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PeaceMaker

Using an online educational game on Middle East politics as an 'Object To Think With' (OTTW) in a Masters-level Public Policy course

Teaching causality in complex adaptive systems to tertiary students poses dual challenges: presenting key concepts like tipping points, emergence, nonlinearity, path dependency, and feedback; and then guiding students to grasp the uncertainties these entail for policy and decision-making. While the pedagogical value of educational games is increasingly recognised, there is little consensus on underlying learning theories or game design principles. In particular, as traditional behaviourist approaches do not address the implications of complex systems, the author (teaching a Masters-level Public Policy course) used the Israeli/Palestinian politics game, *PeaceMaker*, in a more constructivist approach that understands games as 'objects-to-think-with' (OTTWs).

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Introduction

The importance of some awareness of complexity and systems thinking for the successful design and implementation of public policy is now widely recognised. At the same time, there is a growing acceptance in the academic literature that games and simulations are educationally valuable. This chapter discusses an attempt to bring these two areas together: the use of an educational game to teach complexity and systems theory to current and emerging public policy practitioners.

I taught a Masters-level Public Policy course on policy evaluation at an Australian university in 2017 and used the online game *PeaceMaker* (an interactive digital game from Israel designed to introduce the complexity of Israeli/Palestinian politics to high school students from both communities) in class to explore some of the challenges and implications of policy design and implementation within complex adaptive systems (such as dynamic public policy environments).

The structure of this chapter does require some patience from the reader, as it explores a number of conceptual areas before moving on to the case study. It first outlines the relevant pedagogical theories, and in particular a focus on games as 'objects-to-think-with' (OTTWs) (Holbert & Wilensky 2019), that underpin this example of educational gaming. It then presents a brief overview of complexity and systems thinking, before discussing the implications for public policy and the challenges of teaching these concepts to postgraduate students.

Finally, this paper presents the specific example of *PeaceMaker* as a case study in using educational games in this space and offers some general comments on this specific teaching and learning experience. It ends with a call for further exploration and evaluation of the pedagogical value of games as 'OTTW' for the teaching and learning of complexity and systems thinking.

The Pedagogy of Educational (or Serious) Games

There is perhaps a strengthening consensus (Al Mubarak 2023; Bechkoff 2019; Dörner et al. 2016; Arnab et al. 2015; Gentile, Groves & Gentile 2014; Black, Huang & Khan 2014) around the pedagogical value of educational games, or serious games (Dörner et al. 2016), sometimes characterised as the 'gamification' of education (Bechkoff 2019; Arnab et al. 2015) or Game Based Learning (GBL) (Linderoth & Sjöblom 2019). While the research into gaming pedagogy is extensive and growing, this chapter will not be addressing this broader literature in any detail. Instead, it is focused on three important aspects relating to this specific example of educational gaming.

A constructivist approach to gaming pedagogy
A 'behaviourist' approach to educational gaming (building competency through repetition) is extremely common. This approach, relying on repetitive drills, and punishments or rewards to motivate learners (Mystakidis et al. 2022; Holbert & Wilensky 2019; Gentile, Groves & Gentile 2014) can be valuable when teaching/learning relatively simple concepts or procedures (where there is a right way to achieve success in the game, and thus demonstrate task competency or understanding of the target concepts) (Mystakidis et al. 2022; Biesta 2010). There are clear similarities to a competency-based approach to education in general: 'learn how to do this process or demonstrate this skill'.

However, this pedagogical approach may be less effective in teaching more complex theories and concepts; or in cases where a deeper exploration of concepts is required; or where there is not a clear process or system which the learner must learn. It is also less effective when dealing with the nonlinearity and emergence found in complex systems (as described below).

Constructivism in the educational context is an ill-defined and increasingly contested term (Biesta 2010), but from a student perspective (as opposed to a broader social perspective) it can be described as the way in which knowledge is actively constructed by the student. Learning happens by integrating prior knowledge and new information through experimentation and social interaction, rather than by knowledge being absorbed uncritically from a teacher or other authority. There is evidence that well-designed constructivist games can 'provid[e] rich, perceptually grounded experience with the content to be learned' (Black, Huang & Khan 2014: 299; Magee, Richardson & Pepperell 2016).

However, while experimentation implies iterative engagement with a game (playing it more than once), a constructivist model of learning 'is incommensurate with drill and practice' (Holbert & Wilensky 2019: 33). To drill means to repeat until competency is achieved, while experimentation implies changing elements or actions to explore different outcomes.

Games as 'Objects To Think With' (OTTW)
One example of a constructivist educational gaming pedagogy is the concept of games as 'Objects To Think With' (OTTW): as tools to allow players to explore theoretical concepts and experiment with 'personally interesting questions around domain-relevant representations' (Holbert & Wilensky 2019: 32). An OTTW (such as a game) is a 'cognitive tool that thinkers can observe, manipulate, or probe, and in doing so test and explore complex phenomena or ideas with which they are unfamiliar' (Holbert & Wilensky 2019: 36). The assumption here is that such games are to be replayed repeatedly, but not to build competency through practice. Instead, the goal is experimentation.

This concept of games as an OTTW appears to have been explored primarily in the physical and computing sciences, with the development of *Logo* and the *Logo Turtle* being famous examples (Papert 1980) of this emerging constructivist pedagogy within educational gaming. However, there have been examples from within the social sciences, including the use of the simulation software *Fierce Planet* as an OTTW to explore various theories of sustainability in an undergraduate sustainability course (Magee, Richardson & Pepperell 2016; Richardson, Magee & Pepperell 2015). *Fierce Planet* is a simulation program which allows students to adjust various simulation settings (such as energy consumption and population growth) to explore classic sustainability theories such as Malthusian population collapses ('Limits to Growth') or scenarios of endless growth. As a classic DMG, students replay these scenarios numerous times, changing settings to see if they can achieve the various outcomes predicted by the theories. The various scenarios thus become OTTWs for exploring the implications of the various theories.

Decision Making Games (DMGs)
Finally, *PeaceMaker* is a Decision Making Game (DMG) (Gonzalez & Czlonka 2010) in which the impact of player decisions, whether intended or otherwise, can be modelled within the game itself, leading to a range of possible outcomes which diverge further as more iterations are undertaken by the player(s). The lineage of such games can be traced back to the immensely popular *Choose Your Own Adventure* books first popularised in the 1970s and 1980s, in which decisions taken lead the player through a branching 'decision tree' of possible outcomes (Cook 2021; Bechkoff 2019). This model of game is unlike more linear genres such as the platformer (the classic *Mario* or *Sonic* games) or the traditional narrative/quest game (*The Last of Us* or the single-player campaigns in *Battlefield* or *Call of Duty*), in which the goal (the victory) is set and the player must overcome obstacles and enemies in a broadly linear fashion to reach this endpoint. Instead, choice in a DMG player is integral to both the experience and the eventual outcomes of the game, but only up to a point. Player choice does determine how the game will unfold, but these are still choices provided to the player by the game designer(s) in the service of reaching an overall ending which incorporates set victory conditions (again, *Choose Your Own Adventure* books demonstrate this perfectly). Therefore, DMGs are still more linear in nature than 'open world' or 'sandbox' games (*Minecraft* or *Grand Theft Auto*), where there are no stated victory conditions (there is no way 'to win') and players can engage in any actions, and for any motivations, that they choose.

A final important point to note about DMGs is that they are not designed to be played once; instead, it is assumed that the player will replay the game (or reread the *Choose Your Own Adventure* book) while making different choices, based upon previous experience, in the hope of achieving a better outcome. This iterative aspect of DMGs clearly echoes the assumptions that underpin the OTTW pedagogy, and we will return to this iterative nature when discussing Dynamic Decision Making (DDM) in the context of public policy design and implementation below.

Complexity and Systems Thinking

Complexity, or systems thinking, is best thought of as a general approach to thinking about natural, social, or technological systems, rather than a unified and unitary theory:

> It is important to reiterate that what is usually referred to as complexity science is actually a collection of ideas, principles and influences from a number of other bodies of knowledge, including chaos theory, cybernetics and complex adaptive systems (a term coined by researchers at the Santa Fe Institute) in the natural sciences, postmodernism in the social sciences, and systems thinking, which is found across all sciences.
> (Ramalingam et al. 2008: 4-5)

Complexity is a way of understanding our world and seeking approaches to the 'wicked problems' (Rittel & Webber 1973) we face. Clear examples of such wicked problems include climate change and disaster resilience, or public policy issues such as homelessness, drug addiction or crime; in all these cases any solutions which are based upon the assumption of a simple or straightforward cause and effect relationship are unhelpful. Instead, such problems require the ability to grasp the 'messy' interrelationships between the range of interconnected causes and effects which comprise such complex systems.

However, when discussing such complex adaptive systems (CAS) it is important to be clear about what they actually are. The definition of Corning (1998) is still valuable:

> … complexity often (not always) implies the following attributes: (1) a complex phenomenon consists of many parts (or items, or units, or individuals); (2) there are many relationships/interactions among the parts; and (3) the parts produce combined effects (synergies) that are not easily predicted and may often be novel, unexpected, even surprising.
> (199)

While the quantitative aspect of this definition (a high level of component/subsystem differentiation and interconnection) is important, it is the qualitative aspect of such systems (their emergent character) that sets the complex apart from the 'merely' complicated. Emergent (i.e. complex) systems are unpredictable: future system states are not predictable from current conditions. Causality in a complex system cannot be reduced to a simple A+B=C relationship.

This emergent character has in turn been 'broken down' into a number of system characteristics through which such emergence occurs or is mediated. These include (but are not limited to) tipping points, feedback loops, path dependency,

nonlinearity (of causality), and the concept of the system 'phase space' (Lehtimäki, Uusikylä & Smedlund 2020; Patton 2011; Ramalingam et al. 2008). While there is not the space in this chapter to explore each of these characteristics in any detail, it is important to note that the most relevant implication of system complexity in the design and implementation of policy is the overall uncertainty that the policy professional faces:

> With respect to policymaking, uncertainty refers to the gap between available knowledge and the knowledge policymakers would need in order to make the best policy choice … policy failures often follow from a failure to take uncertainties into account in making policy, and suggest that taking into account uncertainty can be essential for successful long-term policymaking. It is clear that uncertainty is at the heart of the very nature of long-term policymaking …
> (Walker, Marchau & Swanson 2010: 917)

The question posed to policy practitioners by an awareness of complex systems is this: how is effective policy planning and implementation possible in the face of the radical uncertainty that complexity implies?

Implications For Public Policy

There is an increasing awareness of complex systems within the professional public policy field (Ramalingam et al. 2008; OECD 2017; IPAA 2023), and within the theoretical literature (Geyer & Rehani 2012; Ball 2012; Geyer & Cairney 2015; Eppel & Rhodes 2018; Calenbuhr 2020; Lehtimäki, Uusikylä & Smedlund 2020) around this space.

As this awareness of complexity has grown, there have been a number of attempts to develop heuristic models to help policy practitioners navigate the uncertainty and nonlinearity which characterises many policy issues and wicked problems. These include the Stacey Matrix (Stacey 1993) and the Cynefin Framework (Snowden & Boone 2007) which can be characterised as analytical tools designed to help policy analysts and practitioners categorise policy problems or situations and thus identify appropriate forms of decision-making and organisational control.

However, it is important to note that such heuristic models are not objective reality (Calenbuhr 2020), nor can they provide clear answers to such uncertainty. The designer of the Stacey Matrix eventually disavowed its use, arguing that it was overly reductive in its conception of organisational knowledge— there is no one solution to wicked problems waiting to be discovered. Instead, all approaches must be contingent and organic, rising from the relations and interactions of numerous stakeholders (Stacey, Griffin & Shaw 2000).

Thus, an important insight from the field of Dynamic Decision Making (DDM), which studies how individuals make decisions in conditions of radical uncertainty, is that decision makers will often base their decisions on what has been learned from experience (Gonzalez & Czlonka 2010; Gonzalez, Saner & Eisenberg 2012). Nonetheless, no previous decision and resultant consequences will ever exactly match a current dilemma. Thus, decisions become a process of trial and error, in which failures become new experiences and further influence the next iteration of the decision-making process.

The similarities with Decision Making Games
The connections between the iterative nature of both this DDM process, and the playing of DMGs, should be noted here. It is a central contention of this chapter that the iterative nature of DMGs leads players to replay the game (retaking decisions at crucial points in game in an attempt to reach a better outcome) in a way which directly correlates to the decision-making process faced by policy makers in situations of complexity and uncertainty.

The Case Study: Teaching Complexity and Systems Thinking to Postgraduate Policy Students

As I delivered the first iteration of a newly designed course on public policy evaluation (described in detail below) it became clear that while students were engaged with the theoretical material around complexity and systems, they were finding it difficult to see what this content meant 'in the real world'. One student's feedback (early in the 12-week course) was particularly thought-provoking: 'Ok, this is all very interesting … but what does it mean for me in my department, trying to make and implement policy? What am I meant to actually do?'

There was no simple or direct answer to that question. It seems my course, up to that point, had been doing a good job of introducing complexity as a concept, and what the implications were for policy making. But the responses it had offered to that complexity were largely seen by students to be 'just use trial and error'. While this is largely correct (!) it was not very satisfying; I realised that some sort of demonstration or 'hands on' example would be very valuable. A game or simulation seemed the obvious answer.

Modelling DDM though an OTTW
The very nature of DDM (trial and error) as a policy approach implies that there is not any one successful approach to any particular task or situation, which can be practised repetitively until success (or competence) is achieved. This means that the behaviourist model of 'learning through repetition' does not apply here—instead the iterative OTTW approach is more useful, given that these systems are unpredictable and emergent.

Describing PeaceMaker

PeaceMaker is a conflict-resolution game, exhibiting many aspects of DDM, and has already been used both as an educational tool and as the subject of academic research (Gonzalez & Czlonka 2010; Gonzalez, Kampf & Martin 2012; Gonzalez, Saner & Eisenberg 2012). This single-player digital game was developed by ImpactGames (Impact Games, 2008) and was originally designed to be played by students in Israeli and Palestinian high schools. The stated purpose was to promote cross-community understanding in the service of an eventual two-state solution to this intractable conflict. The player chooses either the role of the Palestinian President or the Israeli Prime Minister and must attempt to choose policies which advance the eventual goal of a stable political peace.

The game continually poses unpredictable challenges to the player, which occur randomly (every playthrough of the game will be different). These challenges simulate external events such as bombings and other attacks by different factions, international developments, police and military actions, and the resultant changes in public opinion. Often policy choices will backfire, having unintended consequences due to the influence of random events which are outside the player's control.

The overall political situation facing the player is clearly emergent, responding both to player actions and unpredictable events, and players must continually adjust their actions and policy settings to attempt to 'steer' this complex political situation towards the winning condition (a two-party solution). In that sense *PeaceMaker* is also clearly an example of a Decision Making Game (DMG), with all the characteristics described earlier: there is a clear endpoint with defined victory conditions, yet the myriad of player choices available mean that a) there is no one policy trajectory leading to the successful outcome and b) players are invited to replay the game to 'try again' with different choices.

The controversial content of the game

Overall, for the stated pedagogical purpose of this class, the context and content of the game were not considered to be as important as the emergent nature of the gameplay (the nonlinear causality in terms of the policy decisions made by players). In fact, I would have preferred to use a similar style of game (presenting policy decision making and implementation in a policy environment of emergent complexity) with a less controversial setting—but this was not available.

The potential of the game content (the conflict between Palestinians and Israelis) to be politically controversial was of great concern. This conflict is politically charged in Melbourne, given the multicultural nature of the city and the likelihood of students in the class having strong political stances on, or unforeseen personal, family or social connections to, this issue. There was clearly potential for in-class conflict and/or personal distress.

With these concerns in mind, two weeks before the class in question I introduced the proposed upcoming activity to the students. This introduction both explained the pedagogical justifications and acknowledged the controversial nature of the game and its content. I made it clear that any concerns could be raised individually and anonymously after class through a message to myself within the course LMS (*Canvas*), and that if there were any clear objections to this being included in the course it would not occur. Alternatively, any students who did not wish to participate in this class could be excused (and as this was not an assessed task there would be no implications for their final mark). In the end, there were no reservations expressed by any student and I felt free to use the game as planned.

How PeaceMaker was used

As part of an MA in Public Policy, the Public Policy course I taught was designed to allow students to participate in evaluations that explore the short, medium and longer-term outcomes of a given policy initiative. But beyond this, the course was not specifically skills-focused, and instead provided a conceptual framework for making sense of the theory and practice of policy impact evaluation as well as exploring the politics of outcomes/impact measurement. The course, at conception, was designed to include a strong complexity focus, as an awareness of these concepts was seen as important for graduates of this program.

Therefore, this course was based largely upon a Developmental Evaluation (Patton 1994; Fagen 2011) approach, as exemplified by the main textbook used: Developmental Evaluation: Applying Complexity Concepts to Enhance Innovation and Use (Patton 2011). This framework 'is an approach to evaluation especially appropriate for situations of high uncertainty … Developmental evaluation tracks and attempts to make sense of what emerges under conditions of complexity …' (Patton 2011: 7).

This was a face-to-face (F2F) course comprising live two-hour seminars (incorporating approximately 45 minutes of lecture materials delivery, followed by group and whole class activities, and finally assessment work). The LMS used by the institution at this point was *Canvas*, although given the F2F format this was primarily used for delivery of set course readings, the hosting of seminar slides, and class–teacher communication.

The place of the game within the course

I used this online game in class in week six of the 12-week course. The inclusion of *PeaceMaker* was predicated on its educational value as an OTTW for the students. That is, the assumption made was that there was pedagogical value in using this game to encourage students to explore some of the challenges and implications of policy design and implementation within complex adaptive systems (such as dynamic public policy environments).

PeaceMaker: Using an online educational game on Middle East politics as an 'Object to Think With' (OTTW) in a Masters-level Public Policy course

Outline of the PeaceMaker lesson

Students were briefly introduced to the mechanics of the game before being placed in pairs and assigned either the Palestinian or Israeli side. They were then allowed to start playing and were invited to a) discuss their policy options before they chose a policy action for each turn and b) record on a worksheet both the decisions taken for each turn and the outcome (both the immediate results of the chosen policy choice and their ongoing overall game score). They were also allowed to restart their game after at least six turns or start another game if they concluded their first one. They completed the questionnaire again for a second game. The questions were:

After moves 1 to 3:

• What were your first three moves (i.e. what did you do)?
• What was the point of your first three moves (i.e. what were you attempting to do)?
• Did your actions have the intended outcome? Why/why not? Or is it too early to tell?
• How did you evaluate the success or otherwise of your first three moves?
• Were there any unexpected outcomes (i.e. side effects)? If yes, what were they?
• What will you do differently (if anything) in your next three moves? Why?
• What do you predict will happen over the next three moves (what will be the probable outcome of your actions?)

After moves 4 to 6:

• What did you do in these three moves, and why?
• Was it hard to agree on these three moves? Why/why not?
• Did your overall strategy change in these three moves (did you change tack from your original approach)? Why/why not?
• Did your actions have the intended outcome? Why/why not? Or is it too early to tell?
• Were there any unexpected outcomes (i.e. side effects)? If yes, what were they?
• What is the situation at the end of move six (are you winning?) Why/why not?

At the end of the game:

• How successful were you at the point at which the game ended (or you stopped it)?
• What was the biggest problem or challenge that you faced throughout the game?
• How did you attempt to address this? Were you successful? Why/why not?
• Could you identify any aspects of complexity while playing this game? What were they?
• Does public policy design and implementation work like this in your professional field? Why/why not?

• Imagine you were actually in this role (making policy). What would have happened to you (personally and professionally) if this had been reality?

At the end of the class (about 90 minutes of game time) I led a class discussion where the pairs reported their answers to the worksheet questions. They also answered some final questions about the experience and how effective they thought it had been pedagogically.

Discussion

This was an 'on the go' adaptation of a course already underway; a teaching experiment in the pedagogical value of using an online game to promote deeper engagement with complexity concepts within the public policy field. As part of the classroom activity, I collected the worksheets completed by the various pairs and some general comments can be made.

Informal feedback from students indicated that they found the experience of playing (and replaying) the game, and of reflecting on the experience, valuable. Removed as it was from the pressure of real-world policy decisions, the experience of playing this DMG allowed participants to respond to earlier policy failures and propose and test new approaches in a way which clearly reflected the nature of the DDM policy making process. Some students could see more clearly what an iterative DDM process might look like in practice.

However, it was less clear to what extent *PeaceMaker* represented an effective OTTW for the students, as the content (the Israeli/Palestinian conflict and peace process) was far removed from their professional experience. A DMG dealing with more traditional public policy scenarios (such as homelessness, domestic violence or public transport provision) would have been more valuable. There is clearly an opportunity for such a scenario-based DMG to be developed in which the relevance of the scenario (that is, a common public policy scenario with a range of competing stakeholders) would only increase the likelihood of such a game being a valuable OTTW for students.

Some final specific points:

• Playing the game twice (and in one case three times) was crucial for students. Reflecting the character of DMGs and DDM, students reported that this offered them the chance to experiment with different policy approaches and choices.
• One student reflected on a possible real-world implication of iterative experimentation around policy design and implementation—failure is often neither politically or professionally acceptable. Where does that leave the DDM approach to policy making? This led to a provocative yet useful classroom discussion.

Conclusion

This attempt to use an online DMG as an 'Object To Think With' was undertaken 'on the go', in the face of student feedback regarding a course that was already underway. Informal positive feedback by the student participants was broadly positive regarding the pedagogical value of the activity, and I likewise found this a useful activity, given the quality of the discussion around complexity and public policy that it provoked. This chapter therefore closes with a call for further exploration of the pedagogical value of games as 'Objects To Think With', and for further empirical research into their effectiveness in teaching complexity and systems thinking.

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