thus, the risk in adopting contemporary technologies in the hope of improving education is no longer just that today's optimism may one day look "just as silly to people 50 years from now" as past hyperbolic promises look to us today (Mishra et al., 2009, p. 49). Rather, even if today's optimism is warranted, it may come at an ethical cost that is not. This realization must lead us to interrogate the purposes we assign to educational technology and weigh them against the costs imposed by contemporary technologies. Adopting technology may indeed lead to improvements in teaching and learning; however, we must also consider the possibilities that—and perils if—stakeholders merely "use the rhetoric of technological progress to establish legitimacy" (Cuban, 2003, p. 159). Student accountability is important, but we must also consider how learning management systems (LMSs) allow us to monitor students in invasive ways that would be unimaginable in a face-to-face context. Building on an example from Eaton (2021), it would be absurd and unacceptable for a university instructor to sit in their student's dorm room, looking over their shoulder and timing how long they spend reading each page in their textbook. Yet, this is a commonly included and widely valued feature of LMSs. Student safety must be a priority, but are there initiatives other than social media surveillance (led by stakeholders other than education professionals) to ensure that guns aren't brought into the classroom? Whatever the technology and whatever its purpose, we must consider "ethical and privacy values on the same level as functional requirements" (Drachsler & Greller, 2016, p. 8).

What Determines Quality in Educational (Technology) Research?

During the Fall 2021 semester, IT and facilities units at George Washington (GW) University began researching how community members used campus buildings. While this could conceivably be measured in many ways, GW employees chose to use "locational data from… WiFi access points across GW campuses" (Wrighton, 2022, para. 2). Because many students' devices were registered with the university to access WiFi, employees saw an opportunity for examining building use data through various demographic lenses; this locational data was therefore combined with "additional de-identified student data" (para. 2). In February 2022, the new president of the university (who had only assumed that role a month before) apologized to the university population that they had not been informed of the research ahead of time; in doing so, he acknowledged that the technical infrastructure used for this project could potentially have tracked members of the campus community on an individual basis (Beals, 2022).

This threat to individuals' privacy results from overly narrow assumptions about what determines quality in research. Research in education contexts can be understood as "a form of humanistic inquiry grounded in argument from evidence" (Penuel & Frank, 2016, p. 16), so it is clear that *some good data are necessary* for quality research. Even the quality of a "conceptual" chapter like this one depends on its ability to build on and correspond with empirical observations. Nonetheless, a legitimate empirical commitment can sometimes be narrowed into a more problematic assumption that *all data is necessarily good* and that the use of empirical data is the sole determining measure of research quality. It is undeniable that the research project described above needed some data, and the data were indeed both readily available and well-suited to answer the question; yet, as Heath (2021) writes, the "mere availability of data does not confer ethical collection of data" (p. 334).

It is important to acknowledge that it is normal for researchers to consider new forms of data as part of their commitment to empiricism and quality research. Throughout the history of research, data has typically required considerable effort to collect (boyd & Crawford, 2012). Therefore, we should not be surprised that educational technology scholars have been eager to explore new data sources (Rosenberg et al., 2021). Indeed, technologies such as the internet (Kimmons & Veletisanos, 2018), social media platforms (Greenhalgh et al., 2021), and learning management systems "generate user data untiringly" (Romero-Hall et al., 2021, p. 216), drastically simplifying data collection and leading to the application of new methodologies designed to take advantage of large amounts of data (e.g., Baker & Siemens, 2014; Jin, 2021; Rosenberg et al., 2021).

These new methods and methodologies build admirably on our field's commitment to empiricism—however, they risk adopting other assumptions that may misshape our understanding of quality research. For example, while it is true that a major obstacle to properly using these methods is an absence of corresponding technical training (Kimmons & Veletsianos, 2018), it is critical to note that lack of opportunity does not affect all populations equally. For example, D'Ignazio and Klein (2020) argue that expertise in data science (among other fields) is often formally defined in terms of credentials, affiliations, or technical training that men are more likely to have access to—despite the fact that self-taught women helped lay the foundation for the field to begin with. Thus, the use of these methodologies in education contexts will only be inclusive if training and membership in these communities are also inclusive (Rosenberg et al., 2021). Given the dominance of masculine perspectives in educational technology independent of these methods (e.g., Romero-Hall, 2022), these necessary course corrections may require considerable effort. However, failure to do so risks the perpetuation of data-rich projects in education that are "characterized by masculinist, totalizing fantasies of world domination as enacted through data capture and analysis" (D'Ignazio & Klein, 2020, p. 151).

Other troubling assumptions about quality research stem from the association of the eugenics movement with quantitative research and its application in education. Several early pioneers of statistical analysis were eugenicists (Saltz & Stanton, 2018), and it is impossible to separate widely-accepted ideas such as correlation (Shaffer, 2017) and data cleaning (D'Ignazio & Klein, 2020) from their development in and for projects underpinned by racist and social Darwinist assumptions. This troubled history does not necessarily invalidate data-rich or any other quantitative research. However, it does underline the importance of critically reflecting on associated assumptions to determine where they might stand in tension with important ethical commitments. This is particularly true in the context of educational research, where eugenicist ideas played a role in the development of educational psychology constructs such as IQ and in assessment instruments such as standardized tests, which were hoped by some to compellingly shore up White intellectual supremacy (Au, 2016; Kendi, 2017).

It must also not be assumed that data-rich research is necessarily quality research. While this might seem obvious, such an assumption is implicit in much of the discourse about these methods. Indeed, D'Ignazio and Klein (2020) argue that the 17th-century coining of the term *data* was itself a rhetorical flourish meant to convey trustworthiness: “Identifying information as data… converted otherwise debatable information into the solid basis for subsequent claims” (p. 10). This rhetorical force arguably extends to the term *data science* and its application in educational contexts. If the constituent parts of this term are taken literally, it is difficult (if not impossible) to identify a science that does not employ data (D’Ignazio & Klein, 2020; Shaffer, 2017)—why, then, do *these* methodologies deserve this label and its glowing reputation? One strong candidate for setting apart data science and associated methodologies is their ability to consider large data sets; however, Saltz and Stanton (2018) problematize the novelty of this distinction as well, returning us to the original concern. Furthermore, many also assume big data to be inherently high-quality—to the extent that boyd and Crawford (2012) argue that the phenomenon is defined in part by a mythology of “truth, objectivity, and accuracy” (p. 663). While it is true that large datasets can often be helpful, it is equally true that some “projects ignore context, fetishize size, and inflate their technical and scientific capabilities” (D’Ignazio & Klein, 2020, p. 151).

The key to deflating erroneous assumptions about big data—and holding appropriate assumptions about the importance of empiricism in check—is to emphasize that data are inherently non-objective. While some stakeholders may tacitly acknowledge this, there is reason to believe that the objectivity of data is the prevailing assumption in our discipline. Consider, for example, the authority that educational technology stakeholders lend to LMS data: Corrin and colleagues (2019) note that students may instinctively trust—rather than interrogate—learning analytics that have institutional approval, and the Electronic Frontier Foundation points to teachers and institutions using data for purposes that LMS developers have not intended or endorsed (Budington, 2021). Indeed, quantitative techniques and quantified data are particularly likely to be seen as (more) objective and, therefore, of higher quality, despite many debates among educational technology stakeholders on this subject over the years (e.g., Boekweg et al., 2021; Romero-Hall, 2021). In contrast, Shaffer (2017) suggests that quantitative modeling may require more scrutiny than qualitative research—not because it is inherently inferior but because it is more often the basis for decisions. Such scrutiny is based on the understanding that despite countless assertions to the contrary, “data cannot speak for themselves, so they must be made to speak” (Crooks, 2019, p. 485; see also boyd & Crawford, 2012). Campos and colleagues (2021) describe how teachers’ making sense of LMS data is influenced by individuals’ emotions, analyses, and intentions—not to mention collective, organizational, and institutional factors. On a similar note, Crooks (2019) describes how school administrators made a sudden shift in their interpretation of standardized testing data in response to labor disputes at the school: “the relevant data did not change, rather what these data were allowed to represent changed and did so rather abruptly” (p. 492).

Beyond a general and foundational non-objectivity, we must also consider the constraints and limitations of the technologies we use to provide these novel data. The design and governance of social media platforms influence which platforms researchers collect data from (Tufecki, 2014) and what phenomena they study on the platform (boyd & Crawford, 2012). Some kinds of data are easier to collect through LMSs than others (Corrin et al., 2019), and Jin (2021) raises the possibility that available LMS data may not perfectly align with the theoretical constructs researchers are investigating. Furthermore, digital data “dynamically order and reorder the world” (Crooks, 2019, p. 495) rather than merely capture reality. Facebook (or Twitter) data neatly quantify likability for internal—and scholarly—

consideration, but van Dijck (2013) problematizes the validity of those measures, drawing particular attention to how corporate values shape platforms' understanding of these constructs. Learning Management Systems offer massive amounts of data about student activity, but by privileging quantitative and categorical data and presenting them in carefully arranged and neatly structured formats, they may "undermine and erase" the messy complexity that defines "humans and learning" (Eaton, 2021, para. 9). These limitations may not challenge our assumptions about the importance of data for quality research, but they should invite consideration about what data we assume to be of sufficient quality.

Who Has What Say in These Domains?

For over 20 years, the Pasco County Sheriff's Office in Florida accessed data collected by county schools and combined the data with records from other public agencies to produce "a secret list of kids it thinks could 'fall into a life of crime'" (Bedi & McGrory, 2020, para. 1). This collection and use of data is based on several dubious assumptions, including that one purpose of educational data is to engage in predictive policing and that school grades are an objective measure of intelligence. However, I include the story in this section to draw attention to two other controversial aspects which led to the dismantling of the program six months later (Associated Press, 2021): first, the sharing of educational data with a law enforcement agency, a move which experts described as "highly unusual" (Bedi & McGrory, 2020, para. 12); second, the fact that students and other stakeholders had no say in—because they were not informed of—the development and use of this list.

This kind of data misuse is based on assumptions about who has what say in education, educational technology, and research in these contexts. Throughout this chapter, I have referred generally to "educational technology stakeholders" without specifically considering who these stakeholders are or should be. The purpose of this section is to underline the importance of these questions, although (as with previous sections) I stop short of trying to answer them. While these questions could be considered in many ways, I focus particularly on how they relate to our use of data. Comparing digital data to oil has become somewhat of a cliché in the popular discourse because both have had a revolutionary impact on the world. However, D'Ignazio and Klein (2020) note that this metaphor draws (perhaps unintended) attention to how the changes brought about by data are not always for the better. Not only are the "power and profit" associated with data distributed unevenly (i.e., with data barons succeeding oil barons), but the metaphor also "helps highlight the exploitative dimensions of extracting data from their source—people—as well as their ecological cost" (p. 45). Different stakeholders may have conflicting, equally legitimate perspectives (and corresponding ethical interpretations; Corrin et al., 2019), so care must be taken to ensure the just treatment of all stakeholders.

Indeed, Slade and Prinsloo (2013) argue that the ethical application of learning analytics depends on benefiting all parties. Learning analytics is usually (perhaps even always) deployed under the assumption that all parties will benefit, but careful consideration is important. For example, one application of learning analytics allows instructors and institutions to intervene when a model predicts that a student may be about to drop a course or leave a university (Corrin et al., 2019). While intended to benefit students, U.S. institutions of higher education may also have self-serving reasons for wanting to prevent attrition, including retaining tuition dollars and improving performance metrics—are there cases where institutions' priorities stand in tension with students'? Moreover, if so, whose priorities do learning analytics serve? Corrin and colleagues (2019) also draw attention to ways other stakeholders might benefit from student data that raise ethical tensions: Professors may use the data to advance their research careers, and educational technology companies may use it to improve their products. This latter point is particularly important given that products "offered by commercial vendors obviously come at a cost" even though their effectiveness has not yet been proven (p. 16). Going further, Eaton (2021) asks why Learning Management Systems collect fine-grained student data (such as time spent taking a quiz) for instructors and institutions but not fine-grained instructor and institution data (such as time spent grading a quiz) for students; there are no technical obstacles to sharing the data both ways, revealing the role of underlying assumptions about the relative importance of various parties. Indeed, Doyle (2021)—writing from a student perspective—notes that she and her peers do not always have a choice to resist data collection they object to on privacy grounds.

On a similar note, it is important to understand the way that the act of data collection shifts agency from some stakeholders to others. High-level stakeholders have always used data to shape educational policy (Nichols, 2021), and digital data and associated tools are playing a growing role in shaping how teaching and learning happen (Williamson 2016a, 2016b). To a certain extent, this is necessary and good, but data collection can also be motivated by an implicit distrust of teachers and a corresponding shift of agency and power to other stakeholders. This was true of the push for curriculum standards and corresponding testing in the U.S. in the early 20th century (Watters, 2021) and has continued through the push for so-called accountability in U.S. federal policy, which Nichols (2021) describes as "a *specific mandate* for how achievement data should be used [that] has had deleterious effects on teacher practices and student outcomes" (p. 82). "Educators are literally drowning in data" (Mandinach & Gummer, 2021b, p. viii), and in some cases, their professionalism is defined in terms of their ability to produce data so that others may evaluate outcomes (Bradbury, 2019; see also Eaton, 2021) rather than their ability to evaluate outcomes on their own.

We must also consider who has what say in educational (technology) research. These considerations can become highly complex in internet and social media research (e.g., Greenhalgh, Koehler, et al., 2021; Kimmons & Veletsianos, 2018). For example, the public nature of these data means that research of this type in educational technology and other disciplines is often not subject to ethical review, creating obvious opportunities for misuse. However, there is little consensus among professionals engaged in ethical review about what that process should look like for this kind of research (Vitak et al., 2017), and failure to understand "the distinctive characteristics of internet research" (franzke et al., 2019, p. 13) may lead to overly conservative approaches to ethical review. Likewise, informed consent is typically not required when research data is public. Because participants have expressed general discomfort with the possibility of researchers' collecting and analyzing their social media data (Fiesler & Proferes, 2018; Gilbert et al., 2021), educational technology researchers should consider whether and how it would be appropriate to obtain participants' consent (Proferes and Walker [2020] discuss these considerations at length).

Nevertheless, there may be cases where it would be more appropriate not to obtain consent. For example, teachers sympathetic to the far right (see Greenhalgh et al., 2021) may be unlikely to permit researchers (who are often perceived as left-wing) to study their public social media posts. The role of private social media companies must also be considered here; these companies are under no obligation to share their data with researchers (boyd & Crawford, 2012) and may use Terms of Service agreements and other policies to restrict researchers from collecting data from their platforms. Although researchers should not violate these policies willy-nilly, there may be cases where ethical research requires their violation (Fiesler et al., 2020); for example, if an influential online educational marketplace forbade automated data collection, its very influence might nonetheless justify such a collection in the name of scholarly scrutiny (e.g., Aguilar et al., 2022; Shelton et al., 2021).

Of course, ensuring that the appropriate stakeholders have a say in how data are used in educational contexts depends on their awareness of how data—and associated technologies—are being used. Traditional, perfunctory approaches to obtaining consent for data collection are often insufficient, especially when people are not fully aware of the risks associated with that consent (Beardsley et al., 2019, p. 1031). Modern data platforms are often highly complex, making it difficult for users to understand what that collection and use look like (Drachsler & Greller, 2016; Proferes, 2017). Thus, Corrin and colleagues (2019) emphasize that stakeholders cannot truly consent to the collection and use of data unless those leading the collection are “open and transparent” about how they do so (p. 10).

Questioning Assumptions and Ethical Reflection: An Extended Example

In this final section, I provide an extended example of how identifying and questioning assumptions associated with the categories above can inform additional ethical reflection when making decisions related to educational data. This example is necessarily narrow in scope; as I have previously argued, it is impossible to address every possible implication of all possible assumptions held by any possible stakeholder—or even to address in appropriate detail a single implication of a single assumption held by a single stakeholder. Furthermore, I have deliberately decided to focus this entire section on a single hypothetical decision by a single hypothetical stakeholder; while this allows me to demonstrate how a single decision may be influenced differently by different assumptions, it also further limits the scope of this example.

More specifically, I consider a hypothetical scenario in which an American high school French teacher is considering adopting the ClassDojo app in their classroom. This app has many features, but this teacher is specifically considering its use for behavior management. They are relatively new at their job and are facing obstacles related to disruptive classroom behavior, so they are interested in the app's ability to measure classroom behavior by awarding and deducting points to and from students. This teacher knows that ClassDojo has long been controversial—especially regarding data privacy (e.g., Singer, 2014; Williamson, 2017)—and understands that this decision has ethical dimensions. However, while they take for granted that there are ethical costs to collecting data on their students through ClassDojo, they are open to the possibility that the value of the data collected through ClassDojo could potentially outweigh the costs of privacy violations. In the following sections, I revisit each category of assumptions described above to demonstrate how interrogating these assumptions might affect this teacher's ethical reflection.

What is the Purpose of Education?

In reflecting on whether or not to use ClassDojo, this French teacher asks how important behavior management is among all their professional responsibilities. They are genuinely frustrated by the disruptive behavior in their classroom, and ClassDojo offers a potential solution to this problem. However, this teacher believes that an important purpose of their job is to prepare their high school students to become adult citizens in a democratic society, and they desperately hope that adults' behavior is based on prosocial commitment rather than a gamified point count. The ethical cost of ClassDojo data collection seems higher when the app's design stands in tension with this professional commitment. In contrast, however, this teacher is also committed to establishing an immersion classroom where they and their students only speak French for long periods. They know from their experience as a French student that their students will struggle with this, and they have fond memories of classes they took where students tried to go as long as possible without getting "strikes" for speaking English. ClassDojo might support this particular purpose of the French classroom enough to outweigh ethical concerns.

What is the Purpose of Educational Technology?

In continuing their consideration, this teacher also asks what the role of educational technology in their classroom is. Like many teachers-in-training, they learned that educational technology is only worth adopting when it distinctly enhances teaching or improves learning. Thinking back to the "strike system" in some of the immersive French classes they took, they feel confident that the system helped them break the habit of resorting to English instead of pushing the limits of their French. The French teacher considers that ClassDojo might be useful for the same purpose. After all, if the purpose of educational technology is to improve learning, and if ClassDojo could improve learning, that might be enough to dismiss ethical concerns about the app's data collection. However, it also occurs to them that the teachers and professors who issued strikes never used an app, instead keeping tallies in a notebook or on a whiteboard. This changes the calculation: If a notebook or whiteboard improves learning in the same way (the assumed measure of success of any educational technology) but without the cost to student privacy, they concede that it must be the better option from an ethical point of view.

What Determines Quality in Educational (Technology) Research?

This teacher then continues their reflection by asking whether the data provided by ClassDojo is the kind of data they seek. Although their assumptions about the purpose of their teaching stand in tension with using ClassDojo as a behavior management tool, this—understandably!—has not entirely dismissed their frustration about their students' disruptive behavior. Quantifying students' behavior and communicating those quantifications to parents is an attractive possibility. However, to do so involves figuring out which behaviors merit the awarding of a point and which merit the deducting of a point—and this proves harder than expected for the French teacher. They are unsure they can determine which behaviors are equal in point value and not confident that they would be perfectly consistent across students (including across races, genders, and other demographic categories) in awarding and deducting those points. A point value seems like a simple, objective measure of behavior, but some students bother this teacher more than others. When pressed, they can't defend their initial assumption that ClassDojo points would be a quality, consistent measure of behavior.

Who Has What Say in These Domains?

The French teacher is making this decision about ClassDojo independently, but they must still navigate assumptions about who gets what say in this decision. For example, this teacher's concerns about the app (on data privacy grounds) implies a resistance to the ClassDojo company's assumption that they have a right to collect—and presumably, analyze—data about students in exchange for providing services to classrooms. The teacher may also have to consider whether their advanced students would prefer using an app than a whiteboard or a notebook to manage the "strike system" for not speaking English in class. They may be more likely to adopt the app if they assume that students have a right to determine the educational technologies they use—and are mature enough to consider some of the ethical risks involved. Conversely, if they assumed they had the sole right or responsibility to determine which technologies are used in their classroom, their students' feelings about ClassDojo would become less relevant to this ethical decision. On a related note, it is possible that their school—or a local, regional, or national educational or legislative body—would make the decision about ClassDojo for them, either mandating or forbidding its use based on the assumption that they better understand the benefits and risks involved.

Conclusion

Throughout this chapter, I have demonstrated how our assumptions about education, educational technology, research, and stakeholders in these pursuits shape our collection and use of data. It follows, therefore, that questions of ethics and justice as they apply to data are not limited to the data themselves. Rather, data misuse can be motivated by deeper assumptions, and debates about data ethics are often better understood as debates about deeper issues. Further complicating this issue, few of the assumptions that I have considered in this chapter are inherently wrong: From my perspective, at least, developing mastery of mathematics and literacy *is* an important part of education, technology *does* sometimes improve the processes of learning and teaching, collecting data *is* a necessary part of research, and policymakers *can* use data to improve educational systems. However, the collection and use of data are often justified on the basis of these assumptions alone, without critically examining them or holding them in tension with other guiding beliefs. For example, we would benefit from asking what other content areas are important, what other technologies are used in educational settings, what kinds of data are valued in education research, and what limits should be placed on policymakers' influence in the classroom.

Likewise, even after critical examination, all of these assumptions must stand alongside—rather than override—assumptions about stakeholders' dignity, agency, and privacy.

Many of these considerations are typically seen as outside the realm of educational technology, but they are not less important for that. I do not wish to dismiss the expertise built up within the more traditional boundaries of our discipline, nor would I dare suggest that we do not need to consult stakeholders in other disciplines who are more used to thinking these questions through. Nonetheless, just as the ethical and just use of data in educational technology contexts is not merely about data, it must not be informed only by established and uncontested ideas within our field. Indeed, over 35 years ago, Mason (1986) described four fundamental "ethical issues of the information age" that overlap considerably with many of the considerations I have described here. These issues have only become more pressing in the decades since, and if we have not fully grappled with them, it is perhaps because we have been overly narrow in our concerns. To ensure the ethical use of data in educational technology, we must be willing to explore widely and dig deep.

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Trade-offs in a New Instructional Design for Online Distance Learning: Home-supported Time on Task Versus Autonomy

Scholes, V.

Distance Education Distance Learning Ethics
Instructional Design Online

This chapter outlines a novel instructional design for distance education and explores its likely effects, including ethical impacts, for adult learners. The instructional design has adult distance learners nominate two learning supporters from their 'home' environment, such as family or friends. The teacher or facilitator role pivots from focusing on the learner toward guiding the nominated home-based supporters to support the learner. In turn, adult learners engage in some teaching of course concepts to their home-based family or friend supporters. Underlying this instructional design is a rejection of the idea of an independent adult learner in favour of seeing the

learner as an interdependent person. The 'home-support' approach is rooted in the value of reciprocity. It addresses a key problem for adults learning in an online distance context: difficulty in achieving time on task. However, it carries risks for the learner, involving access, equity and autonomy. This chapter discusses these ethical concerns and recommends avenues to mitigate the risks.

Introduction

Adults who study distance education courses online often do so because of the flexibility these courses offer. There is usually no requirement to attend a class at a set place or online class meetings at set times. Much of the online distance education journey can be self-paced rather than designed to suit the timings of lecturers or peers, and this 'asynchronous' aspect of distance learning is part of its appeal for adult learners with busy lives. However, the lack of requirement for 'real-time' human interaction is also a potential barrier to motivation and the cognitive reach of distance education. This chapter outlines the problem and proposes a novel solution. I argue that designers of online distance learning for adults should consider the potential benefits of recruiting people from the adult learner's 'home' environment to support their learning. My proposal positions adult distance learners as interdependent rather than independent individuals, taking a strengths-based perspective on support people nominated by adult learners from their 'home' environments.[1] I discuss some key ethical concerns arising from this novel instructional design approach, including issues of access and equity and impacts on autonomy. This chapter challenges and defends the concept of a 'home' support approach for online distance adult learners.

Methodology

I start from the basis set out by Moore and Ellsworth, with reference to Barbour, that "… technical design cannot be meaningfully developed separate from human context" (Moore & Ellsworth, 2014, Social Responsibility section). An examination of the human context of online adult distance learners informs the design of the 'home support' approach I propose. I aim to explore and argue a rationale for field-testing this approach. The argument is largely conceptual in nature but draws on research in adult distance education to support key empirical claims. More than two decades of teaching and designing online distance courses for adults has helped shape the view I present of the circumstances of adult distance learners, and informs my reasoning. In the framework of moral dimensions Osguthorpe et al. (2018) applied to instructional design practice, I aim to exercise the 'conscience of imagination': envisioning new ways of doing things, alternative approaches not previously considered, and improving learning and teaching. My disciplinary background in philosophical ethics has also influenced my conclusions. I will explain how the ‘home’ support approach for online distance adult learners finds a grounding in the ethical theories of care ethics and virtue ethics.

The Context of Online Adult Distance Education

A discussion of online distance education for adults needs some initial definitions. In particular, it is important to clarify how online distance education differs from the online education offered as an adjunct (or accompaniment) to conventional classroom-based education. Sikander (2019) suggests distance education is characterised by the “separation of teacher and learner in time and/or place for most part [sic] of the educational transaction, mediated by technology for delivery of learning content … ” (p. 68). Conventional classroom-based education can use online technology to deliver learning, and the online learning may involve the physical separation of teachers and learners. However, this education is not planned around separating teachers and learners in time. Instead, in conventional classroom education, learners are progressed through a course with their peers as a class, according to the teacher's timetable (Nichols, 2022). In the tradition of distance education, however, “the learning experience is based on asynchronicity” (Nichols, 2022, pp.5-6). A real-time connection with teachers or peers is seen by distance education scholars as optional if it would interfere with distance education’s traditional aims of “accessibility, cost-effectiveness, flexibility, openness, and scalability” (Nichols, 2022, p.3). Planning for teachers and learners to operate on separate timetables allows more flexibility for learners: they can study at their own pace without interrupting or planning their study around the availability of others. Asynchronicity is a defining feature of online distance education that distinguishes it from the online education that takes place within the paradigm of conventional classroom education.

Many adult learners have busy lives with responsibilities toward other people; a key reason adult learners choose distance learning is the flexibility it offers them to manage studies alongside their other work (Berry & Hughes, 2020; Hodges et al., 2020; Kauffman, 2015; Brown, 2012; Hannay & Newvine, 2006). As noted, the flexibility comes through the asynchronous nature of distance education that allows ‘self-paced’ learning. Self-paced describes “learning environments that enable individuals to study online in their own time and at their own pace, from their own location” (Moore et al., 2011, p. 131). Flexibility is a double-edged sword for learners, as it can make it harder to find and sustain quality time for their study (Melkun, 2012; Romero & Barberà, 2011). Berry and Hughes (2020, p. 100) note, "Many online students are doing their education online because of full-time work or other obligations including family, and … lack of quality time for school and study is a major concern for many.” This is an important consideration as indicators of learner success emphasise the quality time they spend on their study tasks and the importance of quality study tasks (Lee, 2018; Chen & Guthrie, 2019).

Comparing the traditional classroom instructional environment with the environment for adult distance learners, it is easy to see why the latter might struggle with achieving ‘time on task'. In classroom-based learning, classes are scheduled at set times on set days in a set place. Classes have a teacher upfront and peers learning alongside. With distance education, however, there is usually no requirement to attend class on a set day at a set time. The distance instructional environment does not typically come with a real-time teacher in front of a learner or peers simultaneously present alongside the learner. Lacking a synchronous class setting with a teacher and peers, distance learners lack social encouragement to focus on their studies at a set time for a set time length. By contrast, the design of instructional environments that use a physical classroom setting helps learners manage their time toward their studies (Brown, 2012, p.41). Time management is a primary driver of academic success for online adult learners (Berry & Hughes, 2020; Broadbent & Poon, 2015; Capra, 2015; Lee, 2018). Melkun (2012, p33) notes that these learners "typically work full-time and struggle to balance competing priorities". Competing demands on one's time is one of the key factors leading to dropout in online courses (Hew & Cheung, 2014; Lee, 2018; Kim & Frick, 2011). Understanding the different environments for online adult distance learners helps us make sense of the lower completion rate for many courses (Ragusa & Crampton, 2018; Brown, 2012).

Instructional design aims to make the online course environment engaging for learners, drawing on best practice models. Designers should draw from models that "anchor student interaction in the instructional objectives and strategies that create, support and enhance learning environments" (Abrami et al., 2011, p88). However, learners need to enter the online learning environment and be in an appropriate psychological state to be able to be engaged. Instructional designers can provide a course timetable, including timely electronic notifications to learners with reminders of course deadlines and encouragement to study. These do not bring the same social support to study as synchronous classes. Synchronous classes pull in the learner at a particular time and fill the learner's environment with people who can support their study at that time, such as teachers, tutors, or other learners. By contrast, the asynchronous learning environment for adult distance students is filled with competing priorities and demands on their time – paid work, housework, care for children or aging parents – around which they need to try to fit in some study. The asynchronous learning environment for online adult distance learners offers much more flexibility but much less social support for engaging in study than synchronous learning.

Do instructional design models (hereafter ID models) address the different environments adult distance learners face? Yes and no. I will follow Dousay (2018) in considering ADDIE as an overarching instructional design process enacted through various models. Well-known ID models such as the Dick and Carey Model, ASSURE, or the Kemp Design Model typically require an initial analysis of the learners early in the process. This analysis should identify the learner characteristics, and for adult distance learners, this would include a busy adult life and need for flexibility. Instructional strategies can be designed with this in mind; for example, highlighting the most relevant parts of resources for learners to focus on and flexibility around assessment due dates. However, the models have neither an explicit nor implied requirement to analyse how conducive the learner's general environment is to study. These models thus imply, through omission, that learners' extramural lives are peripheral to the overall design process.

Established ID models that focus more closely on instruction, such as ARCS-V, Merrill's First Principles of Instruction or Gagne's 9 Events of Instruction, have steps in their design processes that connect instruction with learners’ extramural lives. For example, the models may require or encourage learners to connect ideas with their own experiences, or apply a piece of learning in their workplace to understand and integrate new knowledge into their lives. However, if this is the extent to which they make use of features of learners’ extramural lives, these models imply that learners’ extramural lives are, at best, ancillary parts of the learning process. This perspective is not unusual in the analysis of online learning. For example, Bernard et al. (2009) and Abrami et al. (2011) distinguish three types of interactions as relevant for online learners: student-student, student-teacher, and student-content. Belderrain (2008), drawing on others’ work, includes a fourth type: student-interface. Note that an interaction of student-home environment is not envisioned. It seems the interactions that online learners have with people in their ‘life’ environment do not fall in the ambit of consideration for online distance education.

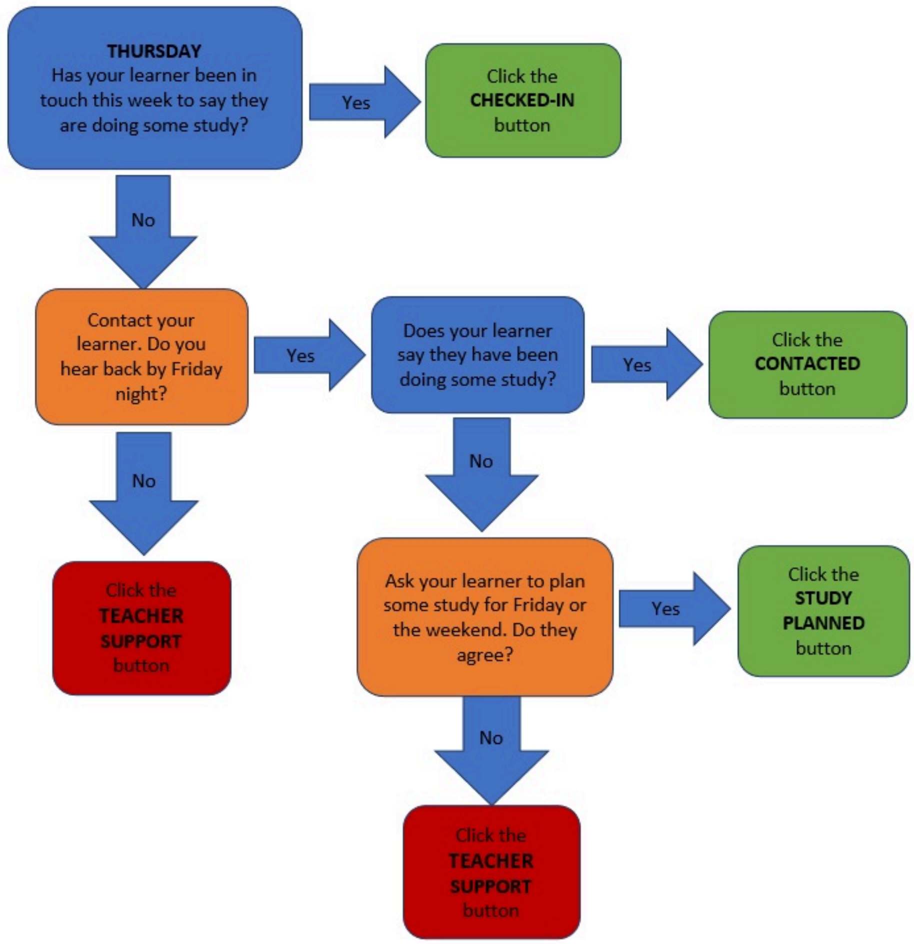
The proposed 'home support' approach

Consider the concept of an instructional design for adult distance learners that takes account of the learning potential of the ‘life’ environment in which they learn – not just the online course space. In this model, adult learners nominate two people from amongst their family or friends to be their ‘home supporters’. The role of home supporters is to help prompt or facilitate more effective ‘time on task’ for the learner. Home supporters are not expected to explain course content or assess course work; instead, they check in with the learner about the learner’s progress in the course. They are there to offer a sympathetic sounding board for the learner’s views on managing study time, what support they need, and how they (the learner) might secure this. In return, adult distance learners share part of what they are learning with their home supporters. Teachers or facilitators monitor overall progress, help home supporters with any issues in their support role, and help the adult learners with course content in the usual way.

In the 'home support' instructional design, the online distance course is structured to facilitate this approach. Automated teacher responses are pre-programmed for all online learning activities. This strategy frees the teacher or facilitator to operate at a monitoring level that is a step up from the detailed content. Thus, the teacher or facilitator role pivots from focusing on the online learner to guiding the nominated family or friends to support the adult learner. Communications between teachers, home supporters, and adult learners are mediated by agreed communication technologies (for example, emails, texts, and social media messaging). These communications follow an agreed plan that combines a timetable and a decision-path flowchart, so all participants know what to expect when and the steps to take when things are not going to plan (see Fig. 1). Activities are developed that empower the learner to teach, or share, some course concepts with their home supporters. This sharing of knowledge, learning and support embodies the key value of reciprocity for participants that underlies the ‘home support’ design approach. Ideally, at the end of the course, successful learners achieve the course credit, and their home supporters receive digital badges that acknowledge their support work.

Figure 1

Example of decision-path flowchart for home supporter



It might seem like a leap of faith, allowing the adult learner to nominate family and friends as supporters and involve 'untrained' people in supporting their learning. Indeed, the research into school students learning by distance, where parents or guardians support the students by taking on the role of 'learning coach', often calls for more training of these home supporters (Hanny, 2022; Nayar, 2021; Connor-Flores, 2021; Barbour & Ferdig, 2012; Hasler-Waters & Leong, 2011). Also, research on students who receive extra coaching from people who are not their teacher suggests that the impact on academic results is often either only weakly positive or non-existent (Cracolice & Broffman, 2021; Moore, 2020; Ricker, Belenky, Koziarski, 2021). However, this is to mistake the role envisaged for family or friends in the 'home support' model. It is not intended that family and friends should engage in any 'coaching' of the adult learner, nor is it expected that the home support will result in higher grades for those who complete the course. Instead, it is simply expected that more learners will complete the course than if the 'home support' were not in place.

A 'home support' model might seem a surprise, given that interactions with the people in the adult distance learner's 'life' environment were earlier noted as potential barriers to learning. A key issue for adult distance learners is quality 'time on task', and an adult learner's obligations to work colleagues, friends, and family can distract attention away from study. Why not instead have the learners draw support from their peers in the course? The problem with this suggestion is that teachers would need to organise a level of ongoing synchronous contact between the adult learners in the course, which would reduce flexibility; but needing more flexibility is a key reason that these adult learners choose distance education. Unless an adult distance learner is removed from their life environment and placed in a classroom (no longer the flexible online learning situation valued by adult distance learners), then their people will be there, in their environment. It seems more useful to acknowledge this than ignore it.

Acknowledging the people in a learner's home environment also seems more appropriate from the perspectives of the ancient theory of virtue ethics and the more modern theory of care ethics. A virtue-based theory suggests the goodness of an action is not determined primarily by reference to the consequences of the action, nor by reference to, for example, whether the action respects people's rights, but by reference to the qualities of a person of virtuous character. The philosopher Aristotle, pre-eminent amongst virtue ethicists, wrote of friendship as a quality a virtuous person would cultivate (Aristotle, Bks 9 & 10). Good friendship disposes us to act excellently toward our friends, seeing a close friend as 'another self' (Aristotle, Bk 9, ch4). Good friends (including kin relationships) should recognise and try to encourage the good qualities of each other. Rather than viewing the adult distance learner's people from a 'deficit' perspective as potential barriers to learning, this supports the question: What strengths could an adult learner's people bring to the learning situation? How might they draw on those strengths to help the adult learner secure more quality 'time on task'?

The modern ethical theory of care ethics has an even greater emphasis on personal relationships, seeing persons as essentially relational beings rather than independent individuals (Burton & Dunn, 1996). The pre-eminent care theorist Nel Noddings (2013) holds that 'ethical' caring is an effortful attentiveness and responsiveness to the needs of people we are in contact with. Moreover, this caring needs to be reciprocated somehow by the 'cared-for' for the ethics of the action to be complete (Noddings, 2013). This perspective supports having family or friend supporters for adult distance learners, and also having learners give something back to their supporters. I have suggested that this take the form of adult learners sharing their learning with their home supporters.

Consequently, the 'home support' instructional design moves away from the perception of adult learners as largely free-floating independent units, in favour of seeing learners as interdependent adults, adults whose lives are inextricably bound up with other people's lives. The instructional design values the presence and importance of those people for the adult learner and vice versa, hence embracing the value of reciprocity in sharing benefits from online learning. The 'home support' design is proposed as a strengths-based approach to distance learning for interdependent adult learners. In what follows, I will outline and discuss some ethical issues that may arise from adopting a 'home support' design approach for adult distance learners studying online.

Access and equity issues

Suppose we proceed under a 'home support' ID model for adult distance learners. Ethical issues will arise as facilitators face learners with different circumstances. Some of these will involve the learners' nominated home supporters. The most obvious issue is what should happen when a learner’s home supporter can no longer offer support. This situation could occur if, for example:

- A supporter becomes clinically depressed or otherwise seriously ill
- A supporter takes on a new job and struggles with the workload
- A supporter is in the military and is liable to be posted somewhere remote with patchy communications
- A supporter is imprisoned

There are practical solutions for dealing with this issue. For instance, courses can be designed to be completed with just one home supporter if needed. If facilitators note that one of the two supporters has issues that could make their support less reliable, they could check that the second nominee has no foreseeable support issues. Another solution could be to request a third home supporter (with no foreseeable support issues) who remains in the wings and can step in if a supporter drops out.

A deeper problem arises from equity considerations. Some adult learners will have a pool of potential home supporters available to them who are well-educated and may offer valuable extra support with the course, helping to tutor the learner. Other adult learners will not have such a pool of supporters to draw from. The former group of learners seem to have a significant advantage conferred on them by the 'home support' course design, which seems inequitable. It should be noted that the former group will have this advantage regardless of the course design – these learners can always call on their well-educated friends and family for support. Nonetheless, a ‘home support’ design seems likely to encourage this far more than a traditional online course would. However, facilitators can give explanations about the role of the home supporter at the start of the course that are designed to mitigate this advantage. Templated instructions and processes to follow for interactions can help with this. When learners nominate supporters and teachers or facilitators explain the course process and gain informed consent, the onus is on teachers to emphasise the focus and limits of the home supporter role.

Independence and autonomy concerns

One concern with the ‘home support’ design is that the adult learner will develop a reliance on family and friends that will hinder the development of independence. While the learner is exercising some independent choice in their selection of their home supporters, if a learner cannot make progress in their studies without family and friends checking up on them or can only make an assignment deadline because of family and friends imposing earlier deadlines on them, this may be a problem. It is presumably a weakness in instructional design if it impedes an adult learner from developing independence. One response is to concede that this is a problem and deal with it by mixing elements of the ‘home support’ design with a more traditional design. For example, learners could be supported by family and friends over the first half of the course and weaned off this support in the second half.

Alternatively, we could reject the ‘hindering independence’ criticism. Instead of assessing the ‘family and friends’ approach against traditional online adult learning, we could compare it with traditional class-based tertiary education. The latter has a co-located class teacher or tutor and peers for every scheduled class. The adult learner taking these classes seems to rely as much, if not more, on other people for support than the adult learner in the 'home support' design. Yet, we would not expect to hear class-based tertiary education criticised as 'hindering independence' simply on that basis. Similarly, I propose that the 'home support' design also ought not to be criticised as unreasonably holding back the development of independence.

We could question whether an instructional design, even if not unduly hindering independence, should still aim for more learner independence for adult learners. However, recall the earlier point about adult distance learners having less support to carve out 'time on task' than traditional classroom learners. Given this, it seems unfair to try to remove some of the available support in the name of greater independence. We should also consider that there may be a separate value to interdependence. If adult distance learners are happy to nominate a couple of learning supporters from amongst their family and friends, this is indicative evidence that they see some value in this interdependence. Furthermore, given that the learning supporter role is structured to provide some reciprocal benefits to supporters within the relationship, the interdependence may also have value to supporters. It may be counterproductive to aim for more learner independence if the effect of this is to 'crowd out' the value of interdependence.

A concern about what might be 'crowded out' under an instructional design cuts both ways, however. What if a design where learners interact with their family and friends 'crowds out' other interactions, such as online interactions with other learners and teachers? Instructional designers incorporate such interactions in online learning courses; technologies include discussion boards, chats, blogs, wikis (Baggio, 2008, pp75-76), and online meetings. Should we be concerned if interacting with family and friends did have an effect of 'crowding out' these other interactions? I think we should be concerned about the potential impact on the adult learner's progress in developing autonomy. The basic argument can be sketched out thus:

1. It is likely that mandating or encouraging engagement with home supporters as part of a course will decrease the amount of time an adult learner interacts with other learners, teachers, or facilitators in the course.
2. Other learners or teachers in the course will likely do a better job of prompting the learner to critically discuss and reflect on their ideas than family or friends would. It is an expectation that other learners and teachers should be prepared to engage critically with the course material, but this is not an expectation of home supporters (and this type of involvement by home supporters might even be discouraged for equity reasons).
3. Critical reflection is better at promoting autonomy than interactions with family or friends.
   Therefore,
4. Having interactions from other learners and teachers 'crowded out' is likely to negatively impact the adult learner's progress in developing autonomy.

Several objections can be raised against this argument. The most radical is to reject autonomy as a goal for education. This approach would find support from British philosopher Michael Hand. In 'Against autonomy as an educational aim' (2006), Hand asks, what is autonomy, and is it desirable as an aim of education? He suggests that for autonomy to be a reasonable goal for educators, it would need to be both learnable and desirable, where desirability is defined as a quality of character whose exercise is generally advantageous to the learner. His article offers a sustained argument that “there is no quality of character one could plausibly call autonomy at which it is reasonable for educators to aim” (Hand, 2006, p536). Hand’s article could be drawn on to argue against the autonomy concern with the ‘home support’ design. Suppose a ‘home support’ design had the effect of ‘crowding out’ some critical discussions with other learners and teachers – still, we should not concern ourselves with any likely negative impact on autonomy because autonomy is not a reasonable aim of education!

Frankly, most education theorists will be sceptical of Hand’s reasons and conclusion, so I will not try to rely on this to support my argument. In any case, I could not do so in good conscience. I have my own definition of autonomy, which is not covered in Hand’s paper. I think my definition is reasonable as an aim of education and that a ‘home support’ model may impact negatively on this autonomy, so there is an ethical issue for me to address. I define a minimum level of personal autonomy as being able to give a justification for your action or belief, or desire, that is not (merely) someone else’s justification. On this definition of autonomy, persons must have thought about their actions, beliefs or desires enough to have chosen (or be able to choose) a justification for them in order for their actions, beliefs or desires to count as autonomous. Justification requires giving reasons. As education assists us in giving reasons, it seems this is a learnable practice. Being more experienced at thinking about actions and beliefs, choosing a justification for the actions and beliefs you adhere to also seems desirable. So I suggest my ‘justification’-based definition of autonomy does not seem unreasonable as an aim of education.

My definition of autonomy is a problem for a home support approach to adult distance learning, if the home interactions crowd out interactions with others in the course. In an educational setting, we are encouraged to give reasons to argue for our preferred position. Studies of argumentation by Dan Sperber and Hugo Mercier (Mercier, 2016) suggest that when we give reasons to argue for our position, we tend to be lazy – we use the minimum effort necessary to convince our interlocutor. It is natural to expect our family and friends to be more supportive of our ideas than strangers (or enemies!). We likely expect that friends and family will more readily and less critically accept our explanations or reasons – in which case, we will make less effort to present or argue for our position. In turn, we will more readily and less critically accept input from our family and friends. This approach may do little to develop our ability to give our justifications, and not support gains in our autonomy.

However, we do not expect that other learners or teachers will readily and less critically accept our explanations and arguments. Rather, we should be inclined to put more effort into thinking about, clarifying and arguing for a position on an issue when interacting with these groups. Suppose, as seems likely, that adult learners expect other learners and teachers to be more critical of their positions, than they do family and friends. More interaction with other learners and teachers should then prompt adult learners to do more work thinking things through themselves, thus improving their understanding and ability to give reasons that represent their thinking work, which is the basis of my definition of autonomy. Thus it seems that a ‘home support’ design, if it crowds out some interactions with other learners or teachers, will negatively impact an adult distance learner’s progress in developing autonomy.

However, I suggest it is unlikely that the interactions with family and friends would completely crowd out any interaction with teachers or other learners. There are more likely to be degrees of dampening of those interactions. The extent to which this dampening occurs will depend on several factors: primarily the learner and their preferences for such interactions, but also the interaction opportunities structured into the instructional materials. Moreover, instructional materials can model autonomy-enhancing practices. For example, each course topic can ensure attention on identifying whose authority is relied on for evidence ('Who said this, and why should we believe them?'). Course materials can also emphasise the practice of examining reasons. Furthermore, consider the reciprocity strategy of adult learners having to teach ro share some course concepts to family and friend supporters. This relationship will likely help the learner develop a clearer or deeper understanding from which to work out reasons to support or reject practices or theories. By aiding this clearer or deeper understanding, the strategy thus supports the preconditions for enhancing autonomy.

A further cognitive gain from the 'home support' design may be experienced by the adult learner's family and friends. Being a supportive audience for an adult learner's explanation of some course concepts may enhance one's cognitive environment. In other words, it may make a supporter's environment more cognitively stimulating and demanding. The effects from this may differ depending on the previous education of the relevant family and friends. The cognitive benefit for friends and family may be seen as a side benefit from the perspective of traditional online learning. It is nevertheless a benefit, and from the perspective of the 'home support' design, it is not peripheral.

Conclusion

I have explored the idea of an instructional design approach to online adult distance learning that provides a role for some important people in the adult learner's life. The motivation for this idea is drawn from elements of the adult distance learner's context: needing flexibility not afforded by traditional classroom instruction but thereby missing the support for achieving quality time on task that the traditional setting offers. I suggested taking account of the adult learner as interdependent and recruiting some of the learner's people – family and friends – to help provide this support, using a strengths-based approach. Based on the value of reciprocity, the 'home support' design aims to facilitate benefits for adult distance learners and their supporters through the learning process.

Having sketched out an argument in favour of the 'home support' instructional design, I then subjected it to ethical scrutiny. I identified several areas of ethical concern, namely, access, equity and autonomy. I argued that access is a practical matter that can be dealt with in the initial set-up of home supporter nominees. The equity concern is trickier, but the inequitable advantage for adult learners with highly-educated family and friends may be mitigated by establishing a clear understanding of the nature of the participation expected of home supporters. I concede that autonomy may be negatively impacted if interaction with family and friends 'crowds out' interactions with other learners and teachers. But I suggest that this may turn out to be a 'dampening' rather than a complete crowding out; that online distance courses can incorporate other autonomy-enhancing features; and, finally, that there is a potential cognitive gain for 'family and friends' supporters that should be taken into account.

As with everything, a 'home support' instructional design is not risk-free. However, I think it has sufficient potential benefits to recommend exploring the design approach in practice.

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Footnotes

[1] While I believe this approach is new in the field of IDT, some indigenous traditions (such as Māori, Pacific peoples, Native American, Ubuntu African) reject the Western individualist perspective of an independent person, in favour of recognising a relational interdependency among persons. For this reason, I call the view I put forward of an interdependent adult learner a 're'-vision of the independent adult learner.

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