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'Wicked problems' as catalysts for learning in educational ethics games

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ABSTRACT

In this paper we discuss the potential of digital games to create meaningful educational experiences that contribute to the learning of ethics in higher education (HE) Science, Technology, Engineering and Mathematics (STEM) degrees. We describe the design of a new digital ethics game with a focus on the challenges we encountered when applying existing theoretical frameworks for educational games and propose ways to address these challenges. We contend that existing design frameworks fail to account for the 'wickedness' of ethical problems – i.e. their inconclusive, complex, and sometimes inherently contradictory nature – as they are centred around consequentiality and consistent game-system feedback to players' actions. Drawing from a Deweyan account of the 'educative experience' we seek to contribute to a domain-adequate theory of transformational experience and transformational play in the context of educational ethics game design.

KEYWORDS

Ethics education; digital educational game; wicked problems; Dewey

1. Introduction

In light of the rapid advance of technology and science, ethics education has become increasingly important in higher education (HE). Particularly in the STEM subjects, universities are expected to foster responsible scientific and technological progress by providing some form of formal ethics education to their students. Typically, research ethics are usually taught in dedicated courses in a combination of instruction on ethical concepts and group discussion of ethical dilemmas or case studies (Gille and Nardo 2020). However, these approaches tend to detach ethics from disciplinary practice and rely heavily on reflection on abstract scenarios that have little to no connection to the students' lives. As ethics education includes both discipline-specific ethics and

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the ethics of research and scientific practice, we believe there is significant room for improving how we teach the ethics of science and academic research as a professional field (Macfarlane 2004).

In this paper, we explore the educational potential of digital games for ethics education. In particular, we focus on games that simulate research as a professional practice – e.g. academic collaboration, writing, and publishing. Drawing from our own experience of developing such a digital educational research ethics game, we seek to highlight some of the core challenges of creating educationally significant ethical gameplay. We argue that to teach research ethics in a formal education context, we need to focus on ways to embed ethical deliberation in professional practice. We position our own game design framework in contrast to other game-based approaches (e.g. those that are oriented towards motivational aspects of games). We consider current rationales for ethics education misguided in their focus on individual conduct. Ethically problematic research practices, as we understand them, emerge not from ignorance or indifference of ethical codes, but from a complex concoction of conflicting systemic pressures, including precarious academic job-markets and competitive work culture. Therefore, we shift our focus from individual action and deliberation, to the systemic factors that motivate unethical research.

Our objective is to work towards a framework for the design of educational ethics games that incorporates design principles with educational theory. Existing theoretical accounts of ethical gameplay in commercial games (see, e.g. Sicart 2005, 2009, 2011, 2013; Bosman 2019; Sparrow, Gibbs, and Arnold 2020; De Sousa, Rasmussen, and Pierroux 2018), and frameworks oriented towards educational games in general (see, e.g. Barab, Gresalfi, and Ingram-Goble 2011; Annetta 2010) do not allow us to meaningfully describe the design of ethical gameplay in a game with an educational aspiration. The former lack a theoretical perspective to connect ethical experiences in games to learning; the latter tend to not account for the educational particularities of ethics. This paper is an attempt to theorise the uncharted territory between the two.

We construct our own approach to the design of an educational ethics games based on an understanding of ethical dilemmas as ‘wicked problems’ (Sicart 2010; Bosman 2019), i.e. complex and inherently ambiguous problems that lack transparency regarding solutions and consequences to action. Drawing from a Deweyan perspective, we reflect on this wickedness as a catalyst for learning and challenge the use of ‘consequentiality’ as a core pillar of educational games in the context of ethics education. We argue further that when designing an educational ethics game, particular considerations have to be made to distinguish instrumental from ethical gameplay. Doing something in order to win the game (instrumental action) must be distinguished from ethically motivated behaviour (e.g. doing ‘the right thing’ according to one’s own values in

a specific context). To make 'ethical behaviour' the aim of the game may undermine its educational goals, fostering instrumental action and inhibiting meaningful ethical gameplay.

2. The potential and challenges of digital games for ethics education

We draw from a professional virtue perspective to conceptualise research ethics in an educational perspective. Professional virtues are defined as the 'dispositions of character that motivate a professional to act in accordance with (as a means to realize) the end of a profession, accomplishing the function it plays in society.' (Stovall 2011, 126). From a virtue perspective, ethical conduct and deliberation are essential to all dimensions of professional practice. This stands in contrast with current didactical approaches that separate research ethics from other degree courses.

Ethical virtue develops as part of a process of enculturation into authentic communities of practice. But how can ethical virtue be taught, or at least fostered in formal education contexts? In this paper we argue that research ethics are particularly difficult to teach in traditional, instruction-based teaching arrangements. One reason for this difficulty is the fact that many ethical issues related to research practices – e.g. collaboration, authorship, originality, consent – are contextual and discursive, rather than binary. Between clearly 'right' and clearly 'wrong' there is often a vast grey-zone. Mere knowledge of and compliance with disciplinary codes of conduct and university protocols is insufficient. What is needed are the skills to negotiate between professional codes, social and cultural context, and personal values; the skill to navigate the grey-zones of ethical conduct. Consequently, grounded in a professional virtue perspective, we view research ethics not as 'content' that can be taught, but as negotiating practice. In this paper we explore the potential of digital games to model the complexities of ethical quandaries and to foster such processes of negotiation.

The potential of games to provide rich environments for collaboration, enquiry and novel experiences has been recognised by many in the field of ethics education (e.g. De Sousa, Rasmussen, and Pierroux 2018; Briggie et al. 2016; Schrier 2015). A game can simulate professional practice and immerse players in narrative-rich scenarios, in which they become ethical agents in complex ethical problems. Players are 'forced' to actively weigh in on ethical issues. This means that games may also encourage ethical experimentation – also with 'unethical behaviour' – which is discouraged in real-life, thus opening a space of experience that is unique to games.

The design of educationally meaningful ethics games, however, presents particular challenges that have not yet been sufficiently dealt with. Particularly, we note a scarcity of theoretical and qualitative accounts that are able to adequately inform both the design of such games and how they compel

learning. In the past few years, numerous educational ethics games have been created (e.g. EthicsGame,¹ Quandary,² or Umed³). However, we find that these games are often developed from the basis of game-based version of pre-existing ethics education approaches (e.g. the gamification of ethical dilemmas) or with very specific content for students to learn (e.g. competence in moral sensitivity). What is needed, in our opinion, is a theorization of the ludic experience ethics educational games can and should offer, especially connecting these experiences to mechanisms of learning and contexts of formal or informal education.

Within existing educational ethics games, there is a tendency to refrain from being explicit about underlying learning and pedagogical assumptions or mechanisms. General educational games research serves as a good basis for this theoretical work, providing explanations for how learning occurs. Such work, however, is often aimed at well-defined content (Barab, Gresalfi, and Ingram-Goble 2011, 525). Players learn by experiencing consistent system-feedback following their action. To learn, in that sense, means to uncover given links between actions and their consequences. However, when it comes to ethics, we argue, such an approach is problematic. To ground ethical game-play in clear consequences – i.e. to ‘reward’ ‘positive’ ethical decisions and ‘punish’ ‘negative’ ones – means to unduly reduce the complexity of ethical problems and to disregard the inherently discursive nature of ethics. In a professional virtue perspective, ethics are not given, but negotiated – an educational ethics game should model this accordingly.

Significant adaptations regarding the basic design of an ethics educational game are required. For example, a content-oriented educational game might teach through consequentiality, designed to provide explicit, clear and experienceable connections between the players’ actions and evaluations of the consequence of these actions in-game (e.g. Barab, Gresalfi, and Ingram-Goble 2011). As Sicart (2013) suggests, however, an ethics game’s design could instead create a system that reacts to the decisions of the player without quantifying and explicitly evaluating the players’ choices. When it comes to the ethics of research, the consequences to action may be problematic, as they can be considered probabilistic (e.g. the odds of getting caught falsifying data), may be covert (e.g. fewer opportunities to collaborate), or may be entirely absent (e.g. plagiarism that is not discovered). Further, the ethical consequences of in-game action may not be entirely evaluated within pre-defined, game-bound meaning, rather may need to be interpreted relative to professional communities, individual circumstances, and institutional norms. In these ways, designing an ethics game that teaches through consequentiality can be complicated.

3. Designing a digital educational ethics game

In this paper, we discuss some of the tensions we have faced in the process of developing our own digital educational ethics game. We develop our framework in opposition to the design principles underlying many current educational games. We contend that ethics education has complexities that support an experience-oriented approach to the design of educational ethics games, in which rich and ambiguous experiences function as a preparation for later instruction in more traditional educational arrangements such as seminars or lectures.

The aim of our game is to provide doctoral students and early career researchers with the opportunity to experience the interplay of social, personal, and systemic factors and pressures in academia that encourage unethical behaviour. The game models the process of academic collaboration, writing, and publishing and presents players with ethical issues that are inherently connected to these research activities – sometimes straightforwardly, like in the case of plagiarism, and sometimes vaguely, for example when it comes to letting personal sympathies influence collaboration in a research group. In this way, the game presents players with ethically challenging experiences that they can expect to encounter in their profession but does not reward them for overtly ‘correct’ ethical choices. Ethical issues emerge narratively, rather than being labelled as such. Instead of offering a given set of responses to ethical issues to the player, resembling thought plays such as the Trolley Problem, the game offers a wide array of flexible action, urging the player to reflect deeply about how they want to interpret a given ethically challenging situation.

Instead of focusing on achieving homogeneous educational objectives (all students will know ‘X’), our aim is to create a particular type of ambiguous ethical and playful experience (Squire 2005). Play, following the definition of Sicart (2014, 3) ‘is a dance between creation and destruction, between creativity and nihilism.’ It is a form of individual or collective expression. Curating ethical gameplay, in our view, means to design a game ontology that enables players’ ludic expression in the context of ethical problems – ethical gameplay should encourage players to be creative with the meaning they construct through the game experience. This follows Sicart’s (2014, 5) suggestion to ‘reclaim play as a way of expression, a way of engaging with the world – not as an activity of consumption but as an activity of production.’

To create such a ludic experience is extremely difficult to achieve. Additionally, in the case of an educational game, the ludic experience must be translated into a rationale for learning. The aim of this paper is to theorize how the ethical dimension of the gameplay works when extended to education and to outline current design complexities that we have faced in expanding and instantiating this theory. In particular, we continue with Sicart’s (2009, 2010)

framing of 1) the ‘wickedness’ of ethical problems in games, 2) differentiate between instrumental and ethical gameplay, and 3) detail the role of feedback and consequentiality in game-based ethics learning.

3.1. Ethical gameplay and ‘wicked problems’

Ethical dilemmas in games have been described as ‘wicked problems’ by Sicart (2010) and Bosman (2019). ‘Wicked problems’ are unpredictable in outcome, ambiguous in terms of if and how they can be resolved, and irreproducible once interacted with. They have no straightforward solution, and once a solution has been attempted, it is not immediately – and possibly never – clear whether the problem has been successfully solved. In this paper we want to expand on existing work on ethical gameplay in connection with the idea of ‘wicked problems’ and translate it into an educational context.

The ethics of academic collaboration and publishing are wicked in the sense that they are often not binary – ‘wrong’ and ‘right,’ or ‘good’ and ‘bad’ – but a matter of grey zones that need to be negotiated socially. Authorship, and what legitimately constitutes it, for example, is a dilemma frequently faced, in particular by young researchers. Though some questions related to authorship can be viewed as ethically trivial, such as adding an author to a paper despite the individual having contributed nothing, other issues related to authorship can be regarded as ‘wicked’, particularly when they are fundamentally ambiguous, complex and inherently contradictory. These issues can arise because of the way that social dynamics, personal values, and institutional structures are involved in decisions about authorship, often in implicit and covert ways. For example, the amount of work performed by authors may be tied to economic issues (whether someone is funded to work on the project or a volunteer), family issues (a single parent may have less time to contribute to a paper), or personal relationships (whether co-authors are friends). In real life, ethical decisions about authorship are often particular to the circumstances of the individuals and ambiguous in terms of consequences. An educational ethics game, we argue, has to meaningfully model this ‘wickedness.’ Our game is not aimed at ‘improved conduct,’ but rather wants to urge the player think about the dimensions of that wickedness – e.g. the social hierarchies, institutional habits, emotional complexities, etc. – and to relate it to one’s own values. These values manifest in the gameplay as the player’s action.

The wickedness of ethical educational play can be seen as in tension with the need to reify the external, world-model within the game in a way that is clear enough for players to understand and advance. For example, imagine a game that presents players with an obstacle they must climb over. Such an obstacle may be ambiguous in its presentation (e.g. a rock vs. a crate) but cannot be so ambiguous that the player fails to understand that it is something intended to be overcome (an obstacle vs. a wall). Similarly, ethical experiences in our game

must be concrete enough for the players to understand how to proceed (e.g. authoring papers) and that there are ethical dimensions to the decisions (e.g. that they may affect your professional standing), while also being not so concrete that the ethical dimensions indicate 'right' and 'wrong' ethics (e.g. evaluated through arbitrary ethics points).

3.2. Feedback and consequentiality

Video games inherently require players to interact with them, and it is through this interaction that video games communicate meaning. Players come to understand the meaning and use of an object in the game through action, feedback, and observations of the consequences of their action. This exploration of meaning is essential to the ludic experience. Following this, most educational games have grounded learning in consistent feedback and consequences to action (Kiili 2005; Squire 2003; Clark et al. 2011). However, the inherent 'wickedness' of ethical issues has important ramifications for consequentiality as a key pillar of educational gameplay.

An ethics game, like any game, provides a virtual environment that gives meaning to behaviour. This implies that in-game actions must have consequences. In what we consider an adequate educational ethics game experience, however, the meaning of the consequences may not be immediately clear to players. Instead, meaning arises from the player's efforts to make sense of her behaviour in the game ontology, rather than being solely constituted by self-apparent, reliable system feedback. Embracing the 'black box syndrome' that characterises all computer games, i.e. the fact that rules are not always accessible and rarely debatable, urges reflection during or after gameplay in order to make sense of it (Sicart 2013). Consequentiality becomes indirect, ambiguous and partially obscure: Not every 'unethical' act (e.g. plagiarism) is necessarily followed by a negative consequence in daily life; sometimes there are no consequences (if one is not being discovered, for example) or even positive consequences (if one is able to list more publications on one's CV or gets positive feedback from superiors).

With these ideas of ambiguity in the context of ethical decision-making and deliberation in mind, we argue that existing design frameworks that do rely on consistent and immediately interpretable in-game feedback, such as the framework developed by Barab, Gresalfi, and Ingram-Goble (2011), are only partially practical when it comes to the design of educational ethics games.

Barab, Gresalfi, and Ingram-Goble (2011) theory of transformational play highlights the potential of educational games in providing players with the opportunity to engage in actively shaping virtual worlds, mirror professional practices and, through those experiences, being transformed themselves. Their game allows players to adopt roles (e.g. professional identities), to act in and as

these roles, and, most importantly, to subsequently experience the consequences of their action. Through this 'dramatic agency' (525), Barab, Gresalfi, and Ingram-Goble (2011, 525) argue, 'the player can become the protagonist who determines, within designated parameters, how the story unfolds,' creating a 'dynamic (transactional) unity of person, content, and context in which all are transformed through participation.'

Our understanding of ethical problems in games as 'wicked' contrast with Barab, Gresalfi, and Ingram-Goble (2011, 525) description of 'dramatic agency,' by which a choice is not terminal but 'can be reflected on and ameliorated to promote deep engagement with the content and even drive new learning opportunities' (527). Thinking of ethical problems as 'wicked' means to understand them as a 'one-shot operation' (Bosman 2019, 549), meaning that they are essentially non-reversible.

The core limitation – for the purpose of our game – of Barab, Gresalfi, and Ingram-Goble (2011, 526) design framework, however, lies in the idea that the game ought to allow players 'to see the impact of their actions,' and 'learn from the impact of unproductive choices.' Though this approach to educational games may work well in contexts where disciplinary content is well-defined, we found it insufficient in 1) guiding the design and use of an ethics educational game, especially relating knowledge to the design of game feedback and 2) informing appropriate criteria for legitimate in-game content.

Seen from an ecological perspective – which defines learning as 'a process of becoming prepared to effectively engage networks in the world in a goal-directed manner' (Barab and Roth 2006, 4) – students become increasingly familiarised with the environment of the gameplay. This process of familiarisation is limited, as we have argued, by the wickedness of some of the ethical issues they encounter. Their meaning does not disclose itself through experiencing consequences to their action, but rather through the lack thereof. Ethical decision-making is intentional, but it is not necessarily part of the functional intention of the game world. If it were, we would end up with an educational ethics game that, in our opinion, does not adequately reflect the wickedness of ethical problems.

Meaningful participation in the ecology embodied in an educational ethics game, in the view we have presented, can no longer be understood as a 'effectivity/affordance coupling' (Barab and Roth 2006, 6), i.e. the ability to align action with consequences and to present these consequences in ways that make sense immediately and wholly from the game's ontology. Rather, meaningful participation means navigating ambiguity and to negotiate one's own values in particular social and cultural contexts. Rather than being 'provided' by the game – as a 'reward' for action – we think that the meaning of ethical problems is constructed socially and contextually. Our understanding of ethical gameplay emphasizes the importance of game-based meaning

construction as an act that inherently crosses the boundaries of the game and the rest of the player's life (e.g. the player, the culture in which the game is embedded). While others have acknowledged the socially embedded nature of games' meaning making (Gee 2003; DeVane and Squire 2008), such work has not gone so far as to describe a framework that is specific to ethics education.

3.3. Instrumental vs. ethical gameplay

In-game decisions and their consequences create tension around player action and understanding. We characterize this tension as the difference between instrumental and ethical gameplay. Existing educational game design frameworks have tended to highlight the importance of interweaving gameplay with learning outcomes. For example, Squire (2003) and Clark et al. (2011) point toward two categories of educational games. In the first category fall educational games that layer content atop core game experiences but not deeply connect the two – Squire (2003) calls these 'exogeneous games' and Clark et al. (2011) refers to them as 'conceptually embedded games.' In the second category of games player experiences and actions in-game are aligned with the target content and learning outcomes, so that what players do in-game is integral to the educational aspect of their experience – Squire (2003) refers to these as 'endogenous games' and Clark et al. (2011) as 'conceptually integrated games.' This latter category, both argue, is arguably a better design for gameplay and has been shown to produce measurable learning gains (Clark et al. 2011). Designing educational ethics games from an endogenous or integrated approach, however, is complicated by theories of ethical gameplay.

To exemplify and better define educational ethical gameplay, we return to Sicart (2010, 104) who describes it as 'the outcome of a game sequence in which players take definitive choices based on moral thinking, rather than instrumental thinking.' One frequently mentioned example of ethical gameplay separate from instrumental gameplay is a game sequence from *Fallout 3*, where the player is confronted with the 'life or death' decision to favour either a group of humans or a group of ghouls, and upon choosing a middle, or supposedly 'ideal' and 'fair' solution, inadvertently sacrifices the group of humans (Bosman 2019, 546; see also Sicart 2009). Importantly, the decision does not have any direct impact on the game mission. Nevertheless, it creates a deep experience that transforms the gaming experience of the player. 'Ethical gameplay,' according to Sicart (2009), urges the player to make decisions that require deliberation outside of the overarching aim of the game, distinguishing it from 'instrumental gameplay.'

For educational games, as others have noted, there is a tendency to foster an 'efficiency-mindedness' (Waddington 2015, 18), i.e. instrumental thinking. Learning designs, following this criticism, have encouraged students to focus on the quality of their actions within the game particularly in pursuit of their

desire to win. In this way, the theories describing educational games have dealt mostly with tame problems (opposite wicked problems), characterized by orienting students toward solutions through the application of appropriate algorithms or strategies.

For the design of an ethics game grounded in the concept of 'wickedness' to also be educational, the tension between instrumental and ethical gameplay must be resolved. When it comes to ethical decision-making, goals for action are not informed merely by certain envisioned consequences defined wholly within the game, but first and foremost by complex value-systems whose meaning arises from the interaction between the game and the player and the player's social context and history. As illustrated by the above-mentioned sequence from *Fallout 3*, meaningful ethical gameplay is somewhat separate from strictly instrumental considerations directed at winning: To save or not save either/both the group of humans and ghouls has no impact on the player's chances to win or lose the game. Yet, the experience shapes the player's interpretation of the game ontology and will, thus, also likely inform further action in the game. In contrast, if acting 'ethically' becomes the aim of the game, ethical gameplay turns into instrumental gameplay. This not only compromises the richness of the ethical experience offered by the game, but also reduces the complexity of ethical issues unduly, making them tame, rather than wicked. The following section addresses this tension with regards to learning.

4. 'Ambiguity' as a catalyst for learning and collective meaning-making

In this paper, we drew from existing work on ethical gameplay – outside of educational contexts – and design theory for educational games – not specific to ethics – to discuss tensions specific to the design of an educational ethics game. We argued that an educational ethics game has to model ambiguity and 'wickedness' when simulating life-like ethical problems and that this need gives rise to design tensions around the feedback provided to players and the consistent consequentiality of their actions. Further, we contended that ethical gameplay is at odds with the typical instrumental aims of educational games if a meaningful ethical experience is to arise from the player experience. Based on the 'wickedness' of ethical problems and the difference between instrumental and ethical gameplay, we proposed that traditional design frameworks for educational games have to be reconceptualised, in particular in terms of their educational design aims. Our suggested resolution – presenting players with ambiguous experiences – needs to be clarified with regards to what role we expect it to play in learning. To that end, we turn to a Deweyan perspective of educational experiences to discuss the role of ambiguity, confusion, and inconclusiveness in learning.

4.1. Dewey: learning from negative experiences

Others have made connections between the educational works of John Dewey and educational gameplay (see, e.g. Waddington 2015). In support of the educational potential of ‘wickedness’ in gameplay – and the suggestions made regarding the revised role of consequentiality – we consult a particular aspect of Dewey’s theory of experience: Discontinuity (English 2013).

In Dewey’s educational philosophy, education and experience are closely connected, but not identical. Not every experience is educationally meaningful; some experiences, as Dewey (1938, 12) points out, are ‘mis-educative’ in that they arrest, rather than enrich further experience. Experiences that are ‘educative,’ in contrast, enable the individual to draw reflective connections between her action – the ‘doing’ – and the consequences to her actions in a particular context – the ‘undergoing.’ They connect past and present experience in, what Dewey calls, ‘experiential continuity’ (Dewey 1938, 12), or growth (Nardo 2018).

Experiences of ambiguity, irritation, and confusion play a central role in what Dewey defines as ‘educative experiences.’ They open a gap between the individual’s past and present experience, forcing the individual to reconsider prior assumptions and reinterpret the meaning of past experiences (Saito 2005). By breaking the existing ‘experiential continuity’ of the individual, experiences of ambiguity, irritation, and confusion make room for new interpretation and meaning making. This makes them essential for growth (English 2013).

In our own game, we seek to create such ambiguous experiences – which is consistent with the ‘wicked nature’ of ethical problems – and stimulate the reflective process of the player interpreting ethical dilemmas in a given context. This means that meaning is not already incorporated – or affirmed – by the game system but is the result of the interaction between the player and the system. For example, when working on a paper submission, the player in our game can choose to simply write the required number of pages, using her own resources and data that she collected previously and may choose to submit the paper once the page requirements are reached. However, among other options, she can also decide to reuse already published work or paragraphs from online copying them into her text. These latter options might be more appealing when the player is faced with a lack of time or energy in combination with a high workload, or when she simply desires to publish more.

The consequences of this plagiarism, in alignment with the above-mentioned distinction between instrumental and ethical gameplay, are obscured in our game. It is neither the case that ‘bad’ behaviour is always punished, for example by leading to a decreased ‘ethics score’ or some other explicit disciplinary measures. ‘Good’ behaviour is also not always rewarded, for example by raising some in-game ‘ethics score’ or leading to the paper being accepted for

publication. Instead, the game uses an algorithm (which is unknown to the player) that merely increases the probability of 'bad' behaviour being discovered with each time the player performs such an action. This means that someone could be discovered after plagiarising on one page of their paper once, while someone else could not be discovered despite having plagiarised large sections of several papers. This makes consequences to action non-deterministic and ambiguous, which is essential to their 'wickedness,' forcing the player to negotiate the dynamic meaning of their action, rather than being provided said meaning by the game system.

The ethics of the paper writing process seems fairly straightforward: Writing your paper 'in an honest manner' is good, 'cheating' through plagiarism is bad. However, in line with our assumption that unethical behaviour in research practice is not grounded in student's and young researcher's lack of knowledge and understanding of what constitutes unethical practices, our game aspires to focus not on encouraging/discouraging certain behaviours, but to model the factors and context shaping ethical decision-making. The game is set in a particular context: A research lab with a certain academic culture that does neither overtly condemn unethical practices in research nor explicitly encourage them, but instead merely underlines the competitive nature of academia. Moreover, unethical practices – such as plagiarism – are not a matter of either/or, but of degrees. For example, when reusing her old work or copying from someone else's work, the player can decide to continue editing the unoriginal passage. This particular decision raises the question of what constitute original work and urges the player to negotiate her own interpretation with the consequences in the game.

In theory, educationally meaningful moments of ambiguity, confusion, and perplexity could be achieved by negative or unforeseen consequences to action. Grounded in our understanding of ethical issues as 'wicked problems,' however, we consider such an approach building on consistent consequentiality as not conducive to growth. Consistent consequentiality would foreclose the negotiation of meaning – both individually and socially – associated with the inherent 'wickedness' of ethical problems.

In our game, we strive towards meaningful 'negative experiences,' i.e. experiences of ambiguity, irritation, and confusion, not through consistent consequentiality, but through a process of ongoing negotiation in the face of ambiguous meaning. The player 'lives' through a variety of complex ethical issues during the game, and – true to the nature of 'wicked problems' – cannot undo past actions and decisions. With time, however, the meaning of these past actions might change in the light of new actions and decisions. The player is urged to bring into harmony the pressures of the system (e.g. academic precariousness paired with harsh competitiveness) and the social context (e.g. peer pressures and lab hierarchies) with her own moral compass. While playing, in

the absence of clear consequences to action, this process of meaning-construction becomes the focus. The experienced 'wickedness' opens a space for meaning-making.

Reflective thinking, which 'transforms confusion, ambiguity and discrepancy into illumination, definiteness and consistency' (Dewey 1925, 62), is a significant objective for educational ethical gameplay. When consequences to action are ambiguous, the individual is urged to reflectively interpret, and if needed, re-interpret the meaning of her action in particular contexts. The player's actions, her efforts to establish continuity in her experience, is not a process of uncovering given meaning, but the negotiation of meaning in a material, social and cultural context of academic work.

To support ethics learning, then, our game presents players with experiences through which they can confront the intersections of their various work and personal value systems. These intersections may, at times, result in conflicts or incongruences whose ethical resolution is not presented in the game. That is, we chose to avoid posing game-based questions that are both overtly and simplistically ethical (e.g. should you falsify data) or arbitrarily complex (e.g. should you falsify worked hours so a student can eat). Instead, we let the player make decisions based on how they want to play the game so that they can later reflect on gameplay relative to their personal and professional views. It is possible to play the game in many different ways. Some players might interpret 'winning the game' to mean publishing as much as possible regardless of the means, while others might aspire to a more virtuous trajectory focused on honesty and ethical integrity to the potential detriment of their academic competitiveness.

4.2. Making meaning across the boundary of the digital game

Based on Dewey's theory of experience we argue that ambiguous system feedback in ethical gameplay is educationally meaningful in at least two ways. First, it can spark reflective processes for the player about the ontology of the game system, which simulates relevant professional practice. Second, the game itself can be a useful educational artifact through the creation of a record of the player's meaning-making process. Through the game-play experience and with the record of the ethical decision-making processes that players went through, they can reflect on their game and own life experiences outside of the game and more easily compare their experiences with others' (e.g. through in-class discussions with other students). Different players might, for example, have very different interpretations of what constitutes 'original work,' or 'legitimate authorship.' These diverging interpretations will be embodied in record that players receive after the game, which details their decisions numerically, thus creating the basis for discussion and further negotiation.

So far, we focused on the process of meaning-making from the individual's point of view. However, Dewey emphasises the crucial role of interaction and communication in educationally meaningful experiences. To ensure that our game allows for interaction, it is designed as a preparatory activity for a research ethics course. The creation of shared meaning through communication is essential to how Dewey connects individual growth with societal growth (Nardo 2018). Ethics are inherently and essentially discursive and negotiated socially and culturally. Therefore, we design our game embedded in a course setting that supports individual and collective reflection on meaning. Students play the game on their own first. This allows them to explore their own values in relation to the simulated professional practice. The ambiguous feedback in the game forces players to reflect on the meaning of ethical issues related to science and research as a professional field. After playing, students come together in class to reflect on their experiences, decisions, and interpretations in relation to others' and in relation to established rules and codes of conduct.

By emphasizing the cross-boundary nature of meaning construction, both within and outside of the game, especially around ethical and moral topics, we follow Sicart (2013) who points out how externalizing and reifying morality in game systems treats ethics as target outcomes that advance the game or as content to acquire (an 'instrumental' view). Instead, Sicart (2013) argues that ethical games should be means through which players can express themselves, inherently crossing the boundaries of the game structures (e.g. rules) and their own lives as they engage in ethical or moral thinking and deliberation about the meanings that arise through play. A cross-boundary approach also supports growth in the sense of Dewey as it brings together individual and social meaning-making in one process.

5. Discussion

The goal of this paper was to explore the uncharted territory between research on ethical gameplay in commercial games and existing frameworks for the design of educational games in general. Informed by the experience of designing our own educational ethics game, we found that there are particularities to the design of educational ethics games that require special consideration.

First, we argued that ethical problems are inherently 'wicked,' which means that their solutions are often equivocal and contradictory. Ethical decisions often lack clear consequences. Second, we argued that conceptions of learning have to be explored which are not centred around consequentiality. Finally, we argued that when designing an educational ethics game, a distinction between instrumental and ethical gameplay is necessary. The aim of the game cannot be to 'act ethically' as this would distort the ambiguous nature of ethics and turn ethical deliberation into instrumental action. To conceptualise learning within

the game, we drew from Dewey's theory of experience, in which he emphasises the crucial role of negative experiences and 'discontinuity' (English 2013) in learning. With this framework in mind, we suggest that ethical educational games can present players with, and help to document valuable, ambiguous, ethical experiences that can be coupled with other (e.g. classroom) activities in order to achieve ethics learning goals.

In summary, we propose three principles for the design of educational ethics games:

Principle	Operationalisation
<i>Model Ambiguity</i> – To enable educationally meaningful ethical gameplay – rather than instrumental gameplay – the game experience must incorporate the 'wickedness' and ambiguity inherent to ethical decision-making. The players' learning has to be redefined outside of consistent system-feedback and consequentiality.	While clear and coherent in-game feedback is necessary for the player to understand the relationship of in-game objects and complete the game, ethical judgments should be avoided as the primary means for learning ethics. <i>Example:</i> Instead of a visible 'ethics score,' we embed a professional model to convey possible systemic pressures and semi-random, covert consequences for actions.
<i>Goal-driven meaning negotiation</i> – As stated, it is necessary to differentiate instrumental and ethical gameplay. If the game experience is oriented towards ambiguity, meaning must be <i>negotiated</i> rather than <i>discovered</i> .	Player goals must drive game completion while also allowing for different experiences and meanings to be taken away from game play based on a confluence of intersecting social factors. <i>Example:</i> Players must publish papers to complete the game. Paper plagiarism is framed as driven by personally and socially constructed pressures to publish frequently. It does not have a clear in-game meaning of 'right' or 'wrong.'
<i>Directed Discussion</i> – To simulate the social and cultural embeddedness of ethics, the game is incorporated in an educational setting outside of the game that supports cross-boundary reflection, especially through documenting the player experience with artifacts that can assist with reflection. That way, individuals can more easily communicate their interpretations and dialogically work towards shared meaning.	Directed post-game discussion is necessary for formal learning. Discussion should be oriented toward making sense of in-game activity relative to social and professional standards and practices. <i>Example:</i> Game-generated records of activity can support players negotiation and discussion of the grey areas of professional research such as plagiarism (e.g. its prevalence, the pressures that drive it).

One of the biggest and most important challenges we face in creating this educational ethics game is specifying expected outcomes. Many education game designers, intentionally or otherwise, adopt a model of learning focused on information. In such cases, games are seen as powerful due to the way that they can present information to players in, for example, entertaining ways that can thus improve their motivation, or due to the way that games can leverage sophisticated technologies to present information that would otherwise be difficult for players to experience. In such games, the target of learning is the information embedded in the game, and a player can be thought of as having learned if the information was successfully conveyed (e.g. if a player is later able to explain a game-embedded concept).

Other approaches, especially from social perspectives of learning, are less focused on characterizing game-based learning in terms of the information found within the game. Instead, social-learning approaches may characterize

learning in terms of the players' adoption of disciplinary practices related to the game (Clark et al. 2015) or their participation in online communities (Steinkuehler and Duncan 2008). Learning in these games is observed in terms of post-game improvements in conceptual understanding or changes in the way students describe their association with content and its associated communities.

In the approach to ethics education described here, considering learning from the perspective of information or even disciplinary practices presents an immediate tension as the game is not designed to convey content or to teach players particular disciplinary practices. Instead, we imagine ethical issues in research as mundane and ambiguous in their ethical nature. Learning ethics, for this project, is thus defined as the professional, discipline-agnostic practice of reflecting on the intersection of one's own personal and professional values to better understand the complexities of decisions being made and dilemmas faced. Ethics as practiced means that it is enacted, exercised, and never reaches a final arbiter of truth. The game similarly poses dilemmas but does not resolve them; the game does not evaluate decisions as more or less ethical.

The framework developed in this paper also allows us to think about ethics education beyond the game. It points to the need to account for the inherently situated nature of ethical decision making in educational contexts. Whereas typical ethics education interventions tend to focus on particular ethical decisions (e.g. the trolley problem), we find that video games have unique potential. In particular, they allow us to present players with more realistic scenarios through more sophisticated representations of the social structures that are necessary for making sense of ethical decisions. Thinking about the nature of ethical experiences in relation to educationally meaningful experiences has brought to the fore the limitations of a model of ethics education that focuses on an individual, tasked with knowing what is right and wrong within a clearly delineated system, choosing to act appropriately. Instead, our game model assumes that learning ethics is adopting practices of reflection and deliberation, and that the meaning of ethical decision making is co-constituted, individually and socially determined.

Notes

1. <https://www.ethicsgame.com/exec/site/index.html>
2. <https://www.quandarygame.org/>
3. <http://www.koboldgames.ch/project/umed>

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