Gamifying Bioethics: A Case Study of Co-Designing Empirical Tools with Adolescents

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Abstract

Research in bioethics largely relies on interviews and surveys, which engage participants with scenarios that are distal in time and place to an actual situation. However, context and embodiment are relevant to moral decision-making. Due to the potential to immerse participants in a simulated environment, purpose-built games and scenarios might prove valuable as empirical tools. As a case study of gamifying bioethics, we describe the co-design and implementation of "What Lies Ahead?", a digital role-play scenario for research with adolescents. "What Lies Ahead?" engages young people with ethical issues related to predictive technologies in psychiatry. As preliminary evidence of the validity of this gamified approach, we report qualitative results suggesting that the role-play was immersive, and elicited authentic responses and reflective thinking in adolescent participants. Even though application of game-play mechanics is rare in bioethics, we find digital role-play to be a powerful tool that collects data through real-time, realistic scenarios.

Author Keywords

Participatory design; role-play; bioethics; gamification.

CSS Concepts

• Applied computing~Law, social and behavioral sciences

Design feature	What it facilitates
Role-play experience	Immersion, engagement and authentic decision-making
Realistic narrative	
1st person perspective	
Youth-friendly graphics	Engagement and enjoyment
Minimalist graphics	Unbiased responses
Private engagement with scenario	
Qualitative questions following role-play	Reflection upon role-play choices
Peer present during session	Comfortability and deeper ethical reflection
Clear and complete explanations of concepts	Well-informed decision-making

Table 1. Summary of core design features and their research value

Introduction

Empirical bioethics is an interdisciplinary field that studies the social and ethical implications of advances in biology, medicine and health care, using methods from socio-empirical sciences [2]. To understand the experiences and moral attitudes of different stakeholders, bioethicists rely heavily on interviews and surveys [3]. These methods, however, are often decontextualised and devoid of affective value. This is at odds with theoretical frameworks within ethics suggesting that moral values and attitudes depend on emotions, context and social relationships [5,19]. Responding to this challenge, we have recently argued for "design bioethics" [16]—the development and use of purpose-built, engineered tools for bioethics research, including games and digital scenarios. Gamification—an umbrella term for the use of game elements in non-game contexts [4]—is not a new concept in academic research [13]. But why should we bring bioethics into play?

Bioethical research often pertains to possible futures. Through games and digital role-play, these envisioned futures can be simulated and experienced first-hand. The immersion and emotional presence these tools afford might in turn support players' engagement in ethically relevant thinking and decision-making [6]. Although rare in bioethics research, digital scenarios and games have been used to investigate people's responses to classic moral dilemmas [1] and children's understanding of their rights [10]. In academia and in the mainstream, games have also been used as tools to raise awareness around the moral complexities of new technologies, such as artificial intelligence in public surveillance [17] and virtual therapy [21].

This paper presents a case study of "design bioethics" by exploring the feasibility of a gamified tool titled 'What Lies Ahead?'. Co-designed with adolescents, this e-tool consists of a digital role-play scenario for research into the social and ethical aspects of new technologies in psychiatry. In particular, it focuses on the use of predictive algorithms for early detection of mental health problems—an important innovation in preventive psychiatric technology [7,9]. The tool creates a discursive space for young people to share preferences and moral attitudes in this context.

We describe the design (Part 1) and implementation (Part 2) of the e-tool in a qualitative study conducted with UK adolescents. As an initial test of the validity of gamifying bioethics, we analysed participants' responses to "What Lies Ahead?" in relation to three metrics that are relevant for moral decision-making, drawing from literature in psychology and HCI:

- Immersion—defined as the extent to which individuals feel absorbed in and involved with a digital scenario [14]

- Authenticity—the degree to which a person's responses are consistent with their own personality, goals, and values [20]

- Reflective thinking—the extent to which an individual shows active, careful and/or critical thinking [5]

Part 1: Design of "What Lies Ahead?"

"What Lies Ahead?" was designed to facilitate engagement with a reality that actualises predictive testing services for mental health and induce reflection on their implications. As medicine and technology rapidly develop, the use of algorithms combining both biological and digital data to predict the risk of mental
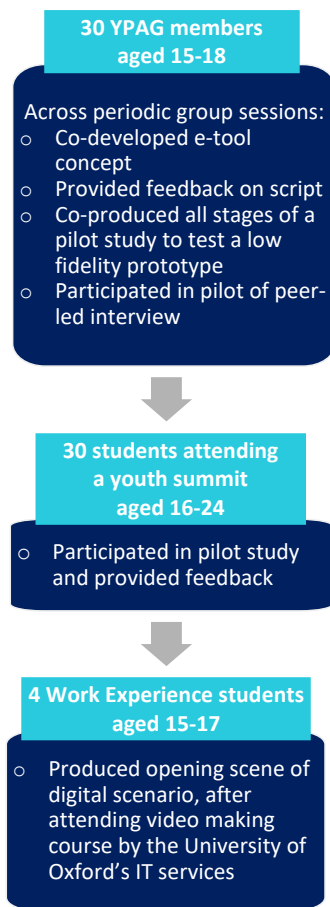
30 YPAG members aged 15-18

Across periodic group sessions:
- Co-developed e-tool concept
- Provided feedback on script
- Co-produced all stages of a pilot study to test a low fidelity prototype
- Participated in pilot of peer-led interview

30 students attending a youth summit aged 16-24
- Participated in pilot study and provided feedback

4 Work Experience students aged 15-17
- Produced opening scene of digital scenario, after attending video making course by the University of Oxford's IT services

Figure 1. Young people's involvement in the design process

health difficulties are likely to become a part of mental health care [7]. Such services promise to significantly reduce the prevalence of mental health difficulties experienced by young people by allowing targeted prevention and early intervention [8]. However, they raise a series of ethical concerns for instance related to data privacy, safety and stigma [8,11].

To ensure the relevance of our e-tool to the target audience, we adopted Participatory Design (PD) [12], an approach that involves stakeholders as full participants in the design process. We worked with different groups of adolescents, all recruited in the UK (for roles and responsibilities, see Figure 1). We primarily collaborated with the Neuroscience, Ethics and Society Young People's Advisory Group (YPAG) [15]. This is a diverse group of students who had worked as co-researchers in bioethics and mental health for over a year before working on this project.

In collaboration with the YPAG, we decided to use digital role-play as a way of immersing participants into a hypothetical yet realistic future scenario where predictive testing for mental health is commercially available. We went for minimalist graphics to minimise the influence of visual cues on decision-making. The scenario is presented from a first-person perspective (no avatar) to promote personal engagement and authentic choices (see Table 1 for design features).

As illustrated in Figure 2, players take the role of clients of a fictional company called Future Forecast, offering predictive testing for mental health challenges based on a combination of data sources. In Section 1, players have the opportunity to sign up to learn their chances of facing challenges such as anxiety and depressed

mood in the future. Players also choose what data sources they wish to provide for the assessment (e.g., DNA, social media data). In Section 2, players receive fictional results from the test: by random assignment, they are told to be either at "higher risk" or "lower risk" of facing mental health challenges than an average person of the same age. All potentially unfamiliar concepts (e.g., "predictive testing") are clearly explained within the game to ensure that participants make well-informed choices during the scenario.

Following each section of the digital role-play, participants engage in face-to-face, peer-led interviews, during which they ask qualitative questions to each other (e.g., "How do you feel about Future Forecast and what they offer?"), drawing from a pile of flashcards (see Figure 3 for setup). We expected immersion in the scenario via digital role-play to support adolescents' reflective thinking and authentic discussion around predictive technologies during the peer-led interview.

Part 2: Implementing "What Lies Ahead?"
We used our digital role-play scenario for qualitative research into adolescents' attitudes towards predictive psychiatry. Given the novelty of this methodology in bioethics, however, we considered it essential to analyse whether "What Lies Ahead?" successfully elicited immersion with the scenario, authentic responses and reflective thinking. As these elements are key to moral decision-making [16] their presence would provide preliminary evidence for the validity of gamified tools in bioethics. In what follows, we report on this analysis.
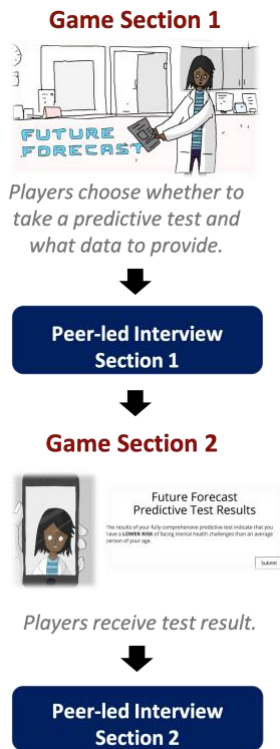
Game Section 1

Players choose whether to take a predictive test and what data to provide.

↓

Peer-led Interview Section 1

↓

Game Section 2

Future Forecast
Predictive Test Results

The results of your fully comprehensive predictive test indicate that you have a LOWER RISK of facing mental health challenges than an average person of your age.

Players receive test result.

↓

Peer-led Interview Section 2

Figure 2. Role-play stages

Figure 3. Schematic of the experimental setup

Sample
A sample of eighty adolescents—aged from 16 to 18 years—from six UK schools took part in the study. Participants completed the full "What Lies Ahead?" role-play as well as the peer-led interview, which was audio recorded. Ethical considerations are outlined under *Selection and participation of children*.

Data coding and reliability
The audio recorded interviews were transcribed in full. Participants' responses were coded using a dichotomous coding scheme to control for utterance length. Authenticity was coded from answers to: "What conditions did you test for and why?", as this was a direct inquiry into participants' personal motivations. Immersion was coded from answers to: "What was your test result, and what went through your mind when you saw it?", which encouraged participants to describe their state of mind during the role-play. Reflective thinking was assessed from responses to: "How do you feel about Future Forecast and what they offer?", which gave participants a chance to express thoughts and values (see Box 1 for coding scheme).

To develop and practice the coding scheme, a third of all responses were collectively analysed and coded by four researchers. The remaining answers were coded independently by two separate coders. Inter-rater reliability was high across immersion (κ = .75); reflexivity (κ = .75) and authenticity (κ = .71). Any discrepancies were resolved by consensus.

Results
We found evidence of authentic decision-making in most participants' (69%) justifications of what conditions they chose to test for. This was expressed by references to personal dispositions (e.g., "My close family have some mental health issues, that's why I picked only a couple, the ones that matter to me the most," Charlotte, 16), or references to the absence of such dispositions ("[I did not choose] addiction problems, mainly because I feel like I wouldn't really have them," Bushra, 17).

Evidence for immersion was present in 84% of participants' responses to receiving test results. This included references to: (a) emotional states ("I think I was quite relieved to be honest, because it's like yes, I don't really have anything to worry about or to stress about, so", Louise, 16, low risk; "It said I was at high risk, and instantly I thought, oh, no, there's something big coming at me", Sheila, 17, high risk); (b) personal intentions following the results ("I'll definitely keep it in mind as time goes by", John, 18, high risk); or (c) comments on the predictive value of the test ("if it's true or not that will all be for the future to decide… it's a prediction in the end", Charlie, 17, high risk).

Reflective thinking was observed in 76% of the answers reporting on participants' attitudes towards the service. Participants covered a range of topics: some reported on the strengths of these services ("it's like shining light on something that needs to be talked about, especially with teenagers, I think", Linda, 17); others provided critical feedback on either Future Forecast (e.g., "I feel like they don't really keep you updated on what they're doing with your data … [I'd prefer if] they interacted with me a bit more", Hanna, 17) or predictive services in general (e.g., "I'm a bit iffy about the whole prediction thing because predictions aren't accurate … it might affect other people as well … Let's say you go on and have kids …", Sam, 17).

Authenticity:

Justifications based on personal relevance were coded as '1' (e.g. "I signed up to the ones I thought I might need help with"). Impersonal justifications were coded '0' (e.g. "Yes I did. I thought it was interesting").

Immersion: Realistic reactions to the test result were coded as '1' (e.g. "I was at high risk, and instantly I thought, oh, no, there's something big coming at me."). Answers where this was unclear or which expressed disengagement from the game were coded as '0' (e.g. "I was calm because I know that this is not a real test").

Reflective thinking: Answers elaborating on pros and cons or that included values and beliefs were coded '1' ("I think it's good because … humans love to have control"). Answers lacking discernable reflection were coded '0' (e.g. "I think what they're doing is good").

Box 1. Coding scheme

Discussion

Following on from previous research utilising games to explore social and ethical concerns [17], this work pioneers the development and use of purpose-built digital tools for bioethics research. We adopted design features that supported authentic, unbiased choices, and ensured that the scenario provided participants with sufficient contextual information to make informed decisions. Guided by principles of PD [12], we involved young people not only as research participants, but also as co-designers and co-researchers in the project, supporting their rights for agency and citizenship.

For most participants, role-play enabled immersion in the predictive testing scenario. The tool also prompted authentic decisions and in-depth reflections around the topic of predictive psychiatry. Taken together, these results indicate that gamification supports participants' engagement with ethically relevant topics and therefore might be a valuable resource for bioethics research.

We analysed immersion, authenticity, and reflective thinking from participants' spontaneous verbalisations during a post-game interview. Although results were encouraging, future studies should replicate these findings using behavioural measures or validated questionnaires and scales [e.g., 17]. Future research should also test the extent to which levels of immersion, authenticity and reflectiveness in response to a gamified tool differ from those elicited via traditional methods such as surveys and contrastive vignettes.

Conclusion

Although gamification is rare in empirical bioethics, this case study represents a significant first step in demonstrating the value of this approach. Digital role-play scenarios such as "What Lies Ahead?" can act as powerful tools to help adolescents envisage the impact that new technologies may have in their lives and voice their preferences and concerns.

Selection and participation of children

Participants and YPAG members were recruited through schools and the research team's network. All adolescents provided informed consent, and their parents were notified about the study. Before taking part, all participants were briefed on the aims of the study and told that they could withdraw at any point. They were also informed about the fictional nature of the scenario. This was reiterated at a debriefing session at the end of the study. During the debrief, participants were also asked how they felt about taking part, and any questions or concerns were addressed. Participants' personal data was kept confidential and their answers treated anonymously. Ethics approval was granted by the University of Oxford (Ref: R38020/RE001).

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