Designing Games for Moral Learning and Knowledge Building

Karen Schrier[1]

Abstract
How can we better learn about and teach moral thinking and skills? How can we solve moral problems? One possible way is to create and use moral learning games, or games that enable players to work on moral scenarios, make moral choices, and gain relevant skills. One possible subcategory of these games is moral knowledge games, or games that aim to solve real-world moral problems and create new knowledge about morality. This article systematically analyzes relevant literature and related games and media to uncover a preliminary set of design principles for creating moral learning games and moral knowledge games. Frameworks such as the Elemental Tetrad, Mechanics, Dynamics, and Aesthetics (MDA), and Ethics Practice and Implementation Categorization Framework (EPIC) were used to analyze individual games and media. Ten different categories of principles emerged, along with 95 possible subprinciples. Implications, next steps, and limitations of this analysis were also discussed.

Keywords
games, morality, learning, design, design principles, crowdsourcing

Introduction

How can we better learn about and teach moral perspectives, behaviors, and cognitive processes? How can we better solve moral dilemmas, problems, and conundrums? Understanding how people think through moral problems, solve moral

[1] Marist College, Poughkeepsie, NY, USA

Corresponding Author:
Karen Schrier, Marist College, 3399 North Road, Poughkeepsie, NY 12560, USA.
Email: karen.schrier@marist.edu

questions, respond to moral choices, and consider moral dilemmas has been researched widely in the social sciences (e.g., Sachdeva, Iliev, Ekhtiari, & Dehghani, 2015; O'Hara, Sinnott-Armstrong, & Sinnott-Armstrong, 2010; Tinghog et al., 2016), philosophy (e.g., Rini, 2015; Moosa, 2016), and other disciplines (e.g., Mayhew & King, 2008; Dickinson, McLeod, Bloomfield, & Allred, 2016), as it helps us to better learn about ourselves; societal, cultural, and individual perspectives; and our humanity. However, traditionally, we have generated new knowledge of moral behavior, thinking, skills, and attitudes by using research methodologies such as surveys, interviews, content analyses, and/or observations, along with activities such as role-playing exercises (Brown, 1994; Doorn & Kroesen, 2013) or cases and scenarios (Bagdasarov et al., 2012; Maclagan, 2003; Peacock et al., 2012).

In this article, I put forth games as an additional option for helping to teach moral-related skills and concepts as well as create new knowledge of moral behavior, decision-making, perspectives, and beliefs. I also propose an initial series of design principles for creating these types of games. I call these games "moral learning games," a category that may include games that teach moral thinking, skills related to morality, and games that involve players in solving moral dilemmas, problems, and issues. These games are distinct from games that aim to inculcate players or dictate how to behave morally or ethically. Rather, moral learning games may show players how to appropriately address specific problems, such as Post-Traumatic Stress Disorder (PTSD) or online harassment, or how to perform skills related to moral decision-making or problem-solving, such as interpretation, argumentation, or perspective-taking. Or, they may help players reflect on their own moral identities, biases, or points of view.

In addition, a possible new subcategory of moral learning games has emerged, called "moral knowledge games." In these games, rather than give players problems with "known" solutions, moral knowledge games seek to answer open questions or mysteries about morality. For instance, this type of game might ask, "how do we best respond to online harassment?" and would then gather and test responses to this question, rather than teach players how to respond to it. This type of game might query and assess how different factors affect player responses to immigration bans, rather than express a single viewpoint on immigration and have players deliberate this viewpoint.

I call these types of games moral knowledge games because they build new knowledge that does not yet exist and generate new approaches to issues and problems (Schrier, 2016b), such as by crowdsourcing perspectives and interpretations from the general public. Moral knowledge games may help social scientists understand the circumstances under which people will make certain moral decisions and what elements may change their choices. They could be used to enable large-scale human participation in real-world problem-solving of complex moral and social dilemmas, such as what to do about xenophobia, climate change, health-care reform, foreign involvement, and global poverty. These games could be used to consider how people's morality changes dynamically, given particular social contexts and communities. They can also be used to consider more quotidian moral questions

such as when to divulge sensitive information to your kids or how to best talk to a patient with an eating disorder.

As of the writing of this article, only one playable knowledge game, *SchoolLife*, has been used to better understand the real-world social problem of bullying (in addition to teaching the steps and dialogue techniques needed to better approach the problem). Most current knowledge games have been used for scientific knowledge production and problem-solving (e.g., *Foldit*, *EteRNA*, *Eyewire*). Beyond *SchoolLife*, no games have been created specifically for the purpose of moral knowledge creation; however, nondigital and digital games have been used to research ethical decision-making and moral behavior (e.g., Schrier, 2016a; Steinkeuhler & Simkins, 2008).

Like many art forms and media, such as film, books, and painting, games are increasingly being designed and used to engage audiences in moral questions and decision-making as part of the gameplay (Sicart, 2013; Zagal, 2009, 2011). For instance, the *Mass Effect*, *Dragon Age*, *Fallout,* and *Fable* series all involve aspects of moral decision-making, whereas part of the gameplay directly involves making ethical choices and then experiencing the consequences based on those choices (Staines, 2010; Stevenson, 2011). Formosa, Ryan, and Staines (2016) describe the moral themes that emerge from *Papers, Please*, a game that enables players to act as a customs inspector who decides which people to let into a fictional regime called Arstozka. Likewise, Ryan, Staines, and Formosa (2016) identify and explore the use of four "moral lenses" such as moral focus and moral sensitivity that players may use in games such as *The Walking Dead*. Other games, such as *That Dragon, Cancer,* and *Gone Home*, use strategies such as evoking emotion and building relationships with nonplaying characters (NPCs), to help players engage with morality and moral reflection (Schrier, 2015b). These games were not necessarily designed as moral learning games, though they can be used in this way to activate and support learning of moral skills and thinking processes.

Some games have been intentionally designed to teach concepts and skills related to ethics and moral learning and problem-solving, such as argumentation in *Argubot Academy* (Lloyd & van de Poel, 2008; Macer, 2008; Schrier, 2015b). *Quandary* aims to teach skills related to moral decision-making, such as interpretation, argumentation, and comparison of perspectives; whereas a primary goal of the *Mission US* series is to help middle school students develop "historical empathy" and other historical thinking skills, which are also involved in ethical decision-making (Schrier, Diamond, & Langendoen, 2010). Through moral learning games, we may be able to explore our own personal morality or express our moral identity. We may also be able to gain skills related to practicing ethical and moral thinking or solving moral dilemmas and ethical questions. There are currently few games that have been intentionally developed as moral learning games, though some "ethically notable" (Zagal, 2009) commercial off-the-shelf games may be used for ethics education, depending on the context, goals, needs, and audience (Schrier, 2015b).

I argue that we need to further develop, research, and test moral learning games. Further, I contend that we should also consider the creation of moral knowledge

games, and the use of games to collectively evaluate morality and human behavior, and solve real-world moral problems and conundrums. Can games be used not only to help us become better moral problem solvers but also help solve open moral problems? Can games motivate us to reflect more deeply on morality systems, but also to better understand human morality, and even reshape our systems? Can games create novel understandings of ethics or help solve real-world moral problems?

Many open moral questions and problems are significant for humanity and essential for us to solve. Yet, many moral mysteries are "wicked problems" (Introne, Laubacher, Olson, & Malone, 2013; Rittel & Webber, 1973) that require multiple people with different types of expertise to communicate, cooperate, and collaborate by sharing perspectives and offering novel solutions. Moreover, the reduction of grant money and research resources, coupled with the enhancement of new techniques for big data analysis and collection, suggest a pressing need for new avenues of knowledge production.

Thus, it is imperative that we understand how to better design and use games to support the learning of morality and ethics as well as moral knowledge production and the solving of open moral problems. In this article, I will review research related to moral learning games, such as using games for moral education and moral problem-solving. I will also consider research related to a new possible subcategory of games, moral knowledge games. In addition, I will posit design principles for creating these types of games. In the next section, I will begin by defining morals and ethics.

Defining Morals and Ethics

There are multiple definitions of ethics and morals—two terms that often get conflated. Typically, morals refer to "universal truths, or public rules or principles" (Tierney, 1994, p. ix) or general guidelines for how to live and behave. Wines (2008) defines morals as a code or set of principles that activates an individual's behaviors, decisions, or actions (Wines, 2008). Ethics, on the other hand, typically refer to the active, cognitive, and reflective processes related to applying moral principles to specific contexts or choices (Wines, 2008). Tierney (1994) explains that it is an "individual's response to social morality in terms of reflective engagement, valuation, and choice" (p. ix). Likewise, Meng, Othman, D'Silva, & Omar (2014) define ethics as the process by which people apply morals or as "a science which concerns the question of right and wrong in human behavior" (p. 134, quoting Lillie, 1971).

Different approaches have emerged as to how one defines a choice, behavior, solution, or attitude as ethical such as utilitarian, hedonist, Feminist, or Kantian ethics (Shafer-Landau, 2010). There are also different moral orientations that can be used to make decisions or the "perspective from which one approaches decision-making" (Levitt & Aligo, 2013, p. 195); for example, a justice-oriented approach to ethics (such as maintaining fairness and equality of resources; Botes, 2000; Glover, 2001) or one that is care-oriented (such as maintaining relationships and other people's needs; Botes, 2000; Gilligan, 1982).

This article does not privilege particular approaches, orientations or definitions and instead focuses on the general domain related to morality, character development, ethics, ethical decision-making, and social issues. Regardless of what term or approach we use (Levitt & Aligo, 2013; Schrier, 2014b), we need to be able to understand how people's approaches to ethics and morality, values used, moral orientations change dynamically depending on different situations, interactions, perspectives, problems, or experiences. All areas of humanity touch and are touched by morality, and as such, they are all potential areas for moral learning and knowledge games to explore.

The Need for Moral Education and Moral Knowledge Building

Before we can fully appreciate the need for moral learning games, we must first consider the need more generally for moral education, problem-solving, and knowledge building. While moral education and its effectiveness (e.g. Hejase & Tabch, 2012; Zgheib, 2015) or ineffectiveness (e.g., Campbell, Chin, & Voo, 2007; Kleinman, 2011) are not the focus of this article, it is a useful starting point (Ryan & Bisson, 2011).

Ethics and morals have been taught in many different fields, such as accounting (Liu, Yao, & Hu, 2012), business (Brown, 1994; Wines, 2008), counseling (Bradley & Hendricks, 2008; Levitt & Aligo, 2013), engineering (Doorn & Kroesen, 2013), hospitality (Lynn, 2010), and marketing (Celuch & Saxby, 2013), as well as in the K–12 classroom (Elliott, 2007; Paul & Elder, 2012). Moral education could include skills practice, such as learning argumentation, writing, deliberation, perspective-taking, or decision-making, or it may incorporate pedagogy related to character and civic engagement development, ethical frameworks (e.g., Kantian, deontological, utilitarian), cross-cultural studies of ethics, and comparisons of institutional versus personal ethics (Frey, 2010; Lynn, 2010; Morris & Wood, 2011). However, moral education standards or guidelines do not exist in most fields or in K–12 in general (Paul & Elder, 2012; Ryan & Bisson, 2011), even though a number of frameworks of moral development and action have been posited (e.g., Kohlberg, 1976; Narvaez & Rest, 1995; Rest, 1986).

Moral education is not a central component of K–12 public education or higher education, yet researchers have cited the need for it (Elliott, 2007; Paul & Elder, 2012). For instance, researchers point to specific "moral crises" such as a rise in plagiarism (Riemenschneider, Leonard, & Manley, 2011) as well as in accounting scandals (Floyd, Xu, Atkins, & Caldwell, 2013; Riemenschneider et al., 2011). However, there is a greater need for moral education regardless of the specific crises that occur. Moral education is essential, for instance, in supporting democratic engagement, enabling inclusive cross-cultural exchanges, and encouraging full participation in humanity (Nussbaum, 2010). It is essential for understanding everyday decisions and more complex social challenges (Kereluik, Mishra, Fahnoe, & Terry, 2013; Schrier & Kinzer, 2009; Schrier, 2015b). In other words, understanding how people think through moral decisions is not just about protecting society, stamping out immorality, or solving social ills, but it is also about finding new ways to

empathize, connect, care, give, communicate, evaluate, critique, deliberate, and be human across different cultures, contexts, platforms, times, and societies (Noddings, 2003, 2010).

Moral problem-solving, moral education, and moral knowledge building all seem to work in tandem. For instance, with effective moral education, we can be better able to address moral problems or complex social issues. By understanding the gaps or deficits in moral knowledge, we may be better able to refine moral education. By better evaluating moral perspectives and problems, we can learn how to better educate each other. We need new approaches to moral education as well as novel ways to approach moral problems. We need to innovate how we solve open moral questions or gain new knowledge about our own morality. One possible way is to use games. In the next section, I will explore the intersection among games, morality, and learning.

Intersections Among Games, Morality, and Learning

Although it may not be surprising that games are being used to "play" with morality—particularly as play has been always used to interrogate identity, connection, behavior, and selfhood, and our understanding of humanity (Salen & Zimmerman, 2003)—games are often seen as *causing* problems, rather than trying to solve and support moral problem-solving (Johnson, 2006). Moreover, games are often studied in terms of their negative moral impact (such as causing violence or addiction) rather than how they can engage players in moral decision-making, ethical thinking, or reflection on values (Schrier, 2014b).

Recently, games have started to be investigated in terms of their design as "ethical objects" (Sicart, 2009b) and as systems that use "procedural rhetoric" (Bogost, 2007) and evaluated in terms of their moral content, such as their inclusion of moral choices (e.g., Svelch, 2011), expression of moral themes (e.g., Formosa, Ryan, & Staines, 2016) or moral lenses (Ryan, Staines, & Formosa, 2016). For instance, in his book *Beyond Choices: The Design of Ethical Gameplay*, Sicart (2013) investigates the design of games for ethics, using as case studies games such as *Dys4ia*, *Fallout: New Vegas*, and *Spec Ops: The Line*. Consalvo, Busch, and Jong (2016) consider how the design of a game may affect how players respond to moral dilemmas.

A number of approaches to evaluating ethical content in games have been established. For instance, Zagal describes ethically notable games (Zagal, 2009), which are games that enable moral reasoning and reflection. Zagal (2009) explains that in ethically notable games, elements such as narrative and gameplay can spur participants to reflect on and evaluate their own ethics and ethical issues. Stevenson's (2011) framework of ethical games classifies and critiques ethics-related games and recommends ways to make them more ethically engaging. Schrier (2016a) puts forth a framework for understanding how people think through ethics in role-playing games, which includes four categories of skills and thought processes: (1) reflection, (2) information gathering, (3) reasoning, and (4) empathy. Likewise, Flanagan, Nissenbaum, Belman, and Diamond (2007) describe the *Values at Play*

methodology, which articulates how to incorporate values and social themes more intentionally into game design (see more in Flanagan & Nissenbaum, 2014).

An Overview of Moral Learning Games

What is the relationship among games, learning, and morality? Games are increasingly being investigated as effective for educational purposes (Turkay, Hoffman, Kinzer, Chantes, & Vicari, 2014; Wouters, van Nimwegen, van Oostendorp, & van der Spek, 2013; Wouters & van Oostendorp, 2017). Ke (2016) identifies two areas of learning that are often supported by games: (1) in the practice of skills such as interpretation, multiplication, literacy, or historiography and (2) domains of knowledge, such as Greek mythology or chemistry (Clark, Tanner-Smith, & Killingsworth, 2016; Ferdig & Pytash, 2014; Gee, 2003; Ke, 2016; Kulman, Slobuski, & Seitsinger, 2014; Shaffer, 2006; Squire, 2011; Werner, Denner, & Campe, 2014). In addition, games may encourage changes in affect or attitude such as enhancing curiosity for a topic (Alhabash & Wise, 2012; Squire, 2011). Such games are often labeled with overlapping and indefinite terms, such as "serious games," educational games, games for learning, games with a purpose (GWAP), or edutainment. Serious games usually refer to those that support serious purposes, such as health, education, or government needs. Any genre of game could be used for these purposes (Schrier, 2016b).

Some empirical studies have suggested the efficacy of games in education (e.g., Wouters et al., 2013; Sitzmann, 2011; Clark et al., 2016), while other studies have pointed to limitations in their effectiveness and in research methodologies used to evaluate games (Brom, Sisler, Slussareff, Selmbacherova, & Hlavka, 2016; Crocco, Offenholley, & Hernandez, 2016). More specifically, researchers have pointed out that games can potentially enhance curiosity and make a topic area more personally relevant (Egenfeldt-Nielsen, 2006; Hein, 2014; Williamson & Facer, 2004) and that games may be more effective when game mechanics are tied to learning mechanics (Plass, Homer, & Kinzer, 2015; Plass, Homer, Kinzer, Frye, & Perlin, 2011) and when learning is appropriately connected to short- and long-term game objectives (Hirumi, Appelman, Rieber, & Eck, 2010). Games have been suggested for learning a variety of topics and skills, such as emotional health education (Vacca, Bromley, Leyrer, Sprung, & Homer, 2014), literacy (e.g., Ferdig & Pytash, 2014), music education (Hein, 2014), research methods and statistics (Boyle et al., 2014), science and computer education (Bertozzi, 2014; Werner et al., 2014), and social studies (e.g., Squire, 2011; Schrier, 2014a; López & Cáceres, 2009). Likewise, teachers are increasingly using games in the classroom, and 9% reported that they use games every day, 55% reported they use games at least once a week, and 25% of respondents use games at least once a month (Groff, McCall, Darvasi, & Gilbert, 2016; Joan Ganz Cooney Center, 2014).

Games are also being specifically used in ethics and moral education (Schrier, 2015b) and to support skills and practices related to ethical and moral decision-making, character education, and prosocial learning (e.g., Sicart, 2009b; Consalvo,

2005; Koo & Seider, 2010). Beyond considering how games may indoctrinate players or students with appropriate morals, researchers have also investigated how they may support the practice of skills and processes related to moral reflection, deliberation, and decision-making. For instance, Fitz gerald and Groff (2011) tested two games (*Civilization IV* and *Diplomacy*) to understand how they support moral and cognitive development. Steinkuehler and Simkins (2008) investigated role-playing games and their use as practice fields for ethical decision-making. Schrier (2015a, 2016a) has investigated the specific ethical thinking skills and thought processes practiced in a game, *Fable III*.

While the efficacy of games to support moral education and ethic-related skills has only begun to be empirically investigated (Schrier, 2016a; Steinkeuhler & Simkins, 2008); there are a number of elements of games that suggest their potential use in moral education and problem-solving (Gilbert, 2010; Schrier, 2014b, 2015b; Zagal, 2009, 2011). For instance, games can encourage the experimentation with new perspectives, roles, and identities; enable players to make choices and adjust to different circumstances; and push the boundaries of propriety without worrying about the dire real-world consequences that could occur if taking those risks in a traditional classroom or other learning context (Paul & Elder, 2009, 2012; Schrier, 2014b). The ability to try out new moral mindsets and alternate systems of ethics also make the use of games in ethics education particularly appropriate (Consalvo, Busch, & Jong, 2016; Schrier, 2014b, 2015b).

The design principles and elements used when creating a moral learning game—and any game—are key drivers of its effectiveness. A common theme that has emerged in the literature is that the design of the game, rather than the use of a "game" itself, is more salient as to whether the game supports learning (Clark et al., 2016). For instance, the context and community around the game, and how it is designed, how content is integrated, and type of narrative, feedback, assessment, and reflection techniques used, may each contribute to a game's effectiveness (Wouters & van Oostendorp, 2017). Thus, it follows that identifying initial design principles is a useful first step to creating games not just for moral learning and problem-solving but also for engagement in real-world knowledge production.

Why Moral Knowledge Games?

Knowledge games are games with a primary aim of solving a real-world problem or issue *through* the playing a game. The problem-solving occurs in the game but is applied to the real world. These games typically create novel solutions and produce new knowledge that did not yet exist—problems that perhaps are only now able to be solved because of the game. While this article calls these games "knowledge games," they have also been called crowdsourcing games, citizen science games, human computation games, or GWAP (Prestopnik & Crowston, 2012; Pe-Than, Goh, & Lee, 2014; Schrier, 2016b; von Ahn, 2005; von Ahn & Dabbish, 2008), and no one established term has emerged. These types of games are also often conflated

with gamification; however, the process of gamifying refers to taking gamelike features (e.g., points or badges) and applying them to other contexts, such as the workplace or doctor's office. Knowledge games are games first and foremost, rather than interventions or activities with game-related features tacked onto them (Ferrara, 2013; Schrier, 2016b).

Although few knowledge games currently exist, research suggests the potential for games to contribute new knowledge and enable real-world problem-solving and, particularly, moral and ethics-related knowledge. First, games can simulate and situate real-world problems. Shaffer describes a simulation as a real or virtual representation of part of the world (Shaffer, 2006). Papert describes the "microworld," or a miniworld (possibly applied to a game) where people can push and pull on its boundaries and constraints, explores its properties, and experiences those elements that could not be felt in the real world (Papert, 1980/1993; Shaffer, 2006). Second, games can enable cooperative or collaborative playing. Problem-solving often occurs in teams because the process of solving frequently requires abilities and expertize beyond any one individual's capabilities (Hung, 2013). Third, games and human beings can work together in a way that the abilities of each are optimized (von Ahn, 2005). Computation, as Shaffer argues, "makes it possible to develop simulations that dynamically enact and reenact parts of the way we understand our world" (Shaffer, 2006, p. 65). Fourth, games can be highly motivating, which can also spur problem-solving and further engagement in the game (Eseryel, Ge, Ifenthaler, & Law, 2011).

Games do not automatically motivate problem-solving simply by the fact that they are games; however, interrelationships do emerge. Eseryel, Law, Ifenthaler, Ge, and Miller (2014) investigated the interconnections among motivation, problem-solving, and engagement in games, particularly in games focused on learning. Ryan et al.'s research suggests that maintaining motivation through a game will encourage players to continue to complete tasks and overcome obstacles (Ryan, Rigby, & Przybylski, 2006).

A key concept related to the potential of knowledge games is crowdsourcing, or the process of culling contributions from the public (Howe, 2008), or using "the collective intelligence of online communities to serve specific organizational goals" (Brabham, 2013, p. xix). Organizations have been inviting the public to participate on a variety of projects, such as voting on new clothes designs (Threadless; Brabham, 2013), tagging music scores for the Bodelian library, or searching for missing airplanes using TomNod. Moral knowledge games, for instance, may elicit moral opinions, perspectives, or approaches from its players, or may seek diverse contributions of solutions to moral problems. Games have the capability of collecting data, interpretations, and solutions at a large scale, with a multitude of voices supporting an open moral mystery. While there are few knowledge games of any type, there has been a rapid increase in the number of online (nongame) crowdsourcing projects, particularly due to changes in technological, analytic, cultural, and communication capabilities (Schrier, 2016b). As of the writing of this article, only one significant

crowdsourcing project has been related to morality—Moral Machine—a project through MIT's Scalable Cooperation Laboratory, which aims to collect from the public moral decisions around self-driving car crash scenarios.

Knowledge games are starting to be more frequently developed and used, however, particularly in the realm of STEM knowledge building and problem-solving. For instance, games such as *Foldit* enable people to fold 3-D representations of proteins and have helped identify the structure of proteins implicated in HIV—leading to new medications and methods of managing the virus (Khatib et al., 2011). In *Play to Cure: Genes in Space*, participants can play a mobile game that is ostensibly about space travel and helps to analyze breast cancer data. Other games seek to help understand how Alzheimer's works (e.g., *Sea Hero Quest*), contribute to quantum computing (e.g., *Quantum Moves* (Lieberoth, Kock, Marin, Planke, & Sherson, 2014), design new RNA molecules (e.g., *EteRNA*), or assist in analyzing cancer cells (e.g., *Reverse the Odds*).

Knowledge games have also been made to motivate other types of crowdsourcing and problem-solving, such as Tiltfactor's *Beanstalk* and *Smorball* games, which help to digitize botanical texts. A few games focus more on humanistic and social scientific knowledge and issues. For instance, teams from USC and Carnegie Mellon are working on the SUDAN game, which aims to crowdsource possible solutions to peace in the Sudan (Landwehr, Spraragen, Ranganathan, Carley, & Zyda, 2013). Only one knowledge game approximates aspects of real-world moral problem-solving—*SchoolLife*—which in one of its first iterations sought to cultivate player responses to a bullying simulation by using a mix of virtual world, dialogue interactions, and natural language processing.

As there are few knowledge games (and even fewer moral-related ones), this article serves to introduce moral knowledge games such that others can further explore their efficacy for moral knowledge building. This article is guided by the following research questions: What are possible initial design principles to use (and to further test), when creating and implementing moral learning games, and, in particular, a new subcategory, moral knowledge games?

Method

One challenge with developing a set of design principles for games is that there are no standard sets of models or frameworks. Moreover, there is no one vetted or empirically validated framework of moral education, ethical decision-making, or moral behavior (Cottone & Claus, 2000; O'Fallon & Butterfield, 2005; Rogerson, Gottlieb, Handelsman, Knapp, & Younggren, 2011) or of morality in games or virtual environments (Schrier, 2015b). There are also very few moral learning games and even fewer moral knowledge games. Thus, to elicit an initial set of design principles for creating moral learning games (as well as the subcategory, moral knowledge games), I first created an initial conceptual model of its key domains: moral education/learning, game design, and crowdsourcing. Next, using a grounded

theory approach (Corbin & Strauss, 1990), categories of primary and secondary design principles were developed, based on the terms and themes that emerged from a review of an inductive content analysis of principles found in relevant literature, games, and media from the initial domains. The design principles were compared, and an initial list was developed that can be further validated and empirically investigated. In this section, I detail this methodology.

Literature Review

I first systematically reviewed and identified all relevant studies, frameworks, and research literature on design principles related to the conceptual model (game design, moral education/learning, and crowdsourcing), knowledge games more generally, and their intersections. The resulting five new intersecting domains were as follows: (1) video games and morality, (2) games that teach morality, (3) moral education/learning, (4) knowledge games (including GWAP, crowdsourcing games, and human computation games), and (5) morality and crowdsourcing. The reason for using a number of interrelated domains, rather than reviewing only literature focused on moral learning games or moral knowledge games, is that little empirical or theoretical research on these games and their principles currently exists. Thus, these interconnected domains of literature were used to first identify a broad and inclusive set of relevant principles that could be synthesized and further studied and revised.

To find appropriate articles in the five aforementioned domains, I searched three major research databases, ProQuest, the ACM Digital Library, and Academic Search Elite (EBSCOhost) during January 2017, using the following criteria: (1) the studies or frameworks are generalizable and comprehensive (McKinley, 2015), (2) relevant to the aforementioned five domains, (3) from the last 10 years, and (4) appear in scholarly, peer-reviewed journals or proceedings.

The result was a list of 14 articles that fit the criteria. I added one additional relevant peer-reviewed article that was not yet searchable via databases due to being recently published online during the analysis process. Upon reviewing the list of principles, I also added another framework (Flanagan's Critical Play Design Framework (2009) to provide a values-conscious perspective that was missing. (Please see Appendix A with a list of the relevant search keyword queries used and literature used.)

From this, any design principle described in each article was iteratively compiled, clustered, and coded using a grounded theory (Corbin & Strauss, 1990) and inductive, qualitative approach (Wiggins & Crowston, 2012) that involved in vivo (labeling significant words) and thematic coding (Saldana, 2011). Overlapping and similar terms and phrases were grouped together and then organized into distinct categories (such as choices and consequences), which became the first round of 46 design principles and 8 categories (see Appendix B).

Game Analysis

To further revise the initial set of design principles, I also analyzed video games that fit the relevant intersecting domains: (1) video games and morality, (2) games that teach morality and ethics, and (3) moral education/learning. I used the following criteria when selecting the games: (1) ethically notable games (Zagal, 2009), (2) released in the past 5 years, and (3) effectively designed, as measured by winning an award for game design by Games for Change, a nonprofit organization that advocates and educates about games that encourage social, civic, educational, health, and emotional change. I also included one additional game—an "ethical notable" game from the past year, which also won the top prize at IndieCade.

At the time of the writing of this article, only one ethically notable or morality-related knowledge game exists. Thus, to further help in identifying design principles, all morality-related knowledge games and applications (websites, apps) that aim to crowdsource moral decisions were also included in the analysis (as based on the intersecting domains (4) and (5), as described in the previous subsection). (See Table 1 for the games and media used.)

I used a content analysis approach to inspect all games and media for design elements, content, interactions, ethical choices and decisions, and gameplay, as well as crowdsourcing techniques (if relevant). I employed five frameworks to help analyze and elicit principles from these games and applications: (1) Ethics Practice and Implementation Categorization Framework (Schrier, 2015b) to help reveal the specific ethics-related strategies and goals in the game and (2) the Elemental Tetrad (Schell, 2008) and the (3) Mechanics, Dynamics, and Aesthetics (Hunicke, LeBlanc, & Zubek, 2004) to help reveal design elements. The knowledge games and crowdsourcing applications were also reviewed using the analysis techniques described by (4) Wiggins & Crowston (2012), and heuristics for interactive media described by (5) Petrie & Power (2012). These frameworks are summarized in Appendix C.

Comparison of Principles

Once the first round of principles was generated and games and media were analyzed, the next step was to apply the principles culled from the literature review to the games and media to reveal any gaps or discrepancies. Additional elements generated from the games and media, but missing from the list of literature review principles, were analyzed using in vivo and thematic coding (Saldana, 2011), and compiled and consolidated for repetition. Terms that were irrelevant or not generalizable were discarded. The additional principles from the game and media (second round) were then compared to the principles from literature (first round) and iteratively consolidated until a final set of 95 principles and 10 categories of principles

Table 1. Games and Media Analyzed.

Title	Designer/Developer (Date)	Summary
Life Is Strange	Dontnod Entertainment/ Square Enix (2015)	An interactive narrative-based game that takes the player through the life of a teenage girl and the series of choices she faces
That Dragon, Cancer	Numinous Games (2016)	A game created by the parents of a boy who died from cancer, which explores illness, care, grief, loss, and family
1979 Revolution: Black Friday	iNK Studios (2016)	An interactive narrative-based game that takes the player through the choices of a photojournalist in Iran around the 1979 Revolution
SchoolLife	Giant Otter (Beta 2013; paid version, 2016)	A game that aims to crowdsource reactions and responses to bullying scenarios and use this to teach players empathy and ethical decision-making skills
Quandary	Learning Games Network/Fablevision (2012)	Players make decisions for a colony on a new planet
Mission US: A Cheyenne Odyssey	Channel 13/WNET, Electric Funstuff (2014)	Players play as Little Fox, a Northern Cheyenne boy who experiences tensions due to expansion and industrialization
Moral Machine	MIT/Stanford (2015)	Participants decide how to approach moral dilemmas related to self-driving cars
Papers, Please	Lucas Pope/3909, LLC (2013)	Participants act as a border inspection agent
Gone Home	Fullbright (2013)	Participants explore a house filled with objects and memories
Way	Coco & Co. (2011)	Participants collaborate to solve problems nonverbally
Unmanned	Mollendustria (2010)	Players experience vignettes from the life of a person manning drones
Spent	Urban Ministries of Durham/McKinney (2011)	Players make choices as to how to spend money over the course of a month in the life of someone struggling financially

emerged. (See Table 2 for the final list of categories and Appendix D for the full list of 95 subprinciples.)

Results and Discussion

A review and analysis of literature from relevant domains resulted in a list of 46 possible design principles that were organized into 8 different categories. Next, this first round of 46 principles was applied to 12 different games and media to further

Table 2. Design Principle Categories.

1. Support problem-solving activities
2. Enable appropriate choices and consequences
3. Provide appropriate constraints and rewards
4. Support social interactions, community, and communication
5. Provide opportunities for personalization and expression
6. Enable teaching and training
7. Support accessibility and authenticity
8. Provide appropriate story, dramatic, and narrative elements
9. Ensure accuracy and validity
10. Be morally conscious and critical

validate these principles. (A number of principles related to the development process could not be confirmed, for instance, "designers verify values and goals through iterative playtesting," which are marked as N/A on the table; however, principles that relate to the resulting gameplay, interactions, and goals were validated through the analysis of the game.) The principles that were most frequently applied were "game enables a balance of information and information gaps," "players can make decisions," "game provides appropriate boundaries," "players with different skill levels are supported," and "the interface and game environment are accessible and open to as many people as possible within reason," which each could be applied to all of the 12 games analyzed. After the first round of principles were applied, a second round of additional terms were elicited, compared, and grouped into categories. The resulting list from literature, games, and media includes 10 categories and 95 principles (see Appendix D). For instance, the main categories that emerged includes, "provide appropriate story, narrative, and dramatic elements," which includes principles such as "game provides episodic moments; scenarios or scenes," and "game enables expression of emotions." Some principles could be applied to multiple categories but were placed in the primary category for the purpose of this study.

The resulting list of initial design principles do not all need to apply to every moral learning game or moral knowledge game—in fact, some principles directly contradict each other, such as whether to enable the iteration of solutions, the extent to which choices should be "open-ended" or clear-cut, or which types of rewards to use. Rather, they are initial principles to consider when creating moral learning games or moral knowledge games, based on literature and games in the intersecting domains of moral education, game design, and crowdsourcing. Some of the principles identified, such as the ones related to the category "ensure accuracy and validity," may not apply to a moral learning game, but would be relevant to a moral knowledge game, for instance. And, many of the principles that emerged could be applied to other types of games as well. Therefore, designers should carefully consider the context, audience, goals, constraints, and content of a potential game, alongside these initial design principles.

Ten Main Categories of Principles

In this section, I review the 10 main categories of principles that emerged based on the literature review and analysis of games. These design principles are preliminary and should be empirically tested to understand their relationship with the effectiveness of moral learning and knowledge games.

Support problem-solving activities. When creating moral learning and knowledge-making games, provide opportunities for players to solve problems, particularly ones related to moral issues. This includes all steps of problem-solving, such as information gathering and reasoning, sorting opinions from facts, collecting items and notes that can be revisited, and providing evidence for one's choices or solutions. Moreover, games are inherently connected to problem-solving, as aiming to win a game is a type of problem to be solved (Schrier, 2016b). For example, educational game *Quandary* more explicitly takes players through the steps of solving problems, such as what to do about a predator. Players can choose from among three possible solutions—trapping them, poisoning them, or building a fence. Players (who are acting as a leader of a new civilization) can cycle through the solutions by first gathering and sorting opinions, possible solutions, and facts from the citizens. They can then explore how each citizen responds to two of the solutions, and they can then decide which solution makes the most sense based on the perspectives heard. Players need to provide evidence for and against their solution.

Another key aspect to consider is the extent to which participants can repeat or replay scenarios to try new choices and experience their consequences. Some researchers argue that choices should be immutable, and players should be "stuck" with the consequences (Sicart, 2010). For instance, *1979 Revolution*, a game about the Iranian Revolution, forces players to quickly make choices and stick with them. Other games have enabled participants to iterate through possible consequences, readdress new solutions, replay scenarios or repeat rounds, or retest choices and their results. For instance, *Life Is Strange* often enables players to experience consequences and then rewind back through scenes and dialogue to replay the scenario with potentially new or different choices. Moral Machine invites participants to replay the car accident scenarios to see whether new moral identities or patterns emerge.

Enable appropriate choices and consequences. Alongside providing opportunities to engage in moral problem-solving, players also should be able to make choices or decisions related to morality-related problems or scenarios. For instance, players should be able to experience or observe in-game consequences based on their choices. While the decisions should matter and be relevant, the consequences of a particular choice should not be personally dire. Choices should not necessarily be correct or incorrect, but may be morally ambiguous (as in, it is unclear what the "best choice" is), or more or less morally appropriate (Sicart, 2010). The extent to which

choices should be open or constrained is dependent on the needs of the game. For instance, in *1979 Revolution* and *Life Is Strange*, limited dialogue choices are provided, though you can sometimes choose not to speak (which is itself a choice that has preconceived consequences). Consequences have already been predetermined by the designers and need to be controlled such that the scope of the game does not exceed capacity. However, in *SchoolLife*, the designers aimed to enable players to respond creatively and openly to the dialogue prompts, such that they could collect and analyze a variety of human responses to the scenario. Game designers that seek to build our understanding of human morality may want to provide entirely open choices, dialogue, or options to ensure a diversity of opinions; or they may want to constrain or reward certain paths to ensure less predictable perspectives or solutions.

Provide appropriate constraints and rewards. Like any well-designed game, designers should carefully consider how to appropriately provide constraints and freedoms and risks and rewards. For instance, a variety of pressures and rewards should be used depending on different players' personal interests, motivating factors, and rationales for playing the game (Yee, Dicheneaut, & Quantic Foundry, 2016). For instance, some people are motivated by leaderboards, rankings, and points, whereas others are more interested in unlocking more scenarios, story lines, or gaining recognition for contributing to human knowledge; some are motivated by achievement, and others by social connection (Yee, 2006; Yee et al., 2016). For instance in *Quandary*, players receive points for completing tasks like providing evidence for an argument, sorting opinions from facts, gathering information on perspectives, and interpreting evidence. However, they do not receive points for their specific solution—just how they interpret and use evidence to support it. Players also unlock new episodes upon completion of the tasks and decision. Enabling and even rewarding alternate pathways, solutions, and possibilities may also be useful, to overcome functional fixedness or the tragedy of the commons in terms of how a problem or dilemma is solved (Schrier, 2016b). For instance, *Mission US: Cheyenne* has a number of badges that players can earn based on their interactions with NPCs, such as bravery, generosity, wisdom, and craziness. There are multiple ways to solve each problem or approach a social interaction, and based on these choices, players can earn advances toward these badges, which can later unlock certain options or story lines. In addition, players can earn skill badges (archery, guns, horse) and unlock episodes of content as they move through the game.

Another key question is the extent to which typical game tropes and mechanics are used, such as fighting, running, or stealth (either for metaphoric purposes, as in *That Dragon, Cancer*; or to provide more authenticity, such as in *1979 Revolution*). Finally, many of the games reviewed did not have clear "win" states or conclusions. There may have been more than one ending or possible outcome, an incomplete ending, or even an ending that felt futile or unfinished. Thus, game designers may also want to consider how to calculate, assess, measure, and reward particular moral choices, perspectives, and behaviors beyond using "moral accounting" or

mathematical models of "good versus evil" (Bogost, 2007; MacGregor, 2017; Melenson, 2011), and instead reward moral ambiguity and openness, or use other alternate models of communal moral verification or deliberation.

Consider how to support social interactions, communities, and communication. Another important consideration is the interpersonal and communication component to these games. Designers need to decide the extent to which players work together, and if so, how they work together, how a player community may emerge and be managed, how players may communicate with each other and the designers, and how the game is discussed or shared with others. For instance, in *Way*, players can only nonverbally gesture to each other but must cooperate to be able to solve puzzles in a shared platformer game (Schrier & Shaenfield, 2015), which may lead to a variety of moral decisions and questions.

Designers may also want to consider how players receive feedback on their decisions and moral expressions, particularly in relation to the community of other players. For instance, at the end of each episode in *Life Is Strange*, players can see how their moral decisions compare to the community's decisions (in aggregate). Likewise, after making decisions for 13 rounds of scenarios in Moral Machine, participants can learn how they compare to the community on a number of metrics related to moral decisions and car crashes, such as how frequently they saved the self-driving car and its passengers.

The interpersonal aspects of the game itself are also important to consider. Games may enable perspective-taking, opportunities to empathize with and/or take care of characters/NPCs, and occasions to deliberate or engage in dialogue with others (including NPCs; Belman & Flanagan, 2010). Games may also be designed such that players can build relationships, such as friendships with others (like NPCs), and these relationships may even dictate the choices, pathways, and information that players get. For instance, in *Mission US*: Cheyenne, players can decide which of two male NPCs would be a better suitor for their in-game sister based on interactions with them; in *1979 Revolution*, how you treat your brother (an NPC) or other characters affects certain story lines, choices, and interactions. Some games may even enable players to embody multiple perspectives; in *That Dragon, Cancer*, players sometimes play as the boy who has cancer, sometimes as the dad or mom, and sometimes, it is unclear whose mindset is inhabited.

Provide opportunities for personalization and expression. Providing opportunities for players to personalize their experience, and express and experiment with their moral identities can also be useful in motivating players, making the play experience more meaningful; the design of the game may even spur players to try out moral mindsets very different from their own (Consalvo et al., 2016). Designers should consider whether players are able to customize play spaces, play modes, or avatars. *Quandary* has only limited choices in terms of an avatar, whereas constrained narrative-driven games such as *Life Is Strange*, *Revolution 1979*, *Mission US*, *That Dragon, Cancer*

have set characters, story lines, avatars, and perspectives with voice actor-driven dialogue and/or inner monologue.

A player having a personal impact on a game—whether by feeling like one is making a real-world change, being able to authentically express one's moral identity, taking photos or other creative media, and/or being able to design and modify parts of the game—can also be highly motivating. For instance, *Life Is Strange* and *1979 Revolution* include taking photos as a primary game mechanic and also as a means of incorporating a personal take or perspective on the events that unfold in the game. The photographs can also serve as personal reflection devices (Schrier, 2015b), which can help the player consider and reconsider key moments and decisions from the game. Diary entries and other collected items and souvenirs can also serve this purpose as well. Moments of personal reflection, reconsidering decisions, and the ability to share one's perspectives on why one made certain decisions is also useful for learning about how people make decisions, as well as personal growth and learning (Merriam, 2004). For instance, *Life Is Strange* enables players to have quiet, reflective moments in the game, such as when the avatar (Max) sits on a bench and looks around; Max also introspectively shares her "inner dialogue" (de Miranda, 2016).

Moral Machine and *SchoolLife* each enable direct, personal impact on real-world problem-solving. For instance, participants of Moral Machine are contributing real perspectives on a possible problem related to self-driving cars and moral choices. Being able to explore and freely roam around a fantasy world, and create one's own personal narrative of the experience, is also effective, as in the case of *Gone Home.*

Enable teaching, training, support, and scaffolding. Providing training—whether by using NPCs or mentors that model behavior or just-in-time reminders, nudges, or cues—is also an effective strategy for creating moral learning and knowledge games. Players should be ultimately able to complete the tasks autonomously with limited support or guidance. The player should be able to progress content, complexity, and difficulty over time, with appropriate scaffolding or boundaries taken away or adjusted as players learn what they need to learn. For example, *Way* enables players to mentor and guide each other through a mixture of gestures, emotions (via emoji buttons), and movement (Schrier & Shaenfield, 2015). In *Mission US*, vocabulary words are highlighted and definitions can be accessed and collected to enable students of all reading comprehensions levels to engage with the game and its dialogue.

One of the most important characteristics of a knowledge game is being able to bring novices up to speed quickly such that they can collaborate with experts, or at least be on the same problem-solving playing field (Schrier, 2016b). Participants should also be able to actively learn and ask questions or find answers they need to be able to solve real-world problems and participate and contribute effectively alongside researchers and other professionals.

Support accessibility and authenticity. Elements that provide authenticity and veracity to the experience are also effective. The connections among the game and with real-life counterparts should be clear. Some ways to support this are by including normal, everyday issues and interactions in the game—even ones that are banal or quotidian—because they add to the feeling that the game is realistic, and therefore, should be judged, evaluated, interpreted, and considered with serious engagement and through using real-life moral decision-making skills and processes (Zagal, 2012).

For instance, *That Dragon, Cancer, Papers, Please*, and *1979 Revolution* use authentic audio, dialogue, letters, actions, or photographic content to create a fantasy world with real-world connections. Games do not need to be completely realistic, however, to feel authentic. In *That Dragon, Cancer*, much of the gameplay is metaphoric (e.g., at one point, the player plays as a child in an arcade-style battle with a dragon to represent the real child, Joel, trying to battle cancer), but the perspective feels authentic because it was created by the parents of the child, and incorporates their actual voices, memories, and the real-life events that took place during their child's illness, death, and the aftermath of their loss.

Likewise, Moral Machine uses a cartoon style to represent people and cars. It incorporates universal symbols of "person" and "car" rather than photorealistic versions, which may serve to make it more accessible and digestible, such as to those who do not speak English. Accessibility is a key aspect of authenticity, as being authentic also means being accessible to many different people and a variety of abilities and needs, as well as being engaging and open to a variety of play styles, languages used, and ways of communicating. For instance, *Way* is accessible globally because players do not need to know any particular language to be able to play it—the gestures, emotions, and movements used are universal and can be used by anyone to teach and to learn how to play. The use of a "universal language" of emotions and nonverbal cues in *Way* also adds to its authenticity, even though the game itself is unrealistic and set in a fantastical world, and includes gameplay such as jumping on invisible platforms and avoiding spikes.

Provide appropriate story, dramatic, and narrative elements. Story and dramatic elements are also integral to some types of moral learning and knowledge games, particularly ones that center around scenarios and dilemmas. Designers should consider which types of storytelling to use, depending on the needs of the game. For instance, should storytelling occur mainly through environmental exploration, such as with *Gone Home* or primarily through character interactions, such as with *Life Is Strange* or *Mission US*? Game designers may also use multiple types of narratives, such as embedded, emergent, and interpreted (Ralph & Monu, 2014). For instance, *Unmanned* tells the story of a drone pilot both through playable moments in his life (such as shaving or playing a war video game), as well as through dialogue choices. The use of rising tension and climactic experiences, music, audio, and sound effects, as well as voice talent can engage players further in a story or scenario and provide

additional tone or mood. Art styles and aesthetic aspects, and how they support scenarios, character development, and storytelling, should also be considered.

In addition, designers should decide whether interactions in games will be based on realistic issues and exchanges, or whether metaphoric interactions or symbols should represent real-life interactions and concepts.

Ensure accuracy and validity. One of the more important elements of knowledge games, which may not be as important in a morality-related or ethically notable learning game (Zagal, 2009), is the need to ensure accuracy and validity when collecting, interpreting and integrating people's contributions, choices, opinions, perspectives, and viewpoints. In addition to designing engaging and appropriate gameplay, knowledge games in particular need to be vetted and tested to make sure they are measuring what they seek to measure and solving the problems they seek to solve. Knowledge games also need to be transparent as to any limitations or issues with accuracy and validity. One way to validate data contributed or solutions offered in a moral knowledge game is to ask similar or the same scenarios or questions to the same people multiple times and/or to different people, and to randomize the conditions and scenarios provided. This is akin to designing research protocols to reduce biases—although biases cannot altogether be eliminated. For example, Moral Machine invites multiple participants to respond to a randomized set of scenarios, each of which multiple different people receive, to compare results. Values-conscious and critical design, as described in the next principle, is essential for reflecting on and exposing the types of biases and values that are inscribed in a particular design (Deng, Joshi, & Galliers, 2016; Flanagan, 2009).

Moral learning games may also need to ensure accuracy and validity, but in terms of the content, approaches, and skills they are teaching and training. In other words, are these games teaching what they aim to teach and are players learning, growing, and expressing in ways that the designers intend? Learning goals do not necessarily match outcomes, despite the best intentions. For instance, when analyzing *Spent*, researchers found that although a key goal was teaching players to empathize with people who are poor, for many players, the opposite occurred, and they instead developed less compassion and empathy for those who are struggling financially (Roussos & Dovidio, 2016).

Be values-conscious and critical. While it is difficult to ascertain, by analyzing the end product of a game, whether its designers have used a critical design process, this is an important consideration for designers of moral learning and knowledge games. Much of these design principles proposed in this category stem from Flanagan's critical design framework (Flanagan, 2009; Reid, 2015). Developers need to set clear design goals and value goals, continually reevaluate progress on these goals and must examine how their design affects and influences values in every step of the design process. Moreover, however intentionally designed, the resulting culture and knowledge created through and around a game should be continually reexamined to

ensure it is inclusive and respectful, supports and empowers the player, and enables a secure, private but expressive space for play. Design decisions and results should be transparent, open, and negotiable, and designers should be continually responsive to their players and encourage feedback.

Conclusion and Next Steps

Learning about and creating new knowledge of morality is essential. One way to learn about and seek new knowledge of moral behavior, perspectives, and cognition is through the creation and use of games. Moral learning games, for instance, enable players to gain skills, concepts, and behaviors associated with morality, such as being able to better think through moral dilemmas and choices. An important new subcategory, moral knowledge games enable real people to work on real-world moral problems and/or to share their moral decisions, such as through crowdsourcing and other techniques. Although few moral knowledge games have been created, knowledge games have been used in other domains (such as science research), suggesting a possible new use for moral knowledge production. The literature from relevant domains, such as games, learning and crowdsourcing, has suggested that design is a key component to a game's effectiveness. Thus, I reviewed relevant literature and related games and media to uncover design principles that could be used to create future moral learning and knowledge games.

Based on the literature review and analysis of games, and comparison of the resulting principles from each, a final set of 10 categories of principles and 95 specific design principles emerged, which should be further investigated to understand their connection to engaging players, supporting learning, and/or producing new moral knowledge. *Designers* may want to consider these principles when creating moral learning games, moral knowledge games, other types of knowledge games, and other types of learning games and problem-solving games. *Researchers* can use these principles to help them innovate their approaches to investigating real-world moral mysteries and other open moral questions. They can also use these principles to critique, compare, and validate future moral learning and knowledge games. Finally, *educators* may want to consider how these design principles may (or may not) translate to other learning and knowledge-making activities as well as use them to determine which future learning games and knowledge games are suitable for classroom activities.

There are a number of limitations to this analysis. First, there are few moral learning games (and even fewer knowledge games) as well as limited empirical research on their efficacy and no vetted frameworks as to their design and use. Therefore, design principles were uncovered from a number of related and intersecting domains. Moreover, the pragmatic, logistical, privacy-related, legal, data analysis, and moral implications of moral learning games and knowledge games have not be fully considered (Schrier, 2016b), nor do we entirely understand how the design of a game's system may influence moral thinking, or whether games can

suitably approximate real-world moral interactions enough to teach moral skills or build actionable knowledge (Consalvo et al., 2016). Although a critical design practice can help to maintain transparency, appropriateness, and empowerment, there may be interactions or uses of these games that emerge that were not expected. Only through iteratively creating, using, and evaluating these games over time may these issues emerge. So, while the possibilities for learning and understanding more about morality through games is limitless, so too are the moral issues that can arise. Knowledge without humanity lacks purpose; true wisdom requires human values and morality.

Future studies should aim to empirically test the proposed game design principles, investigate the circumstances by which moral learning and knowledge games are effective, and continue to explore the types of problems and questions that these games can consider. Moreover, humanistic, social, ethical, cultural, and intimate approaches to evaluating moral learning and knowledge games are also necessary. For instance, games may computationally and technologically enable the large-scale public participation and the generation of dynamic data sets needed to more effectively solve open moral problems or build new knowledge. But it is the poetic and expressive aspects of games that make this new knowledge meaningful and humane.

Appendix

Appendix A. Chart of Literature Reviewed and Search Terms Used.

Name of Author	Search Terms Used
Sicart (2010)	Morality & games
Lankoski (2013)	Morality & "Video games"
Siu & Reidl (2016)	Design & "Games with a purpose"
Poesio, Chamberlain, Kruschwitz, Robaldo, and Ducceschi (2015)	Design & "Games with a purpose"
Flanagan (2009)	Added afterward
Schrier (2016a)	Added due to being late-breaking and not searchable yet
Narvaez (2006)	"Moral education" & design
Berkowitz & Bier (2007)	"Moral education" & design
Sicart (2009a)	Morality & "video games" & "design"
Mah, Taylor, Hoang, and Cook (2014)	Morality & Learning & "Design principles"
Konstantinidis, Tsiatsos, and Pomportsis (2009)	Teaching & morality & "Design principles"
von Ahn & Dabbish (2008)	Design & "Games with a Purpose"
Dulacka (2012)	Design & "Games with a Purpose"
Mayhew and King (2008)	"Moral education" & design
Pe-Than, Goh, and Lee (2014)	"Crowdsourcing games" & design
Deng, Joshi, and Galliers (2016)	Crowdsourcing & Ethics

Appendix B. Round One Design Principle Categories From the Literature Review.

1. Provide appropriate constraints and rewards
2. Enable appropriate choices and consequences
3. Support social interactions, community, and communication
4. Provide opportunities for personalization, expression, and identity
5. Enable teaching and training
6. Support accessibility and authenticity
7. Ensure accuracy and validity
8. Be morally conscious and critical

Appendix C. Frameworks Used.

Framework Name	Citation	Summary
MDA Framework (Mechanics, Dynamics, and Aesthetics)	Hunicke, LeBlanc, and Zubek (2004)	The MDA framework describes how game designers establish the components of the game, including the rules, goals, and mechanics (actions in a game). These in turn create dynamics, which inspire particular aesthetics, such as one's emotional responses to the interactions in the game (Hunicke, LeBlanc, & Zubek, 2004; Ralph & Monu, 2014).
Elemental Tetrad	Schell (2008)	There are four components to the Elemental Tetrad (mechanics, aesthetics, story, and technology). For instance, mechanics are defined by Schell as being things like space, objects, actions, points, timers, chance rules, and skill.
EPIC (Ethics Practice and Implementation Categorization Framework)	Schrier (2015b)	Schrier developed the EPIC (Ethics Practices and Issues Categorization) framework to help teachers select and appropriately use games for teaching ethics in the classroom, such as those that incorporate particular educational strategies (Schrier, 2015b). For instance, games that incorporate "choice and consequences, or "clear ethical choices and decision-making, which have differing effects on the game play," (Schrier, 2014b) could be integrated into a module about making ethical choices related to friendships, and reflecting on the consequences of those decisions.

Appendix C (continued)

Framework Name	Citation	Summary
Categories of heuristics	Petrie & Power (2012)	This list of guidelines or heuristics of websites includes four major categories: physical presentation, content, information architecture, and interactivity.
Citizen science analysis	Wiggins & Crowston (2012)	While this is not a framework per se, it is a general set of processes for evaluating web-based citizen science/crowdsourcing projects and understanding their dynamics and mechanics.

Appendix D. Final Set of Design Principles From Literature, Games, and Media.

Final Set of Design Principles	Representative Games
Support problem-solving tasks and processes	
Players can collect items, opinions, and diary entries	*Life Is Strange; 1979 Revolution*
Players can compare perspectives, opinions, and/or arguments	*Quandary*
Players can provide an argument or perspective	*Quandary*
Players can gather and seek out more information	*Mission US; Revolution 1979*
Players can reason through decisions	*Quandary; Mission US; Life Is Strange*; Moral Machine
Players can propose solutions to problems	*Quandary*
Players can iterate, replay, or retest solutions	*Life Is Strange*; Moral Machine
Players cannot iterate through solutions	1979 Revolution
Enable appropriate choices and consequences	
Game provides choices that are open ended	*SchoolLife*
Players have opportunities to make choices	*Revolution 1979*; Moral Machine
Game is a responsive, ethically relevant world where decisions matter	*Revolution 1979; Life Is Strange*
Players can follow rules or not follow rules; act or not act; lie or not lie	*Papers, Please*
Players can consider consequences alongside earlier decisions and/or revisit past decisions	*Revolution 1979; Life is Strange*
No decisions are incorrect, just different or less or more moral	Moral Machine
Game provides some unpredictability and randomness of consequences and/or choices	*Papers, Please*; Moral Machine
Players can experience consequences and/or solutions	*Life Is Strange; Revolution 1979*

Appendix D (continued)

Final Set of Design Principles	Representative Games
Moral choices are constrained; such as based on previous choices, skills, actions, decisions, and or abilities; or by story elements or dialogue options	*Life Is Strange; Mission US*
Players experience different consequences and/or outcomes based on decisions	*Life Is Strange; Revolution 1979*
Players can create and/or share their own rules or guiding moral principles	Moral Machine
Consequences are not dire in real life; such that players can experiment with and express choices without real-world personal consequences	*Life Is Strange; Papers Please*
Choices are unclear in whether they are "good" or "bad"	*Quandary*; Moral Machine
Provide appropriate constraints and rewards	
Game rewards different types of (even less predictable) paths, processes, or scenarios	*Mission US*
Choices are constrained and/or expanded to ensure a variety of perspectives	*Quandary*; Moral Machine
Game provides a balance of information and information gaps	*Revolution 1979; Papers, Please; Quandary*
Players can receive multiple types of rewards (personal, social, financial), such as leaderboards, rankings, badges, points, story lines, or citations	*Quandary*; *Mission US*
Game offers different types of social and physical pressures or constraints, such as time, social, competition, multitasking, weighing multiple factors, and consider how it may affect play	*Way*
Game provides appropriate boundaries (physical, ludic, social)	*Mission US*
Game enables clear goals but no clear "win" state	*1979 Revolution; That Dragon, Cancer*
Support social interactions, community, and communication	
Players can mentor others on how to act	*Way; Mission US*
Game enables and models relationships, such as friendship and/or romantic interactions, both real and virtual	*Life Is Strange; Mission US*
Players can provide feedback on individual morality in relation to the community	*Life Is Strange*
Game enables appropriate communication among players, as well as with designers/researchers	Moral Machine
Players can participate in a community within and around the game	Moral Machine; *SchoolLife*
Game is shareable and/or is integrated with social media	Moral Machine

(continued)

Appendix D (continued)

Final Set of Design Principles	Representative Games
Game includes natural language processing so participants can communicate as they want to rather than choosing scripted or predetermined choices	*SchoolLife*
Players can engage in deliberation; dialogue and/or dialogue choices with others	*Mission US; Life Is Strange; Revolution 1979*
Players can exchange perspectives; engage in perspective-taking	*Quandary; Unmanned; That Dragon, Cancer*
Game has multiple player options—such as collaborative or competitive—if appropriate	*Way*
Players can take care of others (real or virtual)	*Revolution 1979; Way; That Dragon, Cancer*
Players can listen to others (real or virtual)	*Life Is Strange; Revolution 1979; That Dragon, Cancer*
Players can touch others/have "physical" interactions with NPCs or other players in the game	*That Dragon, Cancer*
Players can persuade people to change their perspectives	*Quandary*
Character relationships affect types of information, choices, and/or opportunities received	*Mission US; Quandary*
Players have opportunities to empathize with and/or be compassionate toward other characters	*That Dragon, Cancer; Life Is Strange; Revolution 1979*
Provide opportunities for personalization, expression, and identity	
Players can customize and personalize game experience, such as different play modes or how an avatar looks	*Quandary*
Players feel like they are making an impact, real-world change	Moral Machine; *SchoolLife*
Players can express their moral identity or personal perspectives, through an avatar or more directly	Moral Machine; *Life Is Strange; Revolution 1979*
Players can engage in moments of introspection or sharing of inner thoughts	*Life Is Strange*
Players can engage in creative expression through making photos, images, sound, text, or other media within and around the game	*Life Is Strange; Revolution 1979*
Players can explore a fantasy world, which may or may not be based on the real world	*Gone Home*
Players can design one's own games, scenarios, or modifications	Moral Machine; *SchoolLife*
Players can contribute personal information about their real-life selves (such as demographic)	Moral Machine

Appendix D (continued)

Final Set of Design Principles	Representative Games
Players can develop one's own identity or role over time	*Mission US; Quandary*
Players can reflect on previous decisions, gameplay, or interactions and/or to provide further feedback on why they made certain decisions	*Mission US; Life Is Strange;* Moral Machine; *SchoolLife*
Enable teaching and training	
Game provides mentoring assistance, support and feedback throughout the play experience	Mission US
Game has agents or NPCs that model behavior or embody perspectives	*Quandary; Revolution 1979*
Players are supported to become autonomous and able to self-regulate	*Way*
Players with different skill levels, from novices to experts, are supported	*Way; Quandary*
Players experience a progression of growth and/or complexity over time	*Papers, Please*
Players are encouraged to participate in active learning	*Way*
Players are encouraged to ask questions	*SchoolLife*
Players receive meaningful feedback and nudges (just in time) on decisions, actions, and choices	*Way; Mission US; Quandary*
Support accessibility and authenticity	
The interface and game environment is accessible and open to as many people as possible within reason	*Mission US*; Moral Machine; *Way*
Designers consider how gameplay affects realism and authenticity	N/A
Designers are responsive to and look for ways people may cheat the system or use it for ways that were not intended	N/A
Game is inclusive and invites multiple perspectives and approaches	*Mission US;* Moral Machine
A safe, secure, private community and experience are provided	*Mission US; Quandary*
Designers are transparent with design decisions and values and how the environment and choices impact values	N/A
Designers playtest with diverse audiences	N/A
Game uses real/realistic dialogue, voices, or authentic written, text, and/or photographic content	*Revolution 1979; Mission US*
Game includes everyday/quotidian interactions that are not necessarily morally notable	*Life Is Strange*

(continued)

Appendix D (continued)

Final Set of Design Principles	Representative Games
Game includes in-game interactions that typically map to real-life interactions	*SchoolLife; Life Is Strange*
Game includes elements related to the passing of time and/or options to wait or be under time pressure	*Mission US; Life Is Strange; Revolution 1979*
Game uses accessible/universally understandable symbols, cues, and/or is open to multiple languages or nonverbal communication	*Way*; Moral Machine
Game includes real-life or realistic decisions, actions, or scenarios	Moral Machine
Provide appropriate story, dramatic, narrative elements	
Game provides episodic moments; scenarios or scenes	*Life Is Strange; Quandary; That Dragon, Cancer*
Game provides storytelling through character interactions; dialogue	*Life Is Strange; That Dragon, Cancer, Mission US; Revolution 1979*
Game provides storytelling through environment exploration	*Gone Home*
Game includes dynamic tension and climactic experiences	*That Dragon, Cancer; Life Is Strange; Gone Home; Revolution 1979*
Game enables expression of emotions (through characters or players)	*That Dragon, Cancer; Mission US*
Game uses music, audio, and sound effects to support mood or decisions	*Life Is Strange; Revolution 1979*
Game uses objects/visuals to represent abstract concepts; consider how visuals help tell the story	*That Dragon, Cancer*
Game uses interactions to represent real-life interactions	*That Dragon, Cancer*
The story in the game is told through exposition	*Quandary; Mission US;*
Game uses (and possibly subverts) game tropes, like fighting	*That Dragon, Cancer*
The story in the game is told through gameplay	*Revolution 1979; Papers Please*
Ensure accuracy and validity	
Game is as robust, flexible, and as error free as possible	All games reviewed
Designers develop and test a playable prototype throughout the process—sometimes for accuracy, sometimes for design and engagement	N/A
Game repeats and provides content or questions multiple times to different people or the same people to see different responses or to validate information or judgments	Moral Machine

Appendix D (continued)

Final Set of Design Principles	Representative Games
Game randomizes scenarios, questions, or other content	Moral Machine
Be morally conscious and critical	
Designers verify values and goals through iterative playtesting	N/A
Designers develop rules and constraints that support desired values	N/A
Designers ensure that any knowledge produced or solutions created through the game are used and applied ethically and morally	N/A
Designers cultivate a culture of respect for others in and though the game, where people act responsibly and respectfully	N/A
Designers support and ensure player empowerment, dignity, and fairness	N/A

Note. N/A (not available) refers to the lack of information available as to whether the designers of the 12 games/media analyzed in this study used this particular design principle when creating them. Arguably, we cannot infer whether *any* of the 95 design principles were purposely used and applied during the design process. However, we can hypothesize whether most of these principles were implemented by analyzing the end product of the game. On the other hand, we cannot identify which principles were used by the designers in the *process* of making the game since these do not necessarily appear in final iteration of the game. For instance, through analyzing a game, we cannot determine whether designers playtested the game beforehand, tested for accuracy and design, aimed to ensure player empowerment, or set value goals. MDA = Mechanics, Dynamics, and Aesthetics; NPC = nonplaying character.

References

Alhabash, S., & Wise, K. (2012). PeaceMaker: Changing students' attitudes toward Palestinians and Israelis through video game play. *International Journal of Communication*, 6, 1–20.

Bagdasarov, Z., Harkrider, L. N., Johnson, J. F., MacDougall, A. E., Devenport, L. D., Connelly, S., ... Thiel, C. E. (2012). An investigation of case-based instructional

strategies on learning, retention, and ethical decision-making. *Journal of Empirical Research and Human Research Ethics*, 7, 79–86.

Belman, J., & Flanagan, M. (2010). Designing games to foster empathy. *Cognitive Technology*, 14, 5–15.

Berkowitz, M. W., & Bier, M. C. (2007). What works in character education? *Journal of Research in Character Education*, 5, 29.

Bertozzi, E. (2014). Using games to teach, practice, and encourage interest in STEM subjects. In K. Schrier (Ed.), *Learning and education games volume one: Curricular and design considerations* (pp. 23–36). Pittsburgh, PA: ETC Press.

Bogost, I. (2007). *Persuasive games: The expressive power of videogames*. Cambridge, MA: MIT Press.

Botes, A. (2000). A comparison between the ethics of justice and the ethics of care. *Journal of Advanced Nursing*, 32, 1070–1075.

Boyle, E. A., MacArthur, E. W., Connolly, T. M., Hainey, T., Manea, M., Kärki, A., & van Rosmalen, P. (2014). A narrative literature review of games, animations and simulations to teach research methods and statistics. *Computers & Education*, 74, 1–14.

Brabham, D. (2013). *Crowdsourcing*. Cambridge, MA: MIT Press.

Bradley, L. J., & Hendricks, C. B. (2008). Ethical decision making: Basic issues. *The Family Journal: Counseling and Therapy for Couples and Families*, 16, 261–263.

Brom, C., Sisler, V., Slussareff, M., Selmbacherova, T., & Hlavka, K. (2016). You like it, you learn it: Affectivity and learning in competitive social role play gaming. *International Journal of Computer-Supported Collaborative Learning*, 11, 313–348.

Brown, K. M. (1994). Using role play to integrate ethics into the business curriculum: A financial management example. *Journal of Business Ethics*, 13, 105–110.

Campbell, A. V., Chin, J., & Voo, T. C. (2007). How can we know that ethics education produces ethical doctors? *Medical Teacher*, 29, 431–436.

Celuch, K., & Saxby, C. (2013). Counterfactual thinking and ethical decision making: A new approach to an old problem for marketing education. *Journal of Marketing Education*, 35, 155–167.

Clark, D. B., Tanner-Smith, E. E., & Killingsworth, S. S. (2016). Digital games, design, and learning: A systematic review and meta-analysis. *Review of Educational Research*, 86, 79–122.

Consalvo, M. (2005). Rule sets, cheating, and magic circles: Studying games and ethics. *International Review of Information Ethics*, 4, 8–12.

Consalvo, M., Busch, T., & Jong, C. (2016, November 17). Playing a better me: How players rehearse their ethos via moral choices. *Games and Culture*, 1–20. doi:10.1177/1555412016677449

Cottone, R. R., & Claus, R. E. (2000). Ethical decision-making models: A review of the literature. *Journal of Counseling and Development*, 78, 275–283.

Corbin, J., & Strauss, A. (1990). Grounded theory research: Procedures, canons, and evaluative criteria. *Qualitative Sociology*, 13, 3–21.

Crocco, F., Offenholley, K., & Hernandez, C. (2016). A proof-of-concept study of game-based learning in higher education. *Simulation & Gaming*, *47*, 403–422.

De Miranda, L. (2016, November 23). Life is Strange and "Games are Made": Philosophical interpretation of a multiple-choice existential simulator with copilot Satre. *Games and Culture*, 1–18. doi:10.1177/1555412016678713

Deng, X., Joshi, K. D., & Galliers, R. D. (2016). The duality of empowerment and marginalization in microtask crowdsourcing: Giving voice to the less powerful through value sensitive design. *MIS Quarterly*, *40*, 279–302.

Dickinson, J. L., McLeod, P., Bloomfield, R., & Allred, S. (2016). Which moral foundations predict willingness to make lifestyle changes to avert climate change in the USA? *PLoS One*, *11*, e0163852.

Doorn, N., & Kroesen, J. O. (2013). Using and developing role plays in teaching aimed at preparing for social responsibility. *Science & Engineering Ethics*, *19*, 1513–1527.

Dulacka, P. (2012). Using game to enhance quality of music tags. *Information Sciences and Technologies Bulletin of the ACM Slovakia*, *4*, 30–31.

Elliott, D. (2007). *Ethics in the first person. A guide to teaching and learning practical ethics*. New York, NY: Rowman and Littlefield.

Egenfeldt-Nielsen, S. (2006). Overview of research on the educational use of video games. *Nordic Journal of Digital Literacy*, *3*. Retrieved from www.idunn.no/ts/dk/2006/03/overview_of_research_on_the_educationaluseof_video_games

Eseryel, D., Ge, X., Ifenthaler, D., & Law, V. (2011). Dynamic modeling as a cognitive regulation scaffold for developing complex problem-solving skills in an educational massively multiplayer online game environment. *Journal of Educational Computing Research*, *45*, 265–286.

Eseryel, E., Law, V., Ifenthaler, D., Ge, X., & Miller, R. (2014). An investigation of the interrelationships between motivation, engagement, and complex problem solving in game-based learning. *Educational Technology & Society*, *17*, 42–53.

Ferdig, R., & Pytash, K. (2014). The use of video games for literacy acquisition and studying literate practices. In K. Schrier (Ed.), *Learning and education games volume one: Curricular and design considerations* (pp. 55–72). Pittsburgh, PA: ETC Press.

Ferrara, J. (2013). Games for persuasion: Argumentation, procedurality, and the lie of gamification. *Games and Culture*, *8*, 289.

FitzGerald, R., & Groff, J. (2011). Leveraging video games for moral development in education: A practitioner's reflection. In K. Schrier & D. Gibson (Eds.), *Designing games for ethics: Models, techniques and frameworks* (pp. 234–273). Hershey, PA: IGI Global.

Flanagan, M. (2009). *Critical play: Radical game design*. Cambridge, MA: MIT Press.

Flanagan, M., & Nissenbaum, H. (2014). *Values at play in digital games*. Cambridge, MA: MIT Press.

Flanagan, M., Nissenbaum, H., Belman, J., & Diamond, J. (2007). *A method for discovering values in digital games*. DIGRA 2007 Conference Proceedings, Tokyo, Japan.

Floyd, L. A., Xu, F., Atkins, R., & Caldwell, C. (2013). Ethical outcomes and business ethics: Toward improving business ethics education. *Journal of Business Ethics*, *117*, 753–776.

Formosa, P., Ryan, M., & Staines, D. (2016). Papers, Please and the systemic approach to engaging ethical expertise in videogames. *Ethics & Information Technology*, *18*, 211–225. doi:10.1007/s10676-016-9407-z

Frey, W. (2010). Teaching virtue: Pedagogical implications of moral psychology. *Science & Engineering Ethics*, *16*, 611–628.

Gee, J. P. (2003). *What video games have to teach us about learning and literacy*. New York, NY: Palgrave Macmillan.

Gilbert, S. (2010). Ethics at play: Patterns of ethical thinking among young online games. In K. Schrier & D. Gibson (Eds.), *Ethics and game design: Teaching values through play* (pp. 151–166). Hershey, PA: IGI Global.

Gilligan, C. (1982). *In a different voice: Psychological theory and women's development*. Cambridge, MA: Harvard University Press.

Glover, J. (2001). *Humanity: A moral history of the twentieth century*. London, England: Pimlico.

Groff, J., McCall, J., Darvasi, P., & Gilbert, Z. (2016). Using Games in the Classroom. In K. Schrier (Ed.), *Learning, education & games: Bringing games into educational contexts* (Vol. *2*, pp. 19–42). Pittsburgh, PA: Carnegie Mellon.

Hein, E. (2014). Music games in education. In K. Schrier (Ed.), *Learning and education games volume one: Curricular and design considerations* (pp. 93–108). Pittsburgh, PA: ETC Press.

Hejase, H. J., & Tabch, H. (2012). Ethics education: An assessment case of the American University of Science and Technology-Lebanon. *International Journal of Islamic and Middle Eastern Finance and Management*, *5*, 116–133.

Hirumi, A., Appelman, B., Rieber, L., & Eck, R. V. (2010). Preparing instructional designers for game-based learning, part 1: Game design as an instructional design process. *Tech Trends*, *54*, 27–37.

Howe, J. (2008). *Crowdsourcing: Why the power of the crowd is driving the future of business*. New York, NY: Three Rivers Press.

Hung, W. (2013). Team-based complex problem solving: A collective cognition perspective. *Educational Technology Research and Development*, *61*, 365–384.

Hunicke, R., LeBlanc, M., & Zubek, R. (2004). *MDA: A formal approach to game design and game research*. In Proceedings of the Challenges in Games AI Workshop, Nineteenth National Conference on Artificial Intelligence, San Jose, CA.

Introne, J., Laubacher, R., Olson, G., & Malone, T. (2013). Solving wicked social problems with socio-computational systems. *Künstliche Intelligenz*, *27*, 45–52.

Joan Ganz Cooney Center. (2014). *Teachers surveyed on using games in class: A games and learning research report*. Retrieved from www.gamesandlearning.org/2014/06/09/teachers-on-using-games-in-class/

Johnson, S. (2006). *Everything bad is good for you*. New York, NY: Riverhead Books.

Ke, F. (2016). Designing and integrating purposeful learning in game play: A systematic review. *Educational Technology Research & Development*, *64*, 219–244. doi:10.1007/s11423-015-9418-1

Kereluik, K., Mishra, P., Fahnoe, C., & Terry, L. (2013). What knowledge is of most worth: Teacher knowledge for 21st century learning. *Journal of Digital Learning in Teacher Education*, *29*, 127–140.

Khatib, F., DiMaio, F., Foldit Contenders Group, *Foldit* Void Crushers Group, Cooper, S., Kazmierczyk, M., . . . Baker, D. (2011). Crystal structure of a monomeric retroviral protease solved by protein folding game players. *Nature Structural and Molecular Biology*, *18*, 1175–1177.

Kleinman, A. (2011). The art of medicine: The divided self, hidden values, and moral sensibility in medicine. *The Lancet*, *377*, 804–805.

Konstantinidis, A., Tsiatsos, T., & Pomportsis, A. (2009). Collaborative virtual learning environments: Design and evaluation. *Multimedia Tools and Applications*, *44*, 279–304.

Kohlberg, L. (1976). Moral stages and moralization: The cognitive developmental approach. In T. Lickona (Ed.), *Moral development and behavior: Theory, research, and social issues* (pp. 31–53). New York, NY: Holt, Rinehart & Winston.

Koo, G., & Seider, S. (2010). Video games for prosocial learning. In K. Schrier & D. Gibson (Eds.), *Ethics and game design: Teaching values through play* (pp. 16–33). Hershey, PA: IGI Global.

Kulman, R., Slobuski, T., & Seitsinger, R. (2014). Teaching 21st century, executive-functioning, and creativity skills with popular video games and apps. In K. Schrier (Ed.), *Learning, education & games: Curricular and design considerations* (Vol. 1, pp. 161–180). Pittsburgh, PA: Carnegie Mellon.

Landwehr, P., Spraragen, M., Ranganathan, B., Carley, K., & Zyda, M. (2013). Games, social simulations, and data—integration for policy decisions: The SUDAN game. *Simulation and Gaming*, *44*, 151–177.

Lankoski, P. (2013). *Models for story consistency and interestingness in single-player RPGs*. AcademicMindTrek 2013 Proceedings of International Conference on Making Sense of Converging Media, Tampere, Finland, 246.

Levitt, D. H., & Aligo, A. A. (2013). Moral orientation as a component of ethical decision making. *Counseling & Values*, *58*, 195–204.

Lieberoth, A., Kock, M., Marin, A., Planke, T., & Sherson, J. F. (2014). User acquisition, engagement and early results from the citizen cyberscience game *Quantum Moves*. A midstream report (working title). *Human Computation*, *1*, 219–244.

Lillie, W. (1971). *An introduction to ethics*. London, England: Methuen & Company.

Liu, C., Yao, L. J., & Hu, N. (2012). Improving ethics education in accounting: Lessons from medicine and Law. *Issues in Accounting Education*, *27*, 671–690.

Lloyd, P., & van de Poel, I. (2008). Designing games to teach ethics. *Science & Engineering Ethics*, *14*, 433–447.

López, J. M., & Cáceres, M. J. M. (2009). Virtual games in social science education. *Computers & Education*, *55*, 1336–1345.

Lynn, C. (2010). Teaching ethics with an integrated online curriculum. *Journal of Hospitality, Leisure, Sport, & Tourism Education*, *9*, 124–130.

Macer, D. R. J. (2008). *Moral games for teaching bioethics*. UNESCO Chair in Bioethics, UNESCO, Bangkok, Thailand. Retrieved March 19, 2017, from http://unesdoc.unesco.org/images/0016/001627/162737e.pdf

MacGregor, J. (2017). Why math is strangling video game morality. *PC Gamer*. Retrieved March 19, 2017, from www.pcgamer.com/why-math-is-strangling-video-game-morality/

Maclagan, P. (2003). Varieties of moral issue and dilemma: A framework for the analysis of case material in business education. *Journal of Business Ethics*, *48*, 21.

Mah, C., Taylor, E., Hoang, S., & Cook, B. (2014). Using vignettes to tap into moral reasoning in public health policy: Practical advice and design principles from a study on food advertising on children. *American Journal of Public Health*, *104*, 1826–1832.

Mayhew, M. J., & King, P. (2008). How curricular content and pedagogical strategies affect moral reasoning development in college students. *Journal of Moral Education*, *37*, 17–40.

McKinley, D. (2015). Design principles for crowdsourcing cultural heritage. PhD. Findings Report. *Science*, *38*, 189–200.

Melenson, J. (2011). The axis of good and evil. In K. Schrier & D. Gibson (Eds.), *Designing games for ethics: Models, techniques and frameworks* (pp. 57–71). Hershey, PA: IGI Global.

Meng, C. L., Othman, J., D'Silva, J. L., & Omar, Z. (2014). Ethical decision making in academic dishonesty. *International Education Studies*, *7*, 126–139.

Merriam, S. (2004). The role of cognitive development in Mezirow's transformational learning theory. *Adult Education Quarterly*, *55*, 60–68.

Moosa, E. (2016). Technology in Muslim moral philosophy. *Journal of Religion and Health*, *55*, 369–383.

Morris, L., & Wood, G. (2011). A model of organizational ethics education. *European Business Review*, *23*, 274–286.

Narvaez, D. (2006). Integrative ethical education. In M. Killen & J. Smetana (Eds.), *Handbook of moral development* (pp. 703–733). Mahwah, NJ: Lawrence Erlbaum Associates.

Narvaez, D., & Rest, D. (1995). The four components of acting morally. In W. Kurtines & J. Gewirtz (Eds.), *Moral behavior and moral development: An introduction* (pp. 385–400). New York, NY: McGraw-Hill.

Noddings, N. (2003). *Caring: A feminine approach to ethics and moral education* (2nd ed.). Berkeley: University of California Press.

Noddings, N. (2010). Moral education and caring. *Theory and Research in Education*, *8*, 145–151.

Nussbaum, M. (2010). *Not for profit: Why democracy needs the humanities*. Princeton, NJ: Princeton University Press.

O'Fallon, M. J., & Butterfield, K. D. (2005). A review of the empirical ethical decision-making literature: 1996–2003. *Journal of Business Ethics*, *59*, 375–413.

O'Hara, R., Sinnott-Armstrong, W., & Sinnott-Armstrong, N. A. (2010). Wording effects in moral judgments. *Judgment & Decision Making*, *5*, 547–554.

Papert, S. (1980/1993). *Mindstorms: Children, computers, and powerful ideas*. New York, NY: Basic Books.

Paul, R., & Elder, L. (2009). Critical thinking: Ethical reasoning and fairminded thinking, part I. *Journal of Developmental Education*, *33*, 36.

Paul, R., & Elder, L. (2012). Critical thinking: Competency standards essential to the cultivation of intellectual skills, part V. *Journal of Developmental Education*, *36*, 30.

Peacock, J., Harkrider, L. N., Bagdasarov, Z., Connelly, S., Johnson, J. F., Thiel, C. E., . . . Devenport, L. D. (2012). Effects of alternative outcome scenarios and structured outcome evaluation on case-based ethics instruction. *Science & Engineering Ethics*, *19*, 1283–1303.

Pe-Than, E., Goh, D., & Lee, C. S. (2014). Making work fun: Investigating antecedents of perceived enjoyment in human computation games for information sharing. *Computers in Human Behavior*, *39*, 88–99.

Petrie, H., & Power, C. (2012). *What do users really care about? A comparison of usability problems found by users and experts on highly interactive websites*. CHI 2012, Austin, TX.

Plass, J. L., Homer, B. D., & Kinzer, C. K. (2015). Foundations of game-based learning. *Educational Psychologist*, *50*, 258–283.

Plass, J. L., Homer, B. D., Kinzer, C., Frye, J., & Perlin, K. (2011). Learning mechanics and assessment mechanics for games for learning (Games 4 Learning Institute, New York University). White Paper. Retrieved from http://steinhardtapps.es.its.nyu.edu/create/classes/2505/reading/Plass%20et%20al%20LAMechanics%202505.pdf

Poesio, M., Chamberlain, J., Kruschwitz, U., Robaldo, L., & Ducceschi, L. (2015). *Phrase detectives: Utilizing collective intelligence for internet-scale language resource creation*. Proceedings of the Twenty-Fourth International Joint Conference on Artificial Intelligence (IJCAI 2015), ACM. doi:10.1145/2448116.2448119.

Prestopnik, N., & Crowston, K. (2012). Purposeful gaming & socio-computational systems: A citizen science design case. *In Group '12: Proceedings of the 17th ACM International Conference on Supporting Group Work*, New York, ACM.

Ralph, P., & Monu, K. (2014). *A working theory of game design: Mechanics, technology, dynamics, aesthetics, & narratives*. Retrieved February 1, 2017, from www.firstpersonscholar.com/a-working-theory-of-game-design/

Reid, A. J. (2015). *Designing video games to encourage political participation in the United Kingdom* (Dissertation), Abertay University, UK.

Rest, J. R. (1986). *Moral development: Advances in research and theory*. New York, NY: Praeger.

Riemenschneider, C. K., Leonard, L. N. K., & Manley, T. S. (2011). Students' ethical decision-making in an information technology context: A theory of planned behavior approach. *Journal of Information Systems Education*, *22*, 203.

Rini, R. A. (2015). Feedback from moral philosophy to cognitive science. *Philosophical Psychology*, *28*, 569–588.

Rittel, H., & Webber, M. (1973). Dilemmas in a general theory of planning. *Policy Science*, *4*, 155–169.

Rogerson, M., Gottlieb, M. C., Handelsman, M. M., Knapp, S., & Younggren, J. (2011). Nonrational processes in ethical decision making. *American Psychologist*, *66*, 614–623.

Roussos, G., & Dovidio, J. F. (2016). Playing below the poverty line: Investigating an online game as a way to reduce prejudice toward the poor. *Cyberpsychology: Journal of Psychosocial Research on Cyberspace*, *10*, article 1. doi:10.5817/CP2016-2-3

Ryan, T. G., & Bisson, J. (2011). Can ethics be taught? *International Journal of Business and Social Science*, *2*, 44–52.

Ryan, R. M., Rigby, C. S., & Przybylski, A. (2006). The motivational pull of video games: A self-determination theory approach. *Motivation and Emotion*, *30*, 347–363.

Ryan, M., Staines, D., & Formosa, P. (2016). *Four lenses for designing morally engaging games*. Proceedings of the 1st International Joint Conference of DiGRA and FDG, Dundee, Scotland, UK.

Sachdeva, S., Iliev, R., Ekhtiari, H., & Dehghani, M. (2015). The role of self-sacrifice in moral dilemmas. *PLoS One*, *10*, e0127409.

Saldana, J. (2011). *Fundamentals of qualitative research* (1st ed.). New York, NY: Oxford University Press, Inc.

Salen, K., & Zimmerman, E. (2003). *Rules of play*. Cambridge, MA: MIT Press.

Schell, J. (2008). *The art of game design*. Burlington, MA: Morgan Kaufmann.

Schrier, K. (2014a). Designing digital games to teach history. In K. Schrier (Ed.), *Learning and education games volume one: Curricular and design considerations* (pp. 73–92). Pittsburgh, PA: ETC Press.

Schrier, K. (2014b). Designing and using games to teach ethics and ethical thinking. In K. Schrier (Ed.), *Learning and education games volume one: Curricular and design considerations* (pp. 143–160). Pittsburgh, PA: ETC Press.

Schrier, K. (2015a). Emotion, empathy, and ethical thinking in Fable III. In S. Tettegah & W. D. Huang (Eds.), *Emotions, technology, and digital games* (pp. 35–60). New York, NY: Elsevier.

Schrier, K. (2015b). EPIC: A framework for using video games in ethics education. *Journal of Moral Education*, *44*, 393–424.

Schrier, K. (2016a). Designing role-playing video games for ethical thinking. *Educational Technology Research and Development*, 1–38. doi:10.1007/s11423-016-9489-7

Schrier, K. (2016b). *Knowledge games: How playing games can solve problems, create insight, and make change*. Baltimore, MD: Johns Hopkins University Press.

Schrier, K., Diamond, J., & Langendoen, D. (2010). Using Mission US: For crown or colony? To develop historical empathy and nurture ethical thinking. In K. Schrier & D. Gibson (Eds.), *Ethics and game design: Teaching values through play* (pp. 239–261). Hershey, PA: IGI.

Schrier, K., & Kinzer, C. (2009). Using digital games to develop ethical teachers. In D. Gibson (Ed.), *Games and simulations* (pp. 250–270). Hershey, PA: IGI Global.

Schrier, K., & Shaenfield, D. (2015). Collaboration and emotion in way. In S. Tettegah & W. Huang (Eds.), *Emotions, technology, and digital games* (pp. 289–312). New York, NY: Elsevier.

Shafer-Landau, R. (2010). *The fundamentals of ethics*. New York, NY: Oxford University Press.

Shaffer, D. (2006). *How computer games help children learn*. New York, NY: Palgrave Macmillan.

Sicart, M. (2009a). The banality of simulated evil: Designing ethical gameplay. *Ethics & Information Technology*, *11*, 191–202.

Sicart, M. (2009b). *Ethics and computer games*. Cambridge, MA: MIT Press.

Sicart, M. (2010). *Wicked games: On the design of ethical gameplay*. DESIRE '10. Proceedings of the 1st DESIRE Network Conference on Creativity and Innovation in Design, Aarhus, Denmark, 101–111.

Sicart, M. (2013). *Beyond choices*. Cambridge, MA: MIT Press.

Sitzmann, T. (2011). A meta-analytic examination of the instructional effectiveness of computer-based simulation games. *Personnel Psychology*, *64*, 489–528.

Siu, K., & Riedl, M. O. (2016). *Reward systems in human computation games*. CHI Play 2016, Austin, Texas.

Squire, K. (2011). *Video games and learning: Teaching and participatory culture in the digital age*. New York, NY: Teachers College Press.

Staines, D. (2010). Videogames and moral pedagogy: A Neo-Kohlbergian approach. In K. Schrier & D. Gibson (Eds.), *Ethics and game design: Teaching values through play* (pp. 35–51). Hershey, PA: IGI Global.

Steinkeuhler, C., & Simkins, D. (2008). Critical ethical reasoning and role play. *Games & Culture*, *3*, 333–355.

Stevenson, J. (2011). A framework for classification and criticism of ethical games. In K. Schrier & D. Gibson (Eds.), *Designing games for ethics: Models, techniques and frameworks* (pp. 36–55). Hershey, PA: IGI Global.

Svelch, J. (2011). The good, the bad, and the player: The challenges to moral engagement in single-player. In K. Schrier & D. Gibson (Eds.), *Ethics and game design: Teaching values through play* (pp. 52–68). Hershey, PA: IGI Global.

Tierney, N. (1994). *Imagination and ethical ideals: Prospects for a unified philosophical and psychological understanding (SUNY series in ethical theory)*. New York: SUNY Press.

Turkay, S., Hoffman, D., Kinzer, C., Chantes, P., & Vicari, C. (2014). Toward understanding the potential of games for learning: Learning theory, game design characteristics, and situating video games in classrooms. *Computers in the Schools*, *31*, 2–22.

Tinghog, G., Andersson, D., Bonn, C., Johannesson, M., Kirchler, M., Koppel, L., & Västfjäll, D. (2016). Intuition and moral decision-making $\pm$ the effect of time pressure and cognitive load on moral judgment and altruistic behavior. *PLoS One*, *11*, e0164012.

Vacca, R., Bromley, M., Leyrer, J., Sprung, M., & Homer, B. (2014). Designing games for emotional health. In K. Schrier (Ed.), *Learning and education games volume one: Curricular and design considerations* (pp. 123–142). Pittsburgh, PA: ETC Press.

von Ahn, L. (2005). *Human computation* (Dissertation). Carnegie Mellon University, Pittsburgh, PA.

von Ahn, L., & Dabbish, L. (2008). Designing games with a purpose. Association for Computing Machinery. *Communications of the ACM*, *51*, 58–67. doi:10.1145/1378704. 1378719

Werner, L., Denner, J., & Campe, S. (2014). Using computer game programming to teach computational thinking skills. In K. Schrier (Ed.), *Learning and education games volume one: Curricular and design considerations* (pp. 37–54). Pittsburgh, PA: ETC Press.

Wiggins, A., & Crowston, K. (2012). *From conservation to crowdsourcing*. Proceedings of the 45th Annual Hawaii International Conference on System Sciences, Maui, Hawaii, 2.

Williamson, B., & Facer, K. (2004). More than 'just a game': The implications for schools of children's computer games communities. *Education, Communication, and Information*, *4*, 255–270.

Wines, W. A. (2008). Seven pillars of business ethics: Toward a comprehensive framework. *Journal of Business Ethics*, *79*, 483–499.

Wouters, P., van Nimwegen, C., van Oostendorp, H., & van der Spek, E. D. (2013). A meta-analysis of the cognitive and motivational effects of serious games. *Journal of Educational Psychology*, *105*, 249.

Wouters, P., & van Oostendorp, H. (2017). Overview of instructional techniques to facilitate learning and motivation of serious games. In P. Wouters & H. van Oostendorp (Eds.), *Instructional techniques to facilitate learning and motivation of serious games* (pp. 1–16). Cham, Switzerland: Springer International. doi:10.1007/978-3-319-39298-1_1

Yee, N. (2006). Motivations for play in online games. *Cyberpsychology and Behavior*, *9*, 772–775.

Yee, N., & Dicheneaut, N., & Quantic Foundry. (2016). *Gamer motivation model*. Retrieved from http://quanticfoundry.com/reports/

Zagal, J. P. (2009). *Ethically notable videogames: Moral dilemmas and gameplay*. Proceedings of the 2009 Digital Games Research Association International Conference (DiGRA), London, UK.

Zagal, J. P. (2011). Ethical reasoning and reflection as supported by single-player video-games. In K. Schrier & D. Gibson (Eds.), *Designing games for ethics: Models, techniques and frameworks* (pp. 19–35). Hershey, PA: IGI Global.

Zagal, J. P. (2012). *Heavy Rain:* Morality in inaction, the quotidian, and the ambiguous. In K. Poels & S. Malliet (Eds.), *Vice city virtue:* Moral issues in digital game play (pp. 267–286). Leuven, Belgium: Acco Academic.

Zgheib, P. W. (2015). Learning and teaching of ethics. In P. W. Zgheib (Ed.), *Business ethics and diversity in the modern workplace* (pp. 1–15). Hershey, PA: IGI Global.

Author Biography

Karen Schrier is an associate professor of Games & Interactive Media at Marist College, where she is the Director of the Games and Emerging Media program and the Play Innovation Laboratory. She is the editor of the *Learning, Education & Games* book series (ETC Press) and the author of *Knowledge Games: How Playing Games Can Solve Problems, Create Insight, and Make Change* (Johns Hopkins University Press).