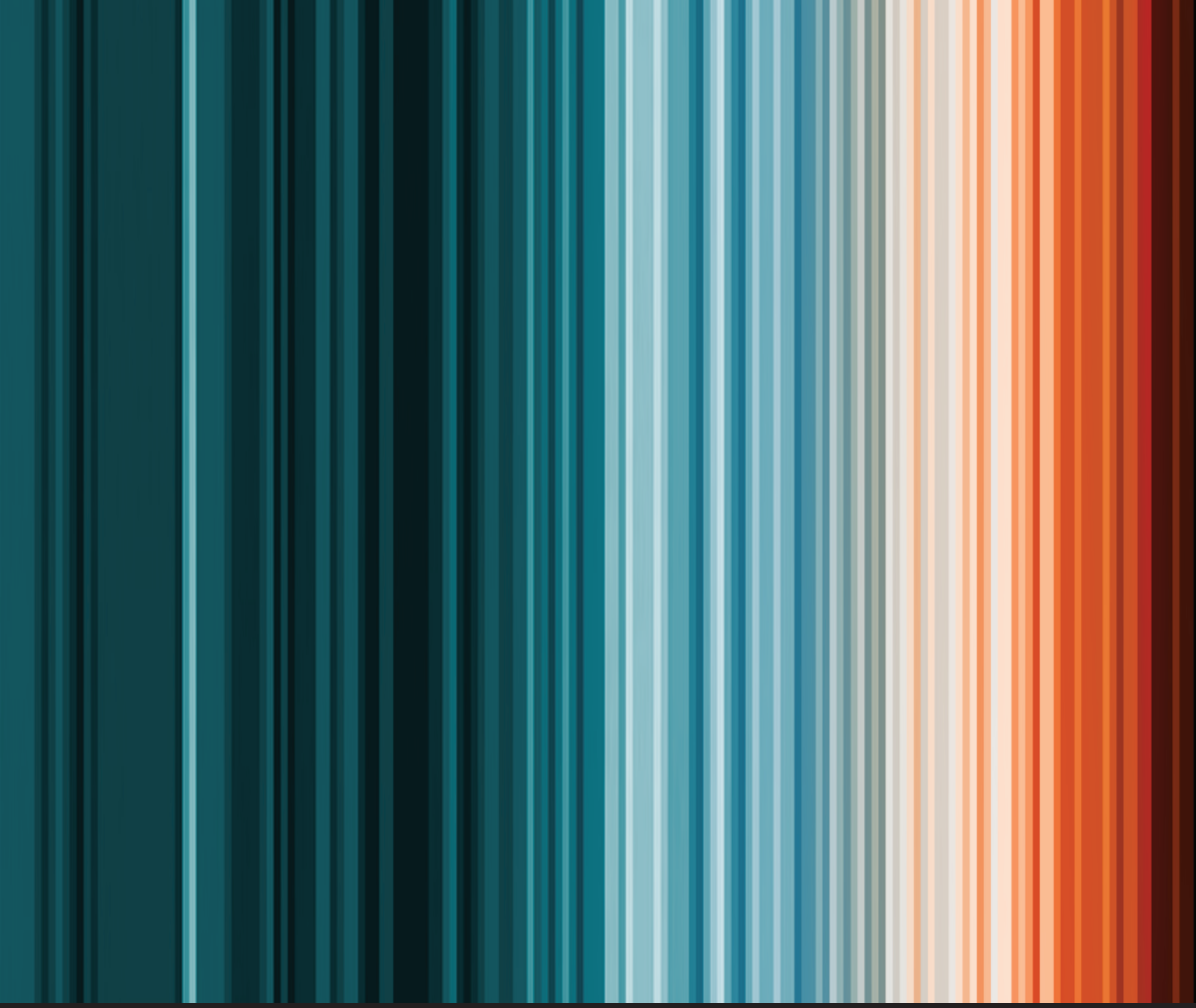

The **Climate Special Interest Group** of the
International Game Developers Association Presents

THE ENVIRONMENTAL GAME DESIGN PLAYBOOK

Version 1.0 Alpha Release

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AUTHORS

Clayton Whittle, Trevin York, Paula Angela Escuadra, Grant Shonkwiler, Hugo Bille, Arnaud Fayolle, Benn McGregor, Shayne Hayes, Felix Knight, Andrew Wills, Alenda Chang, and Daniel Fernández Galeote.

REVIEWERS

Sabrina Culyba, Henry Driver, Charly Harbord, and many more IGDA Climate SIG game developers, researchers, and climate activists who volunteered their valuable time and expertise to review and provide feedback to the community's Design Patterns working group.

ARTISTS

Melanie Christin, Arnaud Fayolle, and Charly Harbord.

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INTRODUCTION

Does what I do really matter?

How am I supposed to fight climate change - when I just make video games?

What can I do to make a difference?

How can I be sure I'm promoting the right kind of change?

If you're a climate-minded game developer or researcher, perhaps you've asked yourself one or more of these questions. In an industry so laser-focused on technical innovation and return-on-investment, it's easy to feel powerless in the face of a global crisis. Releasing a successful game in itself can feel like capturing lightning in a bottle. *Now - you have to design for impact, too?*

We, the community members of the IGDA Climate SIG, are here to tell you that you are not alone - and you do not have to build from scratch. Developers across the globe - working in teams both large and small, across all disciplines - are asking themselves the same exact questions. Many of these developers have already started taking action. Others may believe in the power of their craft, but don't know where to start in the context of their role. Others still may be skeptical if impact is possible at all.

The goal of the Environmental Game Design Playbook is to establish a common design language for discussing climate action in games.

No matter where you are in your own climate journey, we hope to arm you with the tools you need to create climate messaging that's effective and helpful, rather than unproductive - or worse, harmful to your design intent.

Time and time again, developers have come up with new winning strategies for achieving tangible real-world impacts, many of which predate even the notion of climate games. There's no silver bullet. However, there are some common threads shared by commercial and impact-driven games of all shapes and sizes. It's our hope that illuminating these tactics will set you up to create positive change whenever the opportunity presents itself - serving the triple bottom line of **people, planet, and profit**.

By sharing these practices, we also hope to spark deeper conversations with all of you so that we can grow this Playbook over time with your help. Please join us on our merry adventure to a more environmentally conscious and climate resilient video game industry and future.

WHAT *IS* THE IGDA CLIMATE SIG?

We are an inclusive community of game developers, climate scientists, researchers, and enthusiasts committed to supporting grassroots climate action throughout the games industry, all over the world. For more info, visit ***www.igdaclimatesig.org****!*

WHAT'S CONTAINED IN THIS DOCUMENT?

We'll explain relevant processes and techniques that have worked in the past and why they've been successful, along with practical examples and context. We know game development is complicated even before a team considers environmental messaging and impacts.

This is NOT a document of strict recipes you must follow to properly design a game aiming for an environmental impact on your players. Rather, our hope is that this document leaves you understanding the range of relevant ingredients and empowers you to create incredible recipes that work best for you, your games, and your players. At the same time, we must be upfront that designing a game that creates a persistent change in players is itself a delicate endeavor that can't be squashed into a quick-read Top Tips article. In the interest of offering you a good balance between context and accessibility, here's how we've structured this resource:

FIRST, WE NEED TO DISCUSS OUTCOMES.

If you want to reach your destination, it helps to know exactly where you're going. There are some fundamentals that can help you answer these questions and choose an outcome that is specific enough to build a game towards, while being effective enough to have a real-world impact.

To support our section on Outcomes, we'll also tell you about other frameworks. This is far from the first game design framework, and it won't be the last. Frameworks are useful when they help you effectively pair your intentions with your creation, so we want to make sure you're aware of other frameworks in this space. We won't get jealous; use whatever works for you!

THE BULK OF THIS PLAYBOOK IS ABOUT TACTICS.

It's important to choose appropriate outcomes, but knowing the destination is only valuable if we have a plan to get there. How might you effectively design and develop games that reach your target outcomes? **To help identify tools that make sense for your own needs**, we:

- Explain what a **tactic** is,
- Map it to the **evidence** suggesting its effectiveness, and
- Provide working **examples**.

WE CLOSE WITH SOME BIG PICTURE CONSIDERATIONS.

Other factors that surround your player's experience - such as the **metagame** and **social interactions** - can impact the player experience, and thus a player's journey towards your intended outcome. For those of you up for spending some time with more abstract considerations like these, we've got you covered.

Ready? Let's get started.

PART ONE: OUTCOMES

How will players be different after playing your game?

INTRODUCTION TO ENVIRONMENTAL PSYCHOLOGY

Before discussing game design elements, we must set the stage with a brief discussion of environmental psychology: the field that studies how individuals interact with the environment and why they may decide to act in support of the environment (or not). This foundation is critical for understanding how our interactions with people and media empower or discourage pro-environmental behavior.

Without this base knowledge, **WE RISK LOSING**:

Accessibility. Players may not be able to recognize, understand, and/or act upon the game's design intent without unintended difficulty.

Relevance. Players may not feel as though the developer's design intent is relevant to their needs (or that of their community).

Brand Trust and Social Capital. Difficulties in engagement and retention can have downstream effects on player sentiment. These effects can directly impact their willingness to evangelize the game and/or recommend it to others.

Impact. The game's design intent is not achieved. As a result, the needle towards real-world environmentally conscious behavior is not moved.

WHAT DRIVES US TO ACT: LINEAR VERSUS COMPLEX MODELS

We are relentlessly bombarded with choices and messages regarding the environment. Pressure and information from school, the internet, friend groups, and our own experiences mean that any decision we

make is filtered through our own complex knowledge and social desires. Some choose to recycle or become vegetarian; others go to a protest or call their policymakers.

Because our own personal environmental psychology is so complicated, understanding exactly why an individual makes a decision is nearly impossible to do with any level of certainty. In previous years, environmental educators and psychologists believed in the effectiveness of linear models. The idea was: to inspire action, all an educator needed to do was provide knowledge about the environment. That knowledge would then naturally lead to an awareness of threats to the ecosystem. Awareness would cause a pro-environmental change in attitude and, eventually, behavioral changes (Uzzell and Rathzel, 2009).

This approach, however, has had mixed results in the real world, and is increasingly being forgone in favor of more complex approaches (Kollmuss and Agyemen, 2002). With this in mind, environmental psychology and behavioral researchers have developed complex models for reliably predicting pro-environmental behavior. There are two models for influencing behavior that are relevant for game design: **Ajzen's Theory of Planned Behavior** (1991) and **Kollmuss and Agyeman's Pro-Environmental Consciousness** (2002).

AJZEN'S THEORY OF PLANNED BEHAVIOR.

This model identifies 3 broad predictors: **perceived control** (self-efficacy), **pro-environmental attitude**, and **social norms.**

In this model, an individual will take an action ***if*** :

They feel **empowered** to make a difference.

+ They feel taking pro-environmental action is a **good thing to do**.

+ They feel **supported by their peers** to take action.

KOLLMUSS AND AGYEMAN'S THEORY OF PRO-ENVIRONMENTAL CONSCIOUSNESS.
This model identifies 6 predictors that must align for action to occur:

INTERNAL FACTORS are an individual's **knowledge**, **values**, **attitudes**, and **emotional involvement**.

=

EXTERNAL FACTORS are the **social** and **cultural influences** present in an individual's life.

In this model, **internal factors must be in balance with external factors.**

UNLOCKING COLLECTIVE ACTION: SOCIAL PRESSURES AND MICROCULTURES

Critically, each of these models highlights the importance of social pressures. Studies have repeatedly shown how local socio-cultural norms influence decisions over nearly all topics. Changes in society don't happen overnight, and are often daunting because we're individuals seeing a huge problem. However, we can create **micro-cultures** — small communities around our games and companies — that share the values and social norms of supporting science-informed environmental action. These micro-cultures can grow strong enough to challenge existing social norms and pressures from the surrounding society (Barton & Tan, 2010). The Metagame section of this document specifically highlights strategies and research findings in fostering these micro-cultures.

THE TAKEAWAY

Both models discussed identify four high-level predictors of **pro-environmental behaviors**: **knowledge**, **pro-environmental attitude**, **efficacy**, and **hope**. If an individual has all four, they are highly likely to act in a pro-environmental manner. These predictors of behavior are not passive, static traits. Rather, these are ever-changing and constantly adapting to new information. An educator can provide the right kind of knowledge. Through that knowledge, a student can be inspired to make changes in their life. Similarly, a designer may go out of their way to normalize pro-environmental messaging in their design process, providing colleagues and players with the sense of support needed to shift their own attitudes without risking social isolation.

Whatever the pathway, you (as an educator, advocate, designer, content creator, or anything in-between) can influence any of these aspects in an individual or entire community through educated approaches to environmental messaging. Through

these small influences, we can make real progress towards stemming the tide of the climate crisis.

When an individual has the knowledge to act; an attitude that inspires action; perceives themselves to be capable of making a difference; and believes that their action can result in a worthwhile outcome - people are highly likely to act in a pro-environmental manner.

4 KEY PREDICTORS OF PRO-ENVIRONMENTAL BEHAVIOR

The idea of attempting to achieve behavior change or action is daunting. We can make this task more achievable by understanding the specific factors that can encourage a person to take action: **knowledge**, **attitude**, **efficacy**, and **hope**.

With this in mind, we caution that designing effective pro-environmental games should not involve "behavior change" as the immediate, primary goal. This is not to say that behavior change can't or won't happen as a result of the experiences you create.

Rather, "behavior change" may be too vague because there are many steps in-between getting players from where they are to where you hope they head. By focusing on one or more of the pro-environmental predictors, designers can draw on specific design tactics for that predictor - honing in on their desired impact in a way that can be more concretely measurable.

In the following section, we will take a closer look at **how these pro-environmental predictors can help us unlock intention and behavior**.

WAIT - HOW DO WE ARTICULATE WHAT PLAYERS *WANT* VERSUS WHAT THEY *DO*?

Environmental psychology models often refer to primary outcomes or measures: **pro-environmental intentions (PEIs)** and **pro-environmental behaviors (PEBs)**.

PEIs. Much of the research around environmental behavior is tied to intention because intention can tell us what the person wants. These are less easily measured, but equally important. The intention to engage in a pro-environmental behavior may be present, but is not always be acted upon.

For instance, an individual may intend to buy a hybrid car, but never actually make the purchase. When these intentions are not acted on, some barriers may have prevented the action. An individual may not be able to buy a hybrid because it's not financially accessible to them. In other cases, an individual may not be able to buy a hybrid because they live in an area that does not have an easily accessible supply. By understanding what the barriers are, researchers, designers, educators, and governmental organizations can work towards removing them.

PEBs. These are the actual acts or manners in which an individual may demonstrate support for the environment. These behaviors vary significantly person-to-person, and may include anything from recycling and installing solar panels to voting based on environmental policy.

KNOWLEDGE

Knowledge about an environmental issue is a prerequisite for **pro-environmental intentions (PEI)** and, even moreso, effective **pro-environmental behaviors (PEB)** (Kaiser & Fuhrer, 2003). In particular, it is often cited as the critical mediating variable between intention and behavior (Pothitou, Hanna, & Chalvatzis, 2016). In other words, the best intentions are not acted upon if the person does not know how to act effectively. Many games target this important predictor as an outcome for **game-based environmental education (GBEE)** because it can be more easily influenced or measured than the other two predictors (Fernández Galeote et al., 2021).

To achieve the goal of influencing behavior, it is critical to understand that there are many distinct types of knowledge. These types each influence individuals' thinking and decision making. There are four types of environmental knowledge an individual can possess: **awareness**, **systematic**, **action-oriented**, and **effectiveness knowledge**. (Frick, Kaiser, & Wilson, 2004; Kaiser & Fuhrer, 2003).

AWARENESS KNOWLEDGE

*"I am **aware** that the climate crisis is **real**."*

To solve a problem, an individual must first be aware that the problem exists. **Awareness Knowledge** is also called **declarative knowledge** because it involves the declaration of a truth or fact. Many games focus on raising awareness knowledge (Flood, Cradock-Henry, Blackett, & Edwards, 2018).

While an important first step, it is the least helpful kind of knowledge: a person can know that the climate crisis exists, but that knowledge may do little to spark action. **Isolated awareness without a clear path to action can also be counterproductive.** If we enable a person to gain greater awareness but fail to give them the tools to address the problem, we can often leave them feeling overwhelmed. This can result in a self-protection **"fight, flight, or freeze"** mentality. The physical and psychological stress this causes can inadvertently drive them towards anti-environmental rhetoric and behavior - not out of malicious intent against the environment, but because keeping the worldview we've known for longer can sometimes feel safer than admitting that there is a problem, even if there are ways for us to address it.

SYSTEMATIC KNOWLEDGE

*"I **understand why** the climate crisis is **happening**."*

Systematic knowledge is our understanding of how elements relate; for instance, why reliance on fossil fuels might impact ocean biodiversity. In the context of game design, this type of knowledge can be understood as how the player comes to understand the underlying mechanics of the game, and builds skills needed to be able to predict the impact their actions will have on the game world.

To cultivate systematic knowledge, **players need to know not only the components of a system, but how and why they relate**. Deeper understanding most often comes from repeat experimentation within a given system. Video games are uniquely capable of enabling experimentation with complex systems through direct interaction players have with gameplay mechanics (Waddington & Fennewald, 2018; Yang, Lin, & Liu, 2017). Through this trial-and-error process, players have the potential to safely fail multiple times and eventually find a solution that works for them. This specific "a-ha!" moment can directly help players go from pro-environmental intention (PEI) to pro-environmental behavior (PEB).

ACTION KNOWLEDGE

*"I know **what I can do** to help address the climate crisis."*

Action Knowledge is the highest impact type of knowledge: it is the understanding of exactly how to act in order to achieve a specific goal within a specific context. A motivated individual can draw on their accurate action knowledge to move from intention to action. An individual may have a desire

to recycle, but, until they know their local self-sort recycling laws, their attempts will be ineffective and create burnout.

NOTE

Action knowledge is critical, but not universal. **What may work in one community may not work for another.** The degree to which this knowledge can be acted upon is heavily influenced by what cultural, economic, and/or environmental context the opportunity for change is in.

EFFECTIVENESS KNOWLEDGE

*"I know **how to effectively** create a meaningful impact. I know **how to adjust my approach** as needed."*

Action without a clear sense of the outcome can feel disempowering. With this in mind, **effectiveness knowledge** refers to a clear understanding of how to define, adopt, measure, and improve upon the outcomes of pro-environmental behaviors (Frick et al., 2004). In other words, it is the degree of concrete understanding with which we know what to do, how to do it, and what to do in the event we run into challenges blocking our progression towards a specific goal. This kind of knowledge is relevant for pro-environmental intentions as it can greatly improve an individual's perceived self-efficacy (Kaiser & Fuhrer, 2003).

ATTITUDE (OR, HOW THE PROCESS OF LEARNING CAN UNLOCK INTENT)

An individual's ability to apply their action and effectiveness knowledge is directly dependent upon their attitude and intent. **"Attitude towards the environment"** is a blanket term for how an individual defines and feels about their relationship with the natural world. It can refer to everything from a person's empathy towards local wildlife to their comfort level with outdoor activities, like hiking and bird watching.

When considering how to approach attitude-based messaging, think about how the message can influence **3 important sub-attitudes of players**: **preservation versus utilization, connection to nature,** and **empathy**.

PRESERVATION VERSUS UTILIZATION

A person's attitude toward nature can be classified on a scale from wanting to preserve nature to wanting to extract from it. Effective

pro-environmental actors often have a balanced perspective - meaning they feel human beings should find a balance of protecting nature, while using natural resources responsibly, based on just what is needed (Milfont & Duckitt, 2010).

CONNECTION TO NATURE

A person's connection to nature can refer to their self-perceived relationship to the natural world around them. It can also refer to the degree to which a person considers nature to be a part of their identity as a human being. People gain this from spending time in nature and understanding how their lives influence and are influenced by the natural world. This is one of the more reliable predictors of pro-environmental attitude, and can also have direct impacts on our sense of wellbeing.

EMPATHY

Empathy in this context is defined as a person's capacity to understand an animals' lived experiences in a way that invokes a desire to protect or provide care. The result is often a willingness to care for them. People are more likely to become invested in their environment if they empathize with the animals, settings, or people impacted by climate change.

It is very important to remember that attitudes are learned frames of mind. **We construct our attitudes from our experiences - individual and social; emotional and intellectual; physical and cognitive**. In each experience, we as humans can choose to re-examine our attitudes - sometimes so drastically that our entire life is changed; other times, it happens so slightly that we may not even notice. When designing for attitudinal shifts, we can create experiences in which players learn through emotional interactions; exposure to social and/or conceptual norms; and/or the ongoing practice of positive behaviors.

AFFECTIVE LEARNING

*"I **empathize** with what this person or creature is experiencing."*

Our ability to connect with and/or retain memory of our human experiences are powerfully tied to the emotions we feel when living through them**.** **Affective learning** refers to the use of emotional interaction to gain new knowledge or skills. Games can encourage learners to engage emotionally and make important decisions (Janakiraman, Watson, Watson, & Newby, 2021). Compelling stories and roleplay mechanics can create feelings of empathy - in turn, encouraging pro-environmental attitudes (Yant, et al., 2012).

NORMATIVE LEARNING.

*"I recognize water conservation efforts are **normal** and **expected** because **my community values it**."*

Social relationships and interactions can be strong predictors of behavior. The **power of social norms** are strong enough that individuals may engage in normative learning, such that they will identify and change behaviors to be more in line with those around them (Vicente-Molina et al., 2013). The great challenge in designing for normative learning is that it requires some level of ongoing **social reinforcement**. In other words, the **knowledge** and **attitude** to be learned must be supported by the social group in which the person is significantly invested. Though research on normative learning in environmental games is limited, researchers have explored the power of game affinity spaces (Gee & Hates, 2012; Squire, 2012a). They have identified opportunities to leverage local culture and community cohesion as conduits that can spark normative learning moments (Flood et al., 2018; Stokes, 2020).

WHAT ARE THE TWO MAIN TYPES OF NORMATIVE LEARNING?

Normative learning refers to the learning of **social norms** and/or **concepts**.

SOCIAL NORMATIVE LEARNING

This refers to the recognition and/or adoption of new norms and values through social influence or pressure (Lee, Matamoros, et al., 2013).

For example: the mass adoption of recycling bins. In areas with resources for a formal recycling program, governmental regulation and community reinforcement directly enabled the sorting of recyclables to be normalized and sustained.

CONCEPTUAL NORMATIVE LEARNING

This refers to the reorganization of internal mental models through social interaction. Conceptual normative learning is highly internal and happens as our social interactions force us to confront how or what we think.

Games can engage players in ways that challenge inaccurate mental models and beliefs, and can unpack values through gameplay elements such as roleplay (Flood et al., 2018).

BEHAVIORAL LEARNING.

*"I have **practiced** this skill enough that it has now become a **habit**."*

Lastly, **behavioral learning** refers to the idea that the more a person performs a behavior, the more ingrained it will be as a habit (also called **behaviorist theory**). Research indicates games-based environmental education has proven capable of influencing the repeat practice of behaviors because of how skill progression is often reinforced through gameplay (Cowley & Bateman, 2017; Di Dio, La Gennusa, Peri, Rizzo, & Vinci, 2018; Hedemalm, Hallberg, Kor, Andersson, & Pattison, 2017; Janakiraman et al., 2021).

Large commitments to behavior change are often unsustainable because the people declaring them may not have the skills or experience to sustain them. Given this, impactful behavioral learning is best achieved through slow, incremental changes over time (Kamradt and Kamradt, 1999 via Janarkiarman, 2021). Since people's attitudes are not always explicit, attitudes can be extremely difficult to influence and measure through interventions. Short, inconsistent experiences that last less than a few days are largely ineffective unless the player sees the experience as emotionally or practically important to them (Schneider & Schaal, 2018). We as human beings often need reinforcement and safe spaces to re-examine our attitudes over time. If paired with social support and actionable materials, extended exposure to pro-environmental experiences tends to be more effective for nurturing a lasting pro-environmental attitude (Rickinson, 2001).

Impactful behavioral learning is best achieved through slow, incremental changes over time.

Knowing this, games and game-based learning can serve as powerful tools: the act of playing a game is inextricably linked to learning and reinforcement. Games can be 1 hour long, or take over 100 hours to complete; regardless, the act of completing and repeating the core loop through trial and error can give players the safe space and impetus to reflect upon their experiences. In turn, this can help prime them to become more comfortable with attitudes that may feel new - allowing these types of mindsets to become more normative over time.

PERCEIVED SELF-EFFICACY

It is important for us to acknowledge that knowing the solution, understanding it as the best possible one, and caring about it **does not in itself automatically create the willingness to act**. In order for us as developers and players to feel compelled to move from knowledge to self-efficacy, we have to understand what makes us feel like we can act.

Perceived Self-Efficacy refers to a player's belief in their own ability to effectively act to create change they want to see; also known as **agency thinking**, it predicts their likelihood to start, continue, and/or scale pro-environmental behavior. If a person feels capable and well equipped to engage in these behaviors effectively, they are more likely to continue them (Kerret et al., 2021; Yoong et al., 2018). Inversely, if they do not see their actions as impactful or meaningful, they are not likely to continue those behaviors. **When someone feels powerless or hopeless, they are more likely to fall into defensive behaviors, such as climate apathy or full-on climate change denial** (i.e. the "fight, flight, or freeze" mentality we mentioned earlier).

As game designers, we are uniquely positioned to build experiences that empower the player and help them redefine their relationship with failure. Our game systems and stories can encourage the player to explore and overcome challenges safely and with confidence.

HOPE

This last pro-environmental predictor, **hope**, is critical. Our willingness as human beings to take on the emotional labor, time, and energy to act in the face of a major environmental threat necessitates that we are not just aware of the problem - but that we care about it, know what to do about it, and are confident in our ability to do it well. However, these elements alone are not always enough to compel an action or behavior change. It is critical that we feel that there is hope: the belief that we have the ability to generate solutions and have the motivation to pursue them because the positive outcome is obtainable.

Hope is built by creating experiences and environments in which people can build and practice:

- **Social trust**, or the firm belief that other people within a given system are reliable collaborators who are doing their part (Ojala 2012).

- **Pathway thinking**, or the agency with which a person can set clear environmental goals that align with their needs, track incremental progress, and experience successes that can build competence and increase motivation to continue.

- **Perceived self-efficacy**, or confidence in the capacity to successfully achieve goals, paired with positive motivation to do so.

SO – IS HOPE A FEELING?

Hope is a cognitive construct, not an emotional one; this means it is not a state of mind. Rather, **hope is a form of goal-directed thinking**: the ability to find actionable routes that lead to desired goals. Hope can be learned and directly influences how we interpret and approach situations in everyday life (Hartmann et al., 2018).

THE TAKEAWAY

Knowledge, attitude, efficacy, and hope predict whether an individual will act in a pro-environmental manner. As such, these are the factors we intend to unlock in players through our game design. Different game designs can result in different levels of environmental advocacy, in addition to satisfying the diverse emotional and psychological needs of players. This translates to games having significant potential to meaningfully sway people towards pro-environmental action that makes sense for them - in their context.

DESIGN THEORIES

In this section, we'll start with two key empirical frameworks that can help us **conceptualize how to approach impact-based game design**. We'll then talk about what to consider when exploring and defining environmentally-conscious gameplay elements. The concepts discussed have been used to form the guiding principles for this Playbook's design tactics to date.

When thinking about the messaging in your game, keep in mind the opportunities with which we can empower a player to grow in their **knowledge**, **attitude**, and **perceived self-efficacy**, and **hope**. Some of the design tactics explicitly intend to teach and may be more appropriate for serious games or game-based learning endeavors; others can be marketed as commercial games that prioritize more emotional responses and the fulfillment of other psychological needs, like social connection, humor, or achievement.

Nothing in this document should be taken as written in stone. These are meant to serve as starting points, with examples of what others have done in the past that you can look to for inspiration. No one specific pattern is the ultimate solution, and there are endless ways to use and evolve them. So, please consider these patterns as different means to a shared end at which players across all of our ecosystems can collectively become a little more pro-environmentally active than we found them.

TRANSFORMATIONAL FRAMEWORK

In 2018, Sabrina Culyba released the *Transformational Framework* (Culyba, 2018). The framework is created from years of design experience at Schell Games. It is designed to help developers create games that can change players by centering around 8 exploratory questions. For the purposes of this Playbook, we will focus on 3 major design considerations emphasized in the *Transformational Framework* (we strongly recommend checking out Culyba's full framework for details on how to meaningfully approach game topic selection, engagement with subject-matter experts, and more!).

FIRST, LET'S CONSIDER PLAYER CONTEXT. Culyba first reminds designers: before considering the mechanics or goal of their project, we must first consider the context in which their game will be distributed. What is the socio-economic situation of the players? What access do they have to different types of technology? What are the cultural expectations they consider the norm? What formalized structures or social connections encompass the game and the player? Finally, what else will the audience be connected to that is related to your message content?

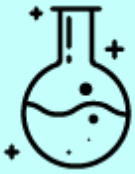
Standard game development is often focused on understanding what will appeal to an audience. For a game to create transformation, we have the additional challenge of understanding how to affect change in the audience. **REMEMBER: WE ARE NOT OUR PLAYERS.** What may be transformational for us may not be transformational for them. Be clear about defining your hypotheses about your players' initial state (i.e. how they are before entering the game) so that you can be more concrete about how you intend to influence their end state.

CONSIDER THE TYPES OF TRANSFORMATION YOU HOPE PLAYERS CAN EXPERIENCE. Next, the designer needs to consider what transformation they actually wish to achieve. Something as vague as "make the world a better place" is noble, but is hard to measure and may not add concrete value to their player audience. Our design goals must be similar to the goals outlined by a business or a scientist: achievable, specific, player-centric, and measurable. Culyba proposes **10 types of transformations**. Defining the specific change we wish to see in the player or the world can help guide the design process, and to prioritize what does (or does not) make the cut for the final game.

Knowledge. Player knows something new or has a different understanding as a result of gameplay.

Skill. Player can do something new.

Belief. Player's sense of truth has changed.



Physical Change. Player's body has changed.

Relationships. Player has altered or formed new relationships.

Disposition (Affect). Player's feelings or sentiment has changed.

Identity. Player's sense of self has changed.

Experience. Player's personal contact with and/or observation of truths or events have changed.

Society. The world around the player has changed as a result of the actions the player has taken.

Behavior. Player acts in a new way.

LASTLY, CONSIDER BARRIERS BASED ON PLAYER CONTEXT. The last concept of the Transformational Framework we'll cover is the presence of barriers. We must ask ourselves, before designing, what has stopped the target change from taking place already? Why is the target player not already recycling? Why does this individual not see themselves as an environmentalist? Recognizing the barriers to the target transformation is a critical step in designing a game that can tear down those

barriers. Culyba identifies 9 primary barriers: **Motivation, Perceived Relevance, Social Norms, Access, Complexity, Unfamiliarity, Misconceptions**, and **Fear.**

Motivation. Player doesn't think going through the game is worth doing.

Perceived Relevance. Player feels the game is disconnected from their needs and lived experience.

Social Norms. Player has taboos or biases that prevent them from being able to experience the game's design intent.

Access. The player lacks resources or is blocked from resources needed to be transformed as a result of gameplay.

Complexity. Player is overwhelmed by the scope, information, and/or topic of the game.

Unfamiliarity. Player is not aware or minimally aware of the topic the game is focused on.

Misconceptions. Player actively believes something is not true, blocking them from being able to transform as a result of gameplay.

Fear. Player perceives or feels an actual risk or danger that prevents them from being able to

transform as a result of gameplay.

By defining the barriers that may most severely affect your game's transformational potential, you can not only be more concrete about defining their potential effects, but also leverage them as catalysts for creative game design ideas that can help your players overcome them.

"Barriers sit at the intersection of the real-world struggle for your purpose and the potential impact of your game mechanics." - Sabrina Culyba (2018)

OUARIACHI FRAMEWORK

Developed by Ouariarchi and colleagues (Ouariachi, Olvera-Lobo, Gutiérrez-Pérez, & Maibach, 2019), this framework identified **15 attributes** that can help maximize engagement of players, particularly in serious games tackling climate change. It is the result of a qualitative investigation in which the authors interviewed game designers and learning theorists; in addition, the proposed attributes have also been validated by young adult players. Each attribute highlights thoughts, feelings, and emotions a player can have when experiencing a serious game.

Designers using the framework can hold their games up against each element and ask themselves: **"Is the learning or messaging in my game in alignment with feature X?"**. In addition, the framework can be leveraged to understand how each feature relates to the cognitive, emotional (affective), and behavioral learning suggested by earlier environmental education theory.

Achievable. Players should be able to learn how to perform well in the game. The behavior encouraged should be specific, possible, and easy to practice in real life.

Challenging. The task provided should require some effort (that the player feels is appropriate for their comfort and/or skill level).

Concrete. Messages should be clear and simple, avoiding information overload. They should be integrated into gameplay, not overlaid as text.

Credible. Trustworthy information from trustworthy sources.

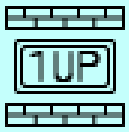
Efficacy Enhancing. Promote empowerment. Allow players to make decisions and see the consequences. Support players in feeling inspired to act.

Experiential Learning. The human brain gives priority to experience over data or analysis. *Do* instead of *think* (Wu & Lee, 2015).

Feedback Oriented. Evaluate performance related to the goal in a timely manner. Give players context that can help them know if they are on the right track or need to adjust.

Fun. Create a sense of enjoyment or fulfillment. WHen pushing hard for impact, it can be easy to forget this. Players should come out feeling like their time is well spent.

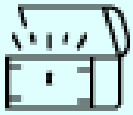
Identity Driven. Connect to relevant personal experiences. This includes the ability to see reflections of oneself in a character or as part of the narrative.



Leveling Up. Goal directed behaviors with clear milestones and challenges that ramp up in difficulty over time.

Narrative Driven. Stories facilitate cognitive processes and emotions that can inspire action. They engage feelings, values, and imagination - all of which have direct and indirect influences on attitudes, hope, and behavior change.

Meaningful. Invoke intense feelings. Feelings increase attention, interest, and willingness to act. Imagery or messages creating fear or discomfort must be connected with remedial action or solutions, linking to everyday emotions. Creating meaningful emotional attachment to a problem, but having no solution presented, can overwhelm players. This can accidentally drive them to actually distance themselves from or totally ignore the intended message to avoid feelings of helplessness.



Reward Driven. Play should be paired with positive reinforcement of target behavior. Ensure the rewards are ethical and avoid exploitative designs that can be harmful to players' mental health and/or safety.

Simulating. System simulations that allow players to trial-and-error multiple outcomes through a wide range of choices. This can teach and elicit

critical systems thinking.

Social. Psychologically safe and inclusive player-to-player interactions can help create positive peer reinforcement of target behavior.

WHAT ARE THE KEY THEMES I SHOULD CONSIDER?

We hope that the frameworks described can help make the macro-level design considerations more concrete. Rather than incorporating these as hard rules or regulations, we hope these frameworks surface guiding questions you can leverage to hone the "big picture" of your design.

- What is the **cultural or societal context** in which your players begin playing your game?

- What are the **biases, thoughts, assumptions, and feelings** that may have a positive or negative impact on your players' ability to experience your design intent?

- What are the ways in which we can ensure players within a specific context **(or multiple contexts)** can understand, access, and be transformed by your game?

HOW FRAMEWORKS CAN BRING US TOWARD OUTCOMES

No matter what framework you decide to leverage, we recommend aiming it towards the outcomes we discussed early: empower players to gain **knowledge**, grow **pro-environmental attitude;** strengthen **self-efficacy**; and deliver **hope**. This will lay a strong foundation for behavioral change.

The above frameworks can pair well with our suggested target outcomes. For example, Culyba's *Transformational Framework* reminds us to consider the context of our players. If our target players have already indicated they possess pro-environmental attitudes, have the necessary knowledge to understand a given problem, and are inclined to take action, then making a game targeting awareness knowledge may not be a meaningful value add. Instead, these players may most benefit from a game that helps them build a strong belief that they can indeed make a positive difference in the world, and/or help them practice a skill needed to be effective when taking a certain set of actions.

The *Transformational Framework* reminds us to consider our players' barriers to change. If we discover our target players are overwhelmed by complexity, this may suggest we need to cultivate player knowledge and perceived self-efficacy. We can then choose tactics that focus on our players' capacity to emotionally handle complex, nuanced systems. If we discover that the main barrier to action is related to opposing social norms, we may choose tactics that involve social play with the intention to help them gain self-efficacy in reframing those norms.

It is completely normal and expected to iterate throughout game development. As you make design decisions, the *Ouariarchi Framework* may serve as a useful tool to gut check your hypotheses. While it is completely natural for development teams to iterate and adapt through production, this can sometimes mean your game-as-implemented can drift away from your game-as-designed. It might be useful to plan for periodic checks on framework-recommended elements to make sure everything stays on track. Is information integrated into gameplay where it makes sense? What are the moments in which actually critical information may unintentionally be presented on an easy-to-miss, skippable text overlays?

It is very beneficial to conduct usability and comprehension tests with core fans and new players throughout the entire development process to ensure many different types of players can identify and gain value from your design intent.

REMEMBER:

Frameworks are additive and integrated into the way you think through your development decisions. These ideas are not prescriptive and should not be seen as a condemnation of or replacement for any current game design strategy. Use them where they can help you achieve your goals, and leave them where they might get in the way.

ARE WE MISSING INFORMATION YOU NEED? WE WANT YOUR FEEDBACK!

This is the alpha version of this Playbook, intended to elicit feedback and serve as an invitation to join the conversation. Your perspective matters - no matter if you're a student, researcher, new game developer, or seasoned industry veteran!

If you see that we're missing a pro-environmental predictor or design tactic, and are excited about adding to the Playbook, please join the IGDA Climate Special Interest Group Discord group (**tinyurl.com/IGDAClimateSIG**) or reach out to **climate-sig@igda.org**. We're excited to

learn from your expertise and experience! .

PART TWO: TACTICS

How might we make our game impact players in the way we intended?

Where the previous section of this document was concerned with big-picture frameworks, target outcomes, and variables of pro-environmental behavior, this section is concerned with the practical steps we can take toward reaching those goals. Now that we know where we want to go, how are we going to get there?

We've included the following tactics because there's at least some documented evidence that they are effective. We'll cite that evidence, but we'll also summarize it and attempt to describe each tactic in an accessible manner so that you can imagine using it in your own projects and contexts. Where possible, we'll provide examples of how a tactic was used in games before, and sometimes we even manage to give you an example that's specifically relevant to environmentally-themed games.

Several tactics are related to each other, so we've grouped them into themes. In this initial release we have **Mechanics and Procedural Rhetoric**; **Narrative Design**; and **Mixed Reality**.

We also have identified some broader, more abstract tactics that warrant their own discussions. For these broad tactics, our aim is to provide actionable context in place of narrow, discrete examples: **Systems Knowledge and Simulations**; **Social Play**; and the **Metagame**.

MECHANICS AND PROCEDURAL RHETORIC

Ian Bogost, a foundational games scholar, once claimed that "games have rhetoric": games have persuasive expression. Some people might read that quote and think, well, of course they do. Games have stories and stories are rhetoric. However, Bogost meant something deeper than that. In his text *Persuasive Games* (Bogost, 2007), Bogost sought to lay out his argument that games are intrinsically imbued with rhetoric. All games, no matter how simple or ludic, have a story to them. This, according to Bogost, applied to everything from football to *Pong* (Atari, 1972) to *Doom* (Id Software, 2005) to *Mass Effect* (EA Bioware).

Bogost built this argument on the cornerstone of what he calls **procedural rhetoric**. This is, as is now widely accepted by the gaming community, the story a game tells through its rules and interactions. Each game, no matter how basic, has some kind of rules which define the way the player is allowed to interact with the game or game world. By defining the

player's means of interaction, rules tell the player a story about what is possible.

Take the examples above. Football tells a story of teamwork and national identity. Doom certainly had an embedded narrative about a marine surviving a demonic invasion. However, that story wasn't told through dialogue or cutscenes. Rather, the fact that your only interactions were to run, shoot, and open doors provided a story, communicated a message, and carried a set of values. Even Pong has rhetoric by creating competition between two players playing table tennis.

Some games, like *Pong*, tell very basic stories with their rules. Other games are intentionally designed to embed complex, deeply nuanced procedural rhetoric. In Bogost's own game, *TSA*, players take on the role of a Transport Security Authority agent working at an airport in the post-9/11 United States. The player must constantly adjust to ever-changing rules about what is and isn't allowed, and operate within a highly inefficient system without causing delays. Without ever passing a word of dialog, Bogost utilizes bureaucracy to intentionally elicit player confusion and frustration, conveying a message about the state of airport security systems during that moment in history. In the following pages, we introduce a litany of commonly used tactics for constructing messages through rules, mechanics, and art.

ABSTRACTION

When processing complex situations, it can often be overwhelming to identify, understand, and act upon everything all at once - especially when we already have existing biases and opinions that can make it hard to do so. **Abstracted game design** breaks down highly complex situations into simplified, more abstract terms so that it becomes easier for the player to suspend disbelief.

CONCEPTUAL EXAMPLE

Consider a scenario where you, the developer of an RPG, want to have a quest where you teach the player the effects of over-harvesting and resource management. You make an NPC named Alice, who gives the player repeating quests to bring her 50 fish, and set the respawn rate of the fish to slow down each time Alice offers the quest. Eventually, the fish run out, leaving the player to contemplate the outcome of their actions.

For certain audiences, you may be concerned this might be too on the nose. You do not want the player's pre-existing opinions about environmental rhetoric to get in the way of the emotional lesson and the overall fun of the game.

You can use **abstraction** to:

- **Make the game world grounded in a fantasy setting** with fictional places, creatures, and/or people, rather than grounded in real-world context.

Alternatively, you can make the fish a different type of fantasy resource with a different purpose. This can put the focus on resource management at a broader level.

WHY USE IT?

Climate change may be seen as inherently stigmatized in some circles (Leiserowitz et al, 2015). Many players will have pre-existing opinions on climate change. Their existing biases can lead them to miss opportunities and reject messaging (for instance, climate denial caused by misinformation).

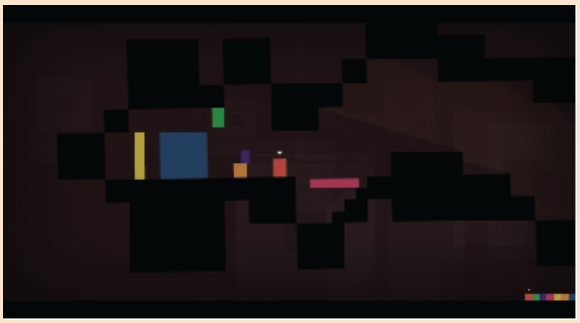
Abstracting ideas removes details that players associate with their own identity or circumstances. Through the abstracted experience the player can form empathy for an environmental experience without direct conflict with their existing identity and opinion. This helps us sidestep barriers preventing players from forming **pro-environmental attitudes**. Players can be more effectively positioned to both grasp the core emotional intent of the game and uncover deeper meaning with which they can identify.

MORE ABOUT THIS TACTIC

Abstraction can create emotionally compelling experiences players may call upon to inform their decision-making in the real world. Abstraction can also allow a message to resonate with a broader audience: the intended message is more generalized to allow players of many different walks of life to identify with what's happening to in-game characters.

It is important to note, however, that Abstraction heavily relies on the inspiration of empathy in players and affective (emotional) learning. If the player does not have a meaningful connection with the experience and/or does not recognize the design intent, players may not map the decisions they make in-game to what can be done in the real world. This is further complicated by the existing reality that the impacts of the climate crisis are intangible to many groups, especially those not already receptive to pro-environmental messaging (Leiserowitz et al, 2015).

To mitigate this, consider opportunities to surface the underlying design intent - be it in-game or through community engagement (see the Metagame section). You can also consider leveraging **Locality and Local Knowledge** to partner with a local climate advocacy organization who can help translate the abstracted experience into specific, concrete real-world action they are already doing.



GAME EXAMPLE

In *Thomas was Alone* (Bithell Games, 2012), players take on the role of the first sentient AI seeking freedom. Players take control of a single block in a maze of other simple shapes and colors. The narrator assigns complex and dramatic meaning to simple actions taken by the two-dimensional shapes. While visually simple, the game uses abstract representation to elicit complex emotions throughout the experience.

GAME EXAMPLE

In the *Gears of War* series (Epic Games), players learn about the Pendulum Wars - a war waged against the Coalition of Ordered Governments by united resource poor countries after economic collapse (an abstraction of geopolitical conflicts in the real world).

INTRINSIC INTEGRATION

Games that seek to teach often integrate the actual target behavior or skill into game mechanics. Rather than using game-based elements that sit "alongside" the target content, **intrinsic integration** means that content knowledge is critical to every interaction of the game system (Clark et al., 2011). In other words, the player actions within a core loop directly reflect how the system and/or tasks are executed in the real world.

CONCEPTUAL EXAMPLE

You are working on a game in which you want players to learn about the logistical complexities of wind and solar in the context of a power grid.
An initial approach could be to provide players with significant information on power grid management and ask them to complete simple quizzes. However, you want to keep your game from getting too information-dense.

You could use **intrinsically integrated design** to:

- **Integrate your learning targets into the game mechanics themselves.** Using a sandbox approach, you can task players with keeping a community powered by deploying different sources of renewable energy. Players can learn of the complexities of power grid management firsthand through trial and error.

Integrate your learning targets into a VR power management simulator in which the player is put into the shoes of a power station employee and must manually manage the production and energy flow of different power sources.

WHY USE IT?

Intrinsic integration is a powerful tactic for building actionable environmental **knowledge**, **perceived self-efficacy**, and **hope** in players. Games build knowledge into their narrative as context for why characters make certain decisions. They can also directly integrate it into the core mechanical loop so much so that the player gains knowledge and skill without it ever being explicitly articulated or even noticed (Chappin, Bijvoet, & Oei, 2017).

This design engages the player constantly with the targeted relationships or knowledge, encouraging the player to experiment and play with these concepts by making them fundamental to game play. Because of this, intrinsic integration can effectively encourage systems thinking by allowing players to experiment within a system and draw conclusions concerning that system. This tactic has been shown to be substantially more effective at conveying knowledge and building skills than **"greenskinning"**, the process of adding green messages on top of existing mechanics (Habgood and Ainsworth (2011).

Research has shown that successfully completing simple, low-risk environmental actions is a key to building the confidence an individual needs to take on more impactful actions. As such, integrated designs can empower perceived self-efficacy. If the game provides appropriate connections from applicable knowledge to solutions, players may then engage in goal-oriented thinking to apply their learnings to real-world scenarios. By exposing players to new skills, behaviors, or thought processes, intrinsically integrated games can significantly improve these real-world skills or behaviors.

MORE ABOUT THIS TACTIC

This tactic involves integrating knowledge or behaviors required for learning outcomes directly into the core mechanics of the game environment (Jacob Habgood & Ainsworth, 2011). Intrinsically integrated designs are more straightforward to accomplish when identified as a priority at the beginning of a project. Each design decision can then be informed by the target tasks and learning outcomes. If design work has already been performed (or if a game already exists and is in the process of being adapted to adopt some intrinsically integrated design), this work will likely require a reimagination of mechanics or game systems.

It is also important to note that the phrase **"easy to learn, difficult to master"** is particularly critical to the success of intrinsic design. In both game design and education, players often need concepts broken down into their most basic components before they can both appreciate the complexity of the system

and act based upon the knowledge and skills they've gained.

GAME EXAMPLE

SimCityEDU: Pollution Challenge (GlassLab, 2016) is a modified version of the commercial *SimCity* game. Players are put in the role of city mayor, doing the challenging work of addressing environmental impact while balancing the employment needs of the city and the happiness of its citizens.

In addition to the task of transitioning their power grids from coal to clean energy, players must use zoning mechanics to determine how much of their city is dedicated residential, commercial, and industrial. If players transition their energy grid too quickly, zones can lose power, causing citizen unhappiness. If players create new opportunities for clean energy and jobs, but do not increase residential zones, citizens will not be able to live there. By integrating system balancing with gameplay, players can learn how to identify multiple causes of pollution and job loss. In doing so, they experiment with solutions that reflect what's possible in the real world.

In a study conducted with n=400 students across the United States, they found **statistically significant learning gains in players' ability to engage in complex systems thinking** as a result of gameplay and instruction.

GAME EXAMPLE

Settlers of Catan: Oil Spring (Catan GmbH, 2012) integrates resource scarcity as an additional mechanic into the already compelling resource negotiation and relationship game, *Settlers of Catan*. In this version, oil is an extremely valuable-but-limited resource. The more an individual player uses, the more of an advantage they

gain over their opponents. However, each use depletes the supply and negatively impacts all players, including the person using the oil.

FORCED DISCOMFORT

Forced Discomfort in this context is a design tactic in which players are placed into physical or psychological situations that can create unease, annoyance, or anxiety. This tactic requires extreme caution, thoughtfulness, and care to avoid creating unintentional harm to the player.

CONCEPTUAL EXAMPLE

You are working on a game focused on how noise pollution interferes with local wildlife. You cast the player in the role of one of the affected animals, set in a peaceful environment that is increasingly disrupted.

You can use **forced discomfort** by:

- **Amplifying visual and auditory interference** until the game is simply uncomfortable to continue playing after some time (i.e. pair with **sensory affect**).

- **Using vocal cues to create emotional distress.** Have nearby or off-screen humans yell things like, “You don’t belong here,” or, “This isn’t your home anymore!” (i.e. pair with **abstraction** and **sensory affect**).

- **Implement character dialogue or environmental reactions that trigger when certain gameplay milestones or actions are unmet or missed.** These contextual cues do not necessarily need to lead to a failed player state, but can elicit emotional responses and amplify immersion.

WHY USE IT?

Emotional or affective involvement is a critical aspect of environmental education and persuasion. Games that use forced discomfort create deep and impactful interactions. The actual discomfort forced on the player drives home the joys and difficulties of the intended lived experience. It can provide insight into emotions and painful experiences that a player has never accessed. By providing players with a new perspective, games that use forced discomfort can serve as potential pathways to eliciting emotional connection, creating empathy, and inspiring **pro-environmental attitudes**.

It is critical, however, that the potential emotional experience should be coupled with actionable changes in behavior to avoid **“tragedy without solution.”** The failure to do so can disrupt the process of building hope and lead to “fight-flight-freeze” avoidance behaviors.

MORE ABOUT THIS TACTIC

First and foremost, designers must ask themselves **if the choice to discomfort the player is both a)**

necessary to convey the message, and **b) done respectfully to both player and those real people who have experienced similar situations**.

This tactic generally involves the use of some sensory or narrative element to make the player uncomfortable. This can include anything from loud noises and disturbing visuals to stories about displacement, marital abuse, or other emotionally and physically stressful or traumatic situations. The use of extreme sensory elements (yelling, shaking screens, harsh music), difficult social situations within the game, or cinematography that directly addresses the player (first person perspective) are all approaches that have the potential to be effective in eliciting empathy and attitudinal shifts.
However, this process often involves intentionally breaking the **player-designer trust agreement** by putting the player (as opposed to the character) in an uncomfortable situation. If trust is broken, we run a significant risk of breaking players' ability to gain a sense of hope - and disrupting the transformational experience overall.

In the event the game design necessitates the use of forced discomfort, we strongly consider **working with subject matter experts** in the topic area to ensure it can be done respectfully to the real people and communities who have been affected in the real world. **Ensure clear trigger warnings** are clearly visible and give players the choice of whether or not they want to participate in the experience This can enable players who will have an unintentionally severe negative reaction or related post-traumatic stress disorder (PTSD) to avoid situations that will cause them physical or psychological harm.

GAME EXAMPLE

Auti-sim (Game Jolt, 2014) aims to raise awareness of the sensory challenges and social discomfort children with autism can experience when at a playground. As the player gets closer to groups of children, their vision becomes blurry and pixelated, and the sounds become more overwhelming. If the player heads toward quieter areas, the sensory strain tapers off.

GAME EXAMPLE

In This War of MIne (11 bit studios, 2014),

players experience war as groups of civilians, rather than frontline combat. Inspired by the Slege of Sarajevo during the Bosnian War (1992-1996), players have to make decisions to survive while navigating food scarcity and danger.

When considering the use of forced discomfort, explore whether it is absolutely necessary to convey the message, as well as if it can be done respectfully to both players and people who have experienced similar real-world situations.

NEW GOAL ORIENTATION

Players often take on new roles when playing a game. New roles often come with new goals, needs, and means to meet said needs. The **process of orienting to new conditions** can provide key insights into the challenges faced by people, communities, and ecosystems distinct from our own.

CONCEPTUAL EXAMPLE

You're creating a game to help environmentally minded players make the leap from just looking at their own individual carbon footprint to reducing carbon emissions on a societal level. Players have certain decisions they have access to take - each of which takes a certain amount of time and resources.

You can use **new goal orientation** to drive home the fact that reducing one's individual carbon footprint may not always be the most effective use of one's time by:

- Transitioning the player's in-game goal from, say, "eating local" to "call your senator to advocate for food waste programs". Provide options to take in-game actions that affect carbon emissions on a larger scale. Provide clear cause-effect through gameplay that emphasizes the potential difference in impact.

- Transitioning the player's in-game goal from "reduce your own carbon emissions" to "inspire action in others". This new goal can help players understand how important it is to spread an environmental message. While difficult, pairing this with social interaction can also be an effective way to help players practice how to communicate with a variety of different people of varying needs and motivations.

WHY USE IT?

New Goal Orientation provides avenues to both **systematic knowledge** and **pro-environmental attitudes** through **logical empathy** (i.e. the process and experience of understanding why someone feels a certain way). New goals are most commonly used to develop empathy or the understanding of a

system that is not familiar to the player. Introducing players to a new set of challenges can provide insight into the difficulties future generations will have to live through, the experiences of people in climate affected areas today, or even the experience of endangered animals. Dealing with these challenges can create empathetic experiences and allow the player to experiment within that role and identify possible solutions to current or future problems.

If well implemented, new goal orientation can improve the chances that a player will consider multiple ways the environmental impact of their own actions can impact the lives of others. It also has the potential to enable positive gains in players' **perceived self-efficacy** and **hope**: the ability to learn, reframe, and adapt is a form of resiliency that is very important to have when facing major existential threats like the climate crisis. This adaptability can be a form of protection against factors that may have a negative impact on our ability to sustain goal-directed thinking.

MORE ABOUT THIS TACTIC

New goal orientation refers to the shift in a player's goals when they take on the role of the character. A player's ability to understand and play a game is often dependent upon the mental model they already have about how they think the game works (Grace, 2019). Modification or subversion of existing mechanics can enable players to experience unanticipated delight or curiosity.

This is most effective when the goals and obstructions to those **goals are realistic**. For example, a 4x game may involve the player expanding their military for dominance of the map. However, if the player is told that they lose the game when they over-tax their natural resources, the player must shift to a new understanding of what it means to win.

It is important to note, however, that **interaction with systems and building systematic knowledge in itself will not automatically create logical empathy**. Ideally, players should have a way to map aspects of the in-game experience to values or aspects of their identity that matter deeply to them. Consider opportunities for players to build an emotional connection with what's happening within the game as they gain mastery of the tasks needed to accomplish their new goals.

GAME EXAMPLE

In the classic tower defense game *Super*

Energy Apocalypse (Larsiusprime, 2008), the player must defend their survivor colony from an onslaught of zombies. In order to power and sustain defense weapons, the player needs to carefully manage a surprisingly realistic power grid. To keep their people alive, the player must balance the availability of solar power, the efficiency of oil, the potential long-term consequences of nuclear, and many other factors. By orienting the game towards the new goal of 'keep the power on', the player is forced to take a new perspective on the pros and cons of different real-world resources.

The ability to learn, reframe, and adapt can be a form of protection against factors that may have a negative impact on our ability to sustain goal-directed thinking (i.e. hope).

NO-WIN SCENARIOS

Not all games can be won. Games using **no-win scenarios** are those that integrate defeat so deeply into their systems that the player can't help but lose. These games violate the core tenets of play in order to illustrate the challenges of real-world situations and challenge players to experience the consequences.

CONCEPTUAL EXAMPLE

You're creating a 4X game where you grow your own oil company. The design goal is to expose these companies' exploitation of natural resources. The articulated goal of the game, however, is to expand your oil empire, driving your stock price as high as you can to retire rich in your mansion. Players are challenged to take advantage of any and all natural resources you can get your hands on!

You can drive home your design goal by creating a **no-win scenario**. For example:

- As you exploit Earth's resources, **voters will begin to catch on** and will start to pass more and more policies until it's no longer possible to continue growing your company.

- **Eventually, the oil runs dry - and the price of gasoline becomes prohibitively expensive**. The company goes bankrupt while competitors with green programs survive.

WHY USE IT?

No-win scenarios are well suited to providing **systems knowledge** (understanding why/how a system works). While it may be counterintuitive to design a game that, in being unwinnable, fails at being a "good game," it may be precisely this brokenness that allows for such effective messaging

(Schleiner, 2019). No-win scenarios are simply situations where winning is impossible; no matter how hard the player tries, they will eventually fail. No-win scenarios require players to deeply examine a concept in order to determine the problem cannot be solved; doing so requires an understanding of relationships between complex ideas. This can be baked into game narratives, but incorporating game mechanics that cannot be beaten can be an even more effective way of showing why the scenario is no-win.

Games are adept at providing no-win scenarios because they are closed and contained systems. Designers can create mechanics that illustrate the complexities of real-world issues well, even if they are not necessarily perfect reflections of the real-world situation.

The ideal outcome of a game featuring an environmental no-win scenario is a direct behavior change. No-win scenarios can show players that a personal behavior or a broader societal norm they may have previously supported or ignored is not sustainable or effective. Given a clear path to action, these players can work to change that behavior.

MORE ABOUT THIS TACTIC

However, simply creating impossible challenges is not enough—a good no-win scenario must goad the player into thinking, even briefly, that it is possible to beat a game (or mini-game) if they try hard enough. When confronted with wicked problems—problems with many interdependent components and changing requirements that are resistant to single solutions—individuals often apply a simple, but ultimately inappropriate, solution. Done well, **no-win scenarios can force players to confront the mechanics of a wicked real-world problem in a safe and more understandable environment.**

Players often develop mental models to understand complex game problems. When the problem resembles a real world problem, that mental model can transfer. We can provide players with no-win situations that resemble real world environmental crisis situations, but limit their interactions to simple, direct actions. Doing so can illustrate the complexity of environmental issues by exposing the futility of "one-size fits all" solutions. This approach can help players to confront inaccurate mental models or ineffective solutions.

Similar to **forced discomfort**, however, this process can involve intentionally breaking the **player-designer trust agreement**. If it is too severe of an experience and trust is broken, we run the significant risk of disrupting access to opportunities for hope and longer-term behavior change. **To mitigate this, a designer must be careful to use the no-win scenario as a lesson, not just a punishment.** The game must, in some way, point out why the situation is no-win and why understanding this situation is important. More importantly, like with *The Good Person of Szechwan*, the designer has a responsibility to encourage the player to reflect on

what they have learned. Players need to be able to take the No-Win Scenario - not as disheartening, but as a challenge to find a better solution than the one presented in your game. Actions that can be taken to address the issue must be clear - and, ideally, within a player or community's context and capabilities.

GAME EXAMPLE

In *September 12th: A Toy World* (Gonzalo Frasca, 2010), players are required to click on "terrorists" to drop bombs on them. However, each bomb dropped inevitably kills several civilians. The resulting pain and outrage causes more terrorists to appear. This gameplay loop illustrates the deep contradictions in the U.S. "war on terrorism" in that the supposed "solution" potentially causes more problems than it solves.

The *New York Times* described the game as "an op-ed composed of not words but of actions."

SENSORY AFFECT

As any artist, musician, interaction designer, or chef will tell you, explicit narrative and dialogue are not the only ways to create a story. Our **human sensory systems** directly help us gather information about the world and guide our response to our experience. The use of these systems help players find stories by **affecting emotions**; these emotions then often get imprinted on our memories and linger long after the fine details of those experiences fade. From music to interaction design, there is much that can be said through how our bodies perceive external stimuli that would be far less effective if left out.

CONCEPTUAL EXAMPLE

You are creating a gritty and futuristic RPG, and want to include some themes on how the pollution of Earth has made it difficult to inhabit. Your first instinct is to include some world-building text scattered throughout the world. The player can find and read these texts to learn about the climate disaster.

As an addition or alternative, you can use **sensory affect** to tell the story without any text or dialogue. For example, you can:

- **Cover the player's vision in a layer of smog.** Whenever the player is outside, it can make breathing difficult, and cause the player to

occasionally stop moving, gasping loudly for air. Players can also hear other characters or players coughing.

- **Make a massive increase in heat apparent through audiovisual cues.** In the daytime, the sun can blaze overhead and create heat distortion effects. All of the visible plants can wilt, turn brown, and/or die to indicate how they are suffering. Characters can talk about how hot it is, and how it affects their ability to accomplish simple tasks without severe difficulty or pain.

WHY USE IT?

Sensory affect is a pathway to establishing pro-environmental attitudes and hope through positive connections with nature and/or empathy.

Affective environmental learning through sensory input has not been heavily researched. However, educational theory and some emerging research shows that individuals are more likely to form a connection to nature and empathetic bonds with animals if they can form an emotional attachment with the place, animal, or idea. This connection can lead to overall shifts in **attitudes** towards nature and, eventually, behavior (Duffy & Verges, 2010).

Emotional learning is tied to more than just facts and figures. We learn through deep connections to people and places, observations, and feelings. Sensory information can greatly impact the emotion that comes along with an experience. A great painting can bring tears to your eyes; a suspenseful score can start your heart beating to build tension during a movie. Learning by emotion can connect players to characters and places in ways that facts cannot, forming emotional attachments to concepts and events that the player can revisit during real-world interactions.

MORE ABOUT THIS TACTIC

The ideal outcome of sensory affect is an increased emotional connection to environmental issues, often through proxy emotional attachments to characters or places within the game. To help players act on this connection, designers can include messaging on how players can protect real world analogues of these in-game places or characters.

When relying on visual and auditory clues to tell a story or touch on player emotions, it is important to keep in mind the amount of sensory information being given to the player. Character design may indicate abject poverty or desolate landscapes may show the extent of ecological decay. Alternatively, harsh sounds, cruel voices, or shaking screens may disorient or irritate the player to create some level of empathy for a situation. Similar to **forced discomfort**, however, this process can involve intentionally breaking the player-designer trust agreement. Remember that, if it is too overwhelming of an experience (and/or trust is broken), we run a significant risk of breaking players' ability to understand the intent - disrupting opportunities for meaningful and/or lasting behavior change.

GAME EXAMPLE

My Cotton Picking Life (TOMAS, 2015) is a game commenting on Uzbekistani cotton slavery scandal in which children are getting taken out of school by the government and are forced to work for the purpose of making clothes (that are then supplied to Western countries).

The player is tasked with picking cotton endlessly. The artistic style of the game denotes extreme poverty. An off-screen voice threatens the player constantly, promising punishment if they do not meet a quota. These sensory inputs can create emotional attachment to the struggle of a cotton worker who is working to survive today.

NARRATIVE TACTICS

All games, at their core, are stories. From the most complex and narrative driven games, like Skyrim, to the most simplistic and (seemingly) narratively neutral games like *Pong* or *Space Invaders*, the story is always there. *Pong* is, for many reasons, a perfect example of how narrative can be present in games. Two short, thick lines sit across the screen from each other as a single dot floats back and forth between them. Out of context, this is meaningless. But, within the context of competition—a contest to outlast the other player in a game of chance and simple physics—a story comes alive.

NARRATIVE TYPES

We can think of narratives in three terms: **Explicit Narratives**, **Implicit Narratives**, and **Imagined Narratives**.

EXPLICIT NARRATIVES.

These are the traditional stories with characters, a setting, and a plot with some type of driving motivation and resolution. The **explicit narrative** experience often puts the player in charge of advancing the story through game mechanics. Even if the story simply serves to provide context to gameplay (like in *Faster Than Light* by Subset Games (2012)), the player's job is to keep the story moving. Examples of games with explicit narratives containing environmental messages include *We are the Caretakers* (Heart Shaped Games, 2021) and *Super Energy Apocalypse* (Larsiusprime, 2009).

IMPLICIT NARRATIVES.

Games without an explicit narrative may still have an implied one. This can be suggested through the mechanics, the art, the setting, or any other non-story elements of the game. **Implicit narratives** can be accidental and/or subject to interpretation, but are often intentionally embedded (like in *Limbo* by Playdead and Double Eleven, 2010). Implicit narrative is a powerful tool because it is a form of **systematic knowledge**: the story being experienced is not directly told by a character or narrator, but the player can understand an unspoken story through engagement with the game's mechanics. This affords a deep understanding of not just the actors and events in a story, but also their motivations and how they interconnect with and affect each other. As mentioned earlier, *September 12th* is another excellent example of this tool. Players are tasked with point-and-click dropping bombs on terrorists walking the streets of a village. No matter how careful players are, civilians are killed by many of the bombs. The resulting trauma civilians experience then leads to more radicalization and harm.

IMAGINED NARRATIVE.

Imagined narratives are those that exist only in the mind of the player(s). In other words, the story established by the player was not explicitly intended by the game creator(s), though they may have provided the tools for it to come to life. When a player is imagining the relationships and interactions of their family in The Sims, they are engaging in exactly this kind of narrative. We as game creators cannot completely control the characters, context, or resolutions within an imagine narrative; however, they can be influenced by including appropriate tools, challenges, and/or interventions.

As you define and iterate on your game design, **consider which might be appropriate to achieve the intended player experience**. Explicit narratives impact the immediate reactions a player can have to your game; to an extent, they will drive the game design process. However, using explicit serious messaging in your game may not always be appropriate or viable - depending on your target audience, resource constraints, and/or perhaps your company's brand identity. In these circumstances, implied narratives may be more appropriate and can even be more effective if handled with care. In the event you intend to allow for more player control and creativity through imagined narratives, consider in-game tools and/or opportunities in which you can incentivize and reward pro-environmental stories or behaviors.

HOW ARE NARRATIVES TRULY EFFECTIVE FOR PERSUASION?

Narratives have specifically been shown to be effective in games-based learning and persuasion. Many frameworks for serious game design include narrative as a critical aspect, such as the *Ouariachi Framework* discussed in the first section of this Playbook (Ouariachi et al., 2019) and the Attitudinal Play Framework (Kors, Spek, & Schouten, 2015).

Research has shown that narrative frameworks facilitate complex cognitive processing (Dahstrom, 2014). This high level processing accounts for how we understand and apply complex abstract concepts such as ethics and is notoriously difficult to engage with basic instruction. One benefit narratives provide here is a **structure in which the player can think of the consequences of their actions** (Klopfer & Squire, 2008). Further, engagement in a narrative has been shown to be a strong influencer of **"flow state"**, the high-level player engagement state in which learning and persuasion can be maximized (Harker-Schuch, Mills, Lade, & Colvin, 2020).

TRANSACTIVE LEARNING AND TRANSFORMATIONAL PLAY

Good storytelling can inspire us. However, the act of being told a story in and of itself does not necessarily make the message transformative. For it to be so, players need to see and feel the impact of their in-game decisions - both positive and negative. In 2010, Sasha Barab introduced the concept of **transactive learning**: the process by which a player takes actions that significantly impact the game world in ways that are visible and persistent - so much so that the player feels the weight of the outcome and is emotionally affected in real life. Using transactional learning to achieve an intentional learning goal significantly increases the likelihood for meaningful, lasting learning experiences.

CONCEPTUAL EXAMPLE

You are building an action role-playing game about a human colony on Mars and want to involve some serious socio-political and environmental themes. The player takes on the role of a freedom fighter against an oppressive regime. They have the choice to destroy or take over a power plant. Taking over the plant would greatly help the cause, but destroying it would stop the plant from producing dangerous and destructive pollution. As it is designed now, the game offers this choice, and you are considering the long-term consequences of each narrative branch.

You can use **transactive learning** to make this interaction more impactful by:

- **Pairing the message with sensory affect.** Use visuals and other sensory inputs to show the impact of destroying the power plant). After the plant is destroyed, the environment shows clear signs of improving (water color, plant life, air quality). Characters in the game world can mention having improved quality of life and how they feel as a result.

- **Pairing it with Intrinsic Integration.** Make the benefit of destroying the plant mechanically important. If the players destroy it, the air quality in the area improves; as a positive consequence, all of your allies gain increased stamina.

WHY USE IT?

Transactive learning is powerful when directly paired with its natural supporting tactic, **intrinsic integration**. By integrating target skills into the core mechanics of the game, players can gain actionable **knowledge**. By having the world change in accordance with the player's actions, the game implies cause-effect relationships that can reflect the reality of an environmental issue. If the actions the player takes are realistic and achievable in their real-world context, seeing the impact they have in the game can give players a sense of **empowerment** - increasing **perceived self-efficacy**.

In a game that leverages this tactic, players can get exposed to different cause-effect relationships in a given system. This highly contextualized learning experience can encourage players to see the importance of serious messages and serious content in games. As Barab argues, the game helps players in "recognizing the value of the tools in terms of the context" (S. Barab, Klopfer, Sheldon, & Perry, 2012) within the game, which can lead to recognizing that value in the real world.

MORE ABOUT THIS TACTIC

Transactive learning is founded on the principle of transactive engagement, which is based on the idea that the individual and the environment are coupled (Dewey and Bentley, 1949). In short: whether in a game or the real world - when an individual changes, they change the world around them, and vice versa.

Using this tactic, we can create a learning environment in which the player and the game are linked through narrative (S. A. Barab, Gresalfi, & Ingram-Goble, 2010). The player's actions directly influence the game world and, in turn, the events of the game world significantly impact the play experience. In some ways, all games are transactive. However, Barab and his colleagues argue that for games to truly engage players with this tactic, they must provide the player with real and relevant consequences to in-game actions taken. Their groundbreaking paper calls for **3 specific design requirements**:

Person with Personality. The player must feel emotionally engaged with the game. They must be able to be a protagonist who serves as the most influential character. They must able to take actions that relate to a meaningful in-game goal. Lastly, the story must require the player to engage in the narrative as a pre-requisite for making informed choices.

Content with Legitimacy. The messaging or skills must be factually accurate, legitimate for real-world application and required for in-game progression.

CONTEXT WITH CONSEQUENTIALITY Player actions must have consequences that significantly impact the game world, its story, and the characters within it.

GAME EXAMPLE

Sasha Barab and his colleagues created the games *Quest Atlantis* (2009) and *Atlantis Remixed* (2012) as inspiration and medium for enacting the **Transactive Learning Framework**.

With the intention to draw on the idea of transformational play and turn disempowered students into empowered scientists, doctors, reporters, and mathematicians, they built a 3D fantasy learning environment in which over 100,000 globally-distributed players learned through in-game quests and supplementary lesson plans. These activities could be completed alone or in a group within the game community.

For example, a module on persuasive writing

and argumentation involved tasking players to gather facts about the townsfolk and their individual needs. Their objective was to identify how to convince the townsfolk to not attack Frankenstein's monster.

ROLEPLAY

Roleplay in games is a common device that enables the player to take on the role of a character in a fictional setting. The player takes on the responsibility of performing as that character in-game and making their decisions based on how they want their character to act.

GAME EXAMPLE

In *Environmental Detectives*, created by Eric Klopfer and Kurt Squire (2008), players take on the role of an environmental scientist who must investigate a toxic spill. In doing so, they must take on the responsibilities and perspectives of the scientists, solving the environmental problems presented to them using the education-relevant tools available.

WHY USE IT?

Roleplay is a tactic that fosters **pro-environmental attitude** and **perceived self-efficacy**.

Roleplay provides a litany of affordances within games and games for learning. As designers, we can consider how the role we ask players to adopt might affect their attitudes toward environmental action. The taking on of a new role has the potential to encourage **emotional and logical empathy**. Research indicates taking on a character role allows for **low-risk experimentation** with different points of view that the player may otherwise not be exposed to or feel comfortable with (Stokes, Seggerman, & Rejeski, 2006). As a result, roleplay can also increase a player's ability to solve challenges in new and creative ways (S. Barab, Thomas, Dodge, Carteaux, & Tuzun, 2005). Experiments have also shown that even briefly taking on a role that ties the player to the environment can have a measurable impact on a player's real world identity.

When the player takes on the role of a problem solver, they can experience a related increase in their own perceived self-efficacy. Active roleplay games in which the player has great control over choices or dialogue have been shown to be far more effective in encouraging shifts in attitude than games without this narrative and character agency (Clark & Martinez-Garza, 2012). If their character can make a difference, players feel they can too! The impact of this can be made even more significant when the tasks the player character completes are more realistic or transferrable to the player's life (i.e. **transactive learning** paired with **intrinsic integration**).

MORE ABOUT THIS TACTIC

By taking on the role of an character with a positive environmental attitude, a player can begin to understand that character's needs and empathize with their point of view. This type of role can take many forms: a survivalist living off the land, a woodland creature making a home in the forest, or even a futuristic soldier whose nation depends on the conservation of natural resources.

Given the continued advancements in believable character and narrative design, it is important to be mindful that a character who is purely pro-environmentalist may not be enough to sway the perspective of the player. In order for a player to not only understand the character they are roleplaying, but also care about them, the character needs to be believable - with aspects that players can identify with.

While there is not always a need to have a fully fleshed out character with a comprehensive backstory, it is helpful to consider structure of our model articulating the 4 pro-environmental predictors of behavior: to have a positive attitude towards a pro-environmental character that can inspire goal-oriented decision-making, the player first needs to understand the character and how they meaningfully exist in the game world. Consider what drives that character:

- What are the character's hopes and fears?
- What aspects of the character's lived experience may have caused them to have certain perspectives for why the environment matters? Why are they motivated to act in support of the environment?
- What is the cultural context from which you or your team are designing? How may your context compare or differ from the character(s) you are bringing to life?
- What aspects of the character's identity or lived experience may have an impact on how they interact with other characters in the game? Why?
- What aspects of the character's identity that players may resonate with, and why? What may make players think - "I feel connected to this character and want to help them succeed"?

HOW CAN I UTILIZE ROLEPLAY AND GAME MECHANICS TO SUPPORT HISTORICALLY MARGINALIZED VOICES AND ADVOCATE FOR CLIMATE JUSTICE?

According to the IPCC AR6 2021 report, Indigenous communities protect 80% of our planet's remaining biodiversity in spite of only making up 5% of the world's population.

Even more broadly, communities of color all over the world are the most vulnerable and hardest hit by the climate crisis in spite of not being the most severe emitters of carbon.

However, when we talk about environmental narratives, and the climate crisis in particular, many of the stories we have heard in our industry and media have not elevated their stories, experiences, and perspectives. Without a way to raise awareness, severe weather events and forced migration increase the risks of harm to their livelihoods and erasure of their cultural heritage - their identities and generational knowledge for how to care for our planet without risking further destruction.

To actively engage in climate justice through game design, we recommend using the heuristic: **“Nothing about us without us”.** We as an industry have a critical and timely opportunity to work with historically marginalized communities - not only to support cultural preservation by sharing stories that have not yet been told, but to also support their right to socioeconomic development. We can do this by unlocking opportunities for them to become an active, influential part of our industry. To get started:

- **First and foremost, reach out directly to the community and tell them about your design goals.** Rather than outlining specific opportunities for how you want to engage with them, start by asking them how they would like to engage with you.

- **Help break the cycle of exploitation.** Build mutual trust and respect with the people you are working with by compensating them fairly for their valuable time and experience. If financial resources are limited, there are many creative opportunities to elevate their voice and share recognition of labor. For instance, you can have them be present with you for blog posts, interviews, and Let’s Plays.

- **Ensure they always have the right of refusal / veto content decisions at every phase of the game development process.** Even if we come with excitement and the best of intentions, there are certain aspects of many cultures that are very sensitive, protected, and require considerable care. Be proactive about asking how to approach conversations with respect. Acknowledge where the boundaries of the community are. Be respectful of closed practices (i.e. those that cannot be practiced, used, or portrayed

by people who are not a part of the community or formally invited). Even if it is a part of their story we think is incredible and needs to be told - at the end of the day, it's not ours to tell.

For more info, reach out to our friends at the **IGDA Indigenous Advocacy & Awareness Special Interest Group!**

GAME EXAMPLE

In the AR game *Environmental Detectives* (2008), created by Eric Klopfer and Kurt Squire, the players each take on the role of an environmental engineer who must investigate the spill of a carcinogenic toxin in an underground garage of a controversial construction project.

Players must locate the source of the spill; identify the party responsible; design a remediation plan; and brief their leadership on any health and legal risks they will have to talk through with the Environmental Protection Agency (EPA). They are given tools (ex. a pocket PC with a GPS device, drills for water samples, and a chemical database) by employees in charge of different parts of the project.

Players take on the key responsibilities and perspective of the scientist, searching the grounds to solve the mystery before the 3-hour timer runs out - at which point, they need to report back to leadership with their findings.

CONFLICTING GOALS

Designers can introduce **Conflicting Goals**, which force the player into a situation requiring a delicate balance between choices. These conflicting goals often require the player to decide what level of risk they are willing to handle, as well as the associated opportunity cost (i.e. the value they would lose if they chose an option over others). In many games, these choices are often critical to gameplay progression, the narrative, and/or how the player's character may be perceived by other player characters or NPCs. Oftentimes, the player must accept limited or imperfect success; choose a goal to prioritize; or accept total failure if they choose not to act (or run out of time).

CONCEPTUAL EXAMPLE

You are creating a game about resource management with the explicit goal of conveying some environmental knowledge through the game. You build your city-building game around the idea that the player is the mayor of a city trying to convert to green energy; in particular, you want to help them understand how policy decisions are made.

You can emphasize the complexity of relevant decisions by employing **conflicting goals**. For instance:

- **You can give players the goal of converting your city to green energy while simultaneously improving transport infrastructure.** While the two goals aren't necessarily mutually exclusive, the player will need to consider how every decision impacts both of them. This will force the player to look closely to understand the pros and cons when manipulating different variables.

- **You can task the player with converting their city to green energy, despite their citizens having very little environmental awareness.** The player will need to balance their green energy initiatives with public opinion. They may find ways to appease the voters, or justify green energy initiatives in a way that their voters can support. If they try to fund and implement a green energy initiative too quickly, or regardless of public opinion, that may have consequences in terms of other policy decisions the could make down the line.

WHY USE IT?

Conflicting narrative-driven goals encourage players to acquire **systematic knowledge** through the context of why and how they choose to progress through the game. By making decisions and experiencing the effects of their actions, players gain a nuanced understanding of the trade-offs present when pursuing one goal over the other. When the game systems are realistic representations of existing real-world systems, the knowledge acquired through in-game narrative can translate into systematic knowledge in the real world.

In the real world, goals and decisions are rarely ever binary (”yes/no”, “black/white”). Introducing conflicting goals can be a powerful tool for building player knowledge around how to understand and navigate complex choices. By requiring players to think through the importance of the environmental goal in order to weigh it against other objectives, a game can encourage the player to accept the merits of the environmental goal (Mitgutsch & Alvarado, 2012). Even if they choose to deprioritize the environment within the game, they can walk away with a more complete understanding of why this particular environmental goal is important.

MORE ABOUT THIS TACTIC

Conflicting goals must be balanced carefully and with intention. Depending on the context in which the goals are revealed or expressed, you may choose to share the full context for why the goals conflict - or challenge the player to figure it out

directly. Both are valid approaches, but keep in mind: simply providing the player with conflicting goals without explanation or discussion can cause certain players to assume the goals are mutually exclusive. Depending on the game genre, they may also default to assuming they need to optimize for one path. This can present a potentially counterproductive situation that causes players to internalize false understandings (for example, the false but popular myth that supporting green energy initiatives damages the job market).

For this reason, it is important to provide the player with both factual information and the tools they will need to first understand the information, and then interact in a way that can lead to meaningful environmental learning. This can either be done upfront, or through contextual cues in case the player gets stuck. Lastly, it can also help for these goals to be stated in a way that triggers intrinsic motivation - giving players a clear, compelling incentive to take on the more challenging task of balancing the goals set.

GAME EXAMPLE

Fate of the World (Red Redemption, 2011) players take charge of a global government entity that must prevent the Earth's environmental deterioration. Players balance delicate and conflicting interests, like competition for natural resources, consumer economies, and strategic military goals. The player is not put in a position to choose 1 path over the others; rather, they need to find balance between all of the goals in order to ensure prosperity.

INVESTMENT IN SPECIFICS

To reduce friction and increase opportunities to reach a broader audience, we can choose to leverage the **abstraction** tactic for our game. However, sometimes that can cause players to feel

too disconnected from the content - causing us to miss out on an opportunity to influence behavior change. Rather than referring to general spaces like "the forest" or broad topics like "water quality", we can choose to have our game narratives be specific about places, animals, or societal issues. **Investment in specifics** can help players connect the story or problem presented in the game with the direct impact the real-world situation would have on their own life, the people they care about, and the places important to them. Environmental psychologists refer to this as **framing** (Scannell and Gifford, 2011) or place attachment (Altinay, 2017).

CONCEPTUAL EXAMPLE

The game you are building is an action-packed shooter taking place in an environmentally ravaged future. The player must battle through cities and rural settings alike. You are deciding how to show the environmental impacts in a way that creates an emotional response in the player.

You can **invest in specifics** to accomplish this by:

- **Placing the action in a specific real-world city**, showing how environmental decline will realistically affect famous locations and cultural heritage sites. For instance, one of the cities chosen could be a coastal city that has since flooded; another could be a rural region that has turned into a hazardous dust bowl due to severe drought.
- **Including collectible "old news articles"** that, when opened, trace the negative economic impacts of environmental decline on specific regions.
- **Including references to daily hardships (or even lack of luxuries) the player must go through due to environmental decline.** Short emotion-driven stories through collectibles or character interactions can put a human face to the existential threat and make it concrete how individual people and families may struggle to adapt (note: this does not have to be sad. Stories of community care and triumph in the face of adversity can also inspire pro-environmental attitudes and hope for better alternative futures).

WHY USE IT?

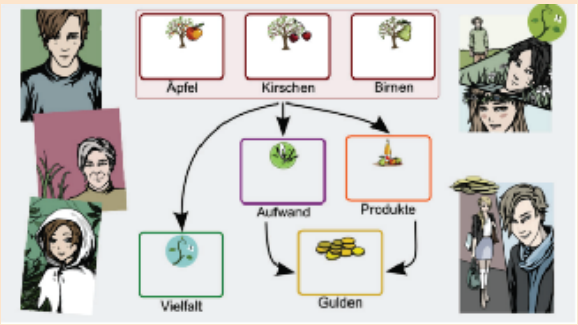
Investment in specifics provides players with the opportunity to empathize in the face of tangible consequences. Whether those consequences are the impact of an environmental disaster on a familiar place or the impact on a cared for NPC, the empathetic impact is almost always stronger when tied to specifics. Environmental educators have used this strategy for many years by naming (and focusing on the name of) rescued or protected animals during zoo or animal preserve visits. Visitors have been shown to more fully internalize how their actions impact animals when they remember the animal's name. It is a method that can provide stronger emotional connections because of memories that are associated. The connection to nature created by these specifics can be integral in forming **pro-environmental attitudes**. As a "trivial space

turns into a space with specific **knowledge**, emotions, and beliefs" (Dourish, 2006), the individual grows more connected to it.

It is also worth noting that calling out specific issues or pointing out how an issue affects a specific person, place, or even animals can encourage emotional connection. Helping the player see that the challenges an entity, community, and/or place is experiencing (and will likely experience worsening conditions around) as real can enable the player to feel the desire to provide care. Paired with in-game actions that can be mapped to real-word actions, this sense of care can transform into hope.

MORE ABOUT THIS TACTIC

It is important to note that investing in specifics does not always have to focus on emotional attachment. For example, when attempting to promote public interest in water quality and preservation along the East Coast of the United States, one of the most successful campaigns focused on how water pollution negatively impacted availability and health of blue crab. This type of crab is a famous and culturally important food in the area - one that many people want to buy. Increasing water pollution risked decreases in blue crab population, causing the price to increase. Framing the problem as one that directly impacted citizen's wallets created a personal investment in the issue and sparked action.



GAME EXAMPLE

Groundbreaking designers in Germany have made great headway in using games situated in German national forests to introduce players to the individual wildlife and hidden beauty of those forests. Using geolocation and hybrid designs, these game developers and researchers have successfully helped form positive attitudes towards nature and create connections with spaces, moving players to protect the real-world spaces they experienced through games (Steffen Schaal & Lude, 2015; Schneider & Schaal, 2018).

GAME EXAMPLE

In *Horizon Zero Dawn: Forbidden West* (Guerrilla Games, 2022), the game reveals and showcases a post-apocalyptic San Francisco that has endured 200 feet of sea level rise. The Palace of Fine Arts and Ferry Building are home to sea creatures. Many skyscrapers and towers are overgrown and deserted. The land is covered in dilapidated cable cars and rusted metal. While beautifully rendered and fun to explore, it illustrates the severe, long-lasting effects of the climate crisis and autonomous warfare.

Leveraging situated learning can encourage a more complete learning experience and remove barriers associated with transferring in-game behavior to real-world behavior.

MIXED REALITY DESIGNS

Mixed Reality refers to the merging of physical and virtual worlds. This concept has gained interest in both entertainment and serious games in recent years. Games like Ingress and Pokemon Go catapulted these mixed reality play modes to the forefront of public view. However, even before the fame of *Pokemon Go* (Niantic, 2016), serious games designers and researchers were interested in how these mixed reality games might function as a tool for environmental learning and action.

One of the more common and potent applications of mixed reality design tactics involve the potential of such games to establish a connection to nature (Schneider & Schaal, 2018; Schneider, Schaal, & Schlieder, 2019). As discussed in the first section of this report, being in nature and experiencing it first hand is a major factor in establishing a connection to nature that, in many people, acts as a foundation for a pro-environmental attitude (Milfont & Duckitt,

In particular, mobile technology can empower learners to game directly within nature. Furthermore, designing with mixed reality in mind can make games that directly facilitate being in nature. This can be amplified by focusing on local knowledge specific to the region, and empowering players to become active participants and/or citizen scientists . By prompting players to complete actions that simultaneously take place in the real world, mixed

reality for environmental gaming blurs the lines between game, the real world, and activism.

REAL-WORLD ACTION

Real-World Action Games (RWAGs) ones in which the player are tasked with taking a real-world action as a core part of gameplay. These actions could range from going to a website, driving to another town, or gathering scientific data on local pollution. Also sometimes called games with green nudges (United Nations Environment Programme, GRID-Arendal,& Behavioural Insights Team 2020), RWAGs have as much diversity in the types of actions they could elicit as the types of genres and mechanics available in virtual environments.

CONCEPTUAL EXAMPLE

You are making an action-adventure card collector game about collecting animals to restore a healthy ecosystem. The player needs to collect specific animals to balance that ecosystem. In your current design, you collect cards by grinding a simple mini game.

You can increase the impact of your game by mapping it to **real-world actions**. For instance:

- **Partner with a few local organizations to support river clean ups in the area your game studio is.** Players who sign up and attend can get a unique fish card they cannot get through standard gameplay. This also leverages the Locality tactic.

- **Partner with a environmental advocacy organization to set up an email or letter campaign for a specific biodiversity protection initiative.** Players who send notes to their local or regional policymakers unlock a special zone in the in-game ecosystem. There, they can discover hard-to-find birds or lizards for a limited amount of time.

WHY USE IT?

In addition to their ability to explicitly map gameplay to real-world environmental impact, RWAGs primarily build relevant **knowledge** and perceived **self-efficacy** through the discovery and execution of increasingly challenging tasks. Even as the difficulty may scale, the use of game mechanics paired with real world actions enables players to have positive ongoing reinforcement that can also encourage them to engage in experiential and experimental learning about environmental issues (Klopfer & Squire, 2008; Schaal, Schaal, & Lude, 2016). For instance, games like Greenify require players to report pro-environmental behaviors as part of the game (Lee, Ceyhan, Jordan-Cooley, & Sung, 2013).

The continued incorporation of real world actions into genres and game mechanics that are enjoyed by a broad range of players can help encourage a **deeper connection to nature**, which can have positive gains on our **goal oriented thinking (hope)**, **mental health** and **wellbeing**. Over the long-term, it

can also help **normalize pro-environmental behaviors** on both an individual and cultural level (Cowley & Bateman, 2017; Janakiraman, Watson, & Watson, 2018; Lee, Ceyhan, et al., 2013).

MORE ABOUT THIS TACTIC

The use of real world actions has been a significant factor in several new serious games and games for change. Tying real-world climate action to entertainment games is difficult because effective real-world actions must feel truly relevant to the gameplay.

By engaging players in the practice of taking real-world actions, designers tap into what is often referred to as **situated learning**: the idea that individuals learn more by doing than by performing simple information analysis (Brown and Collins, 1989). **Situated learning helps players to interact with the content they are learning and the environmental messages they are hearing by placing those messages in a real world context**. By doing so, the designers not only encourage a more complete learning experience, but remove several barriers associated with transferring in-game behavior into real-world behavior.

GAME EXAMPLE

Greenify (Lee, Matamoros, et al., 2013) is one of the most positive examples of a RWAG having a positive environmental impact. Players were issued “missions” that involved pro-environmental behaviors such as recycling. They reported their real-world action within the game, came up with their own missions, and discussed actions on message boards. This resulted in a 61% increase in feelings of efficacy and an 86% increase in pro-environmental behavior.

LOCALITY AND LOCAL KNOWLEDGE

Locality refers to games that focus on play within a specific physical area or allow players to customize their experience based on where they are. Locality can take many forms, but always requires that the game design acknowledges and rewards players for being present within their community. Locality games are generally associated with the Real-World Action tactic, as community involvement often (but not

always) requires some kind of out-of-game experience.

CONCEPTUAL EXAMPLE

You are making a game to educate players about watershed issues. The game uses simple system simulations, similar to city builders, to help players engage in systems thinking as they learn how to delicately maintain the balance of an ecosystem.

You can leverage **locality** by:

- **Having in-game watersheds directly or closely reflect what exists in the real-world.**

- **Prompting players to go to each in-game watershed**, observe wildlife, and record their findings.

- **Including a mode that players can use to create their own watershed management simulations that reflect their own local systems.** This user generated content could then be made accessible so that people all over the world are also able to learn about that watershed.

You can add **real-world actions** to your design by:

- **Requiring players to organize teams that participate in watershed-related volunteer activities.** You can create an event with a local volunteer organization who can then verify their participation to unlock in-game achievements or rewards.

WHY USE IT?

Locality supports the creation and distribution of local environmental **knowledge** - a valuable tool in making day-to-day environmental decisions. Embedding this local knowledge and expanding upon it in future iterations can increase the ability to accurately reflect local truths and gain local trust and participation (Flood et al., 2018; Schaal, Schaal, and Lude, 2015; Di Dio et al., 2018).

If a positive experience, players are more likely to share their game experience and inform others, creating a deposit of shared local environmental information. This co-production of local knowledge can create social reinforcement of updated mental models in favor of **pro-environmental attitudes**. With a clear path to action, locality also can support **self and communal efficacy**. The provision of actionable shared knowledge and readiness to act can also lead players to engage in **goal-oriented thinking (hope)**, which can then empower them to act (Di Dio et al., 2018; Klopfer & Squire, 2004; Barton & Tan, 2010).

MORE ABOUT THIS TACTIC

Game designers can leverage locality and local knowledge for a variety of different reasons, leveraging different methods of collection and application. Below are some of the many possible approaches:

- **Citizen Science, or Data Collection**. Players can be a source of environmental data that can be difficult to collect locally, as well as at scale. Games can prompt players to explicitly gather and interpret scientific data as part of a gamified process, or as a consequence of gameplay mechanics.

- **Events**. Advocacy organizations often bear a significant portion of the burden to create and manage events. To raise awareness and incentivize participation, an approach can be to integrate event participation as a part of gameplay - as part of a level, or an event with a special reward. Direct engagement with advocacy organizations can allow us as designers to leverage their existing specialized knowledge (reducing burden on ourselves to figure out how to make an impact); in return, we can help those organizations both scale their influence and reduce burden on themselves.

- **Geolocation**. The use of player's location data can be integrated as a way to unlock certain in-game actions or activities. For instance, Ingress leverages proximity to physical locations as part of their core exploration and combat loop. It can also be used to unlock in-game achievements, like transit habits in Traffic O2 (see Local Partnerships sub-section below).

- **Local Partnerships**. Game developers can also create ongoing partnerships with organizations or businesses. For Traffic O2, Di Dio and colleagues formed partnerships with local pedestrian-friendly retailers and restaurants. Players gained O2 points by walking or biking instead of taking motorized transport. The points could the be spent at the businesses. This not only benefited players, but the businesses who had a vested interest in increasing local foot traffic to their location.

GAME EXAMPLE

In *Macon Money* (Knight Foundation, 2012), players were able to download fictional money from a website. The players could spend the faux currency at local businesses with one catch: each fake dollar had a twin and, without that twin, you could not unlock the code which made the dollar spendable. Access to the faux currency was distributed at absolute random and players were incentivized to explore, forced to scour their communities to find the person holding the other half of their money. This led to a large boom in local activity (both online and in person) and as well as a significant increase in local business as people began

frequenting the downtown to meet and play the game.

During their evaluation, 46% of players reported they spent Macon Money at a business that was new to them. Of those players, 92% reported they returned 1 or more times. More than 85% of players surveyed reported their perception of shops, parks, and other community amenities improved as a result of gameplay.

COLLECTING SCIENTIFIC DATA (MEASURING DEVICES)

Games can also be enhanced by incorporating **measuring devices** that highlight, surface, or expose environmental or behavioral information. These devices can be attached to as a peripheral; as an app; or physically distributed in board games. The level of integration between these devices and games can vary greatly, and may not necessarily be a hard requirement to engage in the experience.

CONCEPTUAL EXAMPLES

You are making a game that encourages players to understand the conditions in which certain types of plants can survive and thrive. Players are put into the role of gardeners who have to make sure the local plants they take care of have the right sunlight and water conditions. The game simulates how different plants respond based on in-game environmental conditions.

You can enhance gameplay using the **implementation of measuring devices**. For instance:

- **Give players the option to use a light meter app** to physically measure and experiment with direct and indirect sunlight exposure.

- **Give players the option to use a hydrometer** to physically measure and experiment with different moisture conditions that can then be fed back into the game.

WHY USE IT?

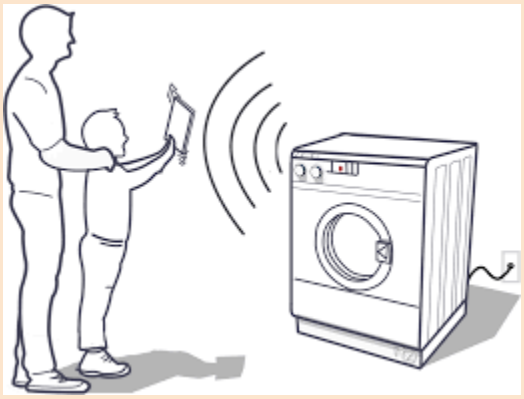
As previously mentioned, studies have shown that connecting in-game systems to real-world outcomes is a highly effective method for shifting **attitudes** and behaviors (Horn, Banerjee, Davis, & Stevens, 2016). Measuring devices give real-world information to the player - information about how their lives are impacted. For instance, a smart device measuring electrical consumption can remind a player that they are not only losing the game by not turning the lights off, but costing themselves money over time. This has the potential to build tools of knowledge, as well as **self-efficacy**, with the regular use of measuring devices that can inform pro-environmental behaviors.

MORE ABOUT THIS TACTIC

While the collection of scientific data is not normally associated with commercial gaming, there are great benefits to using this approach as long as the design of the game meaningfully integrates the information. If the data collected does not directly contribute to the player's in-game progression, it may impact their interest and willingness to continue usage and/or play.

Try to ensure your design intent can be achieved even if players do not have the ability to purchase or access the integrated measuring devices. Avoid making the use of measuring devices a hard requirement, as this may otherwise make your game cost prohibitive. If you are interested in incentivizing use through special in-game rewards, ensure those rewards are not required for game progression. Otherwise, it may result in players with device access to have a disproportionate advantage against players who do not have access. Even if your game is single-player and non-competitive, this indirect form of Pay-to-Win can have a direct impact on player trust, acquisition, and retention.

The level of integration between measuring devices and games can vary greatly.



GAME EXAMPLE

Ghost Hunters (Banerjee & Horn, 2014), for example, requires players to actively use an electron spectrometer to track energy consumption in their house for the game.

GAME EXAMPLE

On the more passive end of the spectrum, *Green My Place* (Cowley & Bateman, 2017) only provided monthly energy consumption updates via the power company.

SYSTEMS KNOWLEDGE AND SIMULATIONS

Environmental education theory strongly supports the idea that **systems knowledge is critical for individuals to become pro-environmental actors**. Strong systems knowledge increases self-efficacy (Wolf and Moser, 2011); empowers people to make scientifically founded decisions in their daily lives (Schneider, Schaal, & Schlieder, 2020); and leads to a more positive attitude towards the environment as people learn how interconnected the world is (Milfont & Duckitt, 2010).

Systems knowledge is a critical aspect of games; in many ways, they are simulations of varying complexity, based on rules and interactions governed by those rules. Classic platformers rely on a rudimentary system simulation of physics, while highly complex systems simulations of entire cultures can be seen in games like Sid Meier's Civilization and Amplitude Studios's Humankind.

HOW SYSTEM KNOWLEDGE IS CODIFIED INTO SYSTEM SIMULATIONS

System simulation is one of the most effective methods for teaching environmental lessons through games (Chappin et al., 2017; Waddington & Fennewald, 2018). In our daily lives, we struggle to understand climate change and how our own actions affect the world around us. As mentioned in the **Abstraction** tactic, simplifying these systems and showing the player how their actions impact the world can beis an empowering experience. System simulations take the complex and implicit rules of an issue and make them explicit, knowable, and simple enough for players to manipulate (Flood et al., 2018). Unlike what is often possible in the real world, the player can receive direct feedback on what they did and see the consequences immediately (Wu & Lee, 2015).

System simulations are common in all spaces - commercial, serious, and educational. Games like *Democracy* (Positech Games, 2005) and *SimCity* (Maxis, 2013) are great examples of games that both entertain and have complex environmental systems from which to learn. Serious games have attempted to simulate real-world systems to draw attention to difficult societal issues, including but not limited to homelessness (*Homelessness: It's No Game* by Terrance James Lavender, 2008), mental health (*Depression Quest* by Zoe Quinn, 2013) and world hunger (*Food Force* by The United Nations World Food Programme, 2005). Indie games with pseudo-educational goals, such as *Space Engine's Universe Simulator*, are also excellent examples of pure simulations; however, some are closer to toys than games in that they do not have reward conditions or rules - only a set of variables to playfully discover and manipulate.

As designers, we get to be creative in how our game teaches systems knowledge to create impact. Many of the systems we create can express environmental messaging in ways that add to (rather than distract from) the fun of the game. However, systems design is complex and nuanced. The more interdependencies you integrate, the higher the risk of logic and knowledge gaps that can render the system unbelievable to the player. To understand their potential impact on pro-environmental behavior, we must examine these factors' individual elements.

The key details surrounding system simulation for environmental impact are split into **2 main tactics** that are really 2 sides of the same coin:

- **System Realism** is the product of the designer and developer, involving the creation of a system that is close enough to the real world for people to learn from it.

- **Experimentation and Inquiry** is the contribution of the player, who plays within the created system to learn from it and transfer that knowledge to the real world.

SYSTEM REALISM

System Realism refers to the extent to which a simulation directly and accurately reflects the reality of a real-world system. An FPS like *Duke Nukem* (3D Realms and Apogee Software, 1991), for example, has very low system realism, with creatures pumping each other full of bullets without slowing down. The original *Tom Clancy's Rainbow Six* series (Ubisoft Montreal), on the other hand, has higher system realism and requires extensive planning, lest the players' team be defeated.

CONCEPTUAL EXAMPLE

You are making a base building and tower defense game that requires players to balance resources and prevent being overrun by the alien hordes at the gate. The player must mine resources between attacks to build and power defensive weaponry. In your current iteration, resources slowly replenish over time.

You can use **system realism** to incorporate environmental messaging by:

- **Modifying or redesigning your resource system so that critical resources like oil and precious metal do not replenish.** Characters or entities the player interacts with can surface the direct and indirect costs of exhausting these resources. This change introduces a level of realism that is small, but can be noticeable in its connection to the reality of fossil fuel dependence.

- **Having the critical decision-making in the game directly reflect environmental resource management in the real-world.** If and when players realize their resources are running out, players must deal with finding reliable and sustainable power. Simultaneously, they must effectively manage the waste created by their actions. Without systems in

place to address it, players will face the impact that waste has on the health of the ecosystem in which their base sits. All of these impacts play a role as environmental health declines: food could become more scarce - impacting the survivability of the personnel the player must keep defending.

WHY USE IT?

The systems knowledge provided by an appropriately realistic simulation is of immeasurable value to a player motivated to make real-world decisions. While telling a player "You should do this!" may help them be aware of a potential action, unlocking their ability to have hands-on practice with how to apply intimate systematic knowledge can empower them to make their own decisions - and evangelize their positive experience to others.

MORE ABOUT THIS TACTIC

To achieve above, system realization usually requires the inclusion of the following elements:

●▶ **Content with Legitimacy**. System Realism is directly tied to the accuracy of how accurate the system knowledge a player gains. The more accurate the in-game system, the more transferable the knowledge is to the real world. Legitimate content means sourcing information from sources that are scientifically and culturally credible. In other words, the way in which the real-world system is articulated must be valid to the degree that a subject matter expert can confirm its legitimacy with evidence.

This concept of legitimacy also extends to the way in which the content is included: legitimate inclusion means that the content is important to the game's context and/or mechanics. Rather than having the content presented as a tool-tip or part of optional reading material, legitimate content is integrated into the challenges a player must overcome throughout the game. The content must respect the player's agency to solve the problem within the rules of the game. If not, the content can feel illegitimate - "pasted on" at the last minute and not considered a part of the core experience (S. A. Barab et al., 2010).

●▶ **Context with Consequentiality.** Player interaction with the system must have consequences (S. Barab et al., 2005). As with legitimate content, context with consequentiality requires we prioritize player agency. The choices players make around or as a result of content (i.e. environmental information) must be important within the game world and affect outcomes on some level. When actions taken by players feel important to them but do not have consequences, it runs the risk of them missing the message entirely. The more important the environmental content affects the outcome of the game, the more importance it holds within the game system - and the more players will focus on it.

●▶ **Contextual Cues or Feedback**. One of the most valuable aspects of climate system simulations is that they can provide immediate feedback on actions that would take years to see in the real world

(de Suarez et al., 2012). In system simulations, feedback can be delayed (an hour later) or immediate (start of the next turn). Games like Fate of the World (Red Redemption Ltd, 2011) provide perspective by giving feedback to players on a scale of 5 years per turn. Whatever the scale, games that provide feedback give the player the opportunity to experiment - a critical aspect of learning systems knowledge for complex ecological relationships (Schulze et al., 2015).

- **Visualization.** The visual representation of information is an important aid in helping players understand complex environmental data (Banerjee & Horn, 2014). Artistic design can bring science to life by showing the consequences of environmental mismanagement and connecting to emotional elements (Harker-Schuch et al., 2020). In addition, the visualization of complex data sets within a game has been shown to greatly increase the amount of information players comprehend within a simulation (Harker-Schuch et al., 2020).

- **Balancing Realism**. Lastly, the level of realism within a game must consider the audience, the aesthetic, and the design intent. Overly simplified systems do not necessarily convey actionable knowledge. A game like Minecraft (Mojang Studios, 2011) can help inspire players to appreciate nature, but the gameplay itself may not be the most rigorous way to teach them the fundamentals of forestry. On the opposite side, games should be fun and/or engaging - and truly detailed, realistic simulations are rarely approachable or accessible to players who do not already have specialized expertise. If Kerbal Space Program (Squad, 2011) were hyper-realistic, it would likely be too complex and actively disincentivize young students from wanting to go into aerospace engineering.

GAME EXAMPLE

Eco (Strange Loop Games, 2018) is a community-based game with a fully simulated ecosystem filled with thousands of plants, animals, and resources. Players have to make strategic decisions about how to build their civilization so that they can save it before a large meteor strikes. At the same time, these activities have a direct impact on their ecosystem - producing downstream effects like pollution and species depletion.

As players' civilization grows, players have the ability to analyze robust datasets about the ecological impact they are creating. Players can leverage this data to learn how to work together, propose laws, and restrict

activities that are being too extractive *without* disrupting technological advancements necessary for survival.

EXPERIMENTATION AND INQUIRY

If system realism is the designer's contribution to games, **experimentation** is the contribution of the player. Players occupy positions of both power and constraint. They consent to interact within the limits of what a given game affords - through mechanics, or even moderation by the developers; yet, within these rules, they are free to experiment, be curious, and push the limits of a system as far as it can go. Players are often difficult to predict, and the many paths they can take through games can be chaotic. From creative exploitation of game design oversights for speed runs to the disruption of entire servers through viruses and hacks, many players do much to investigate and test the limits of a system. The ability of a video game system to respond to players' experimentation is one of the most valuable affordances games have for including environmental messaging, education, and/or activism.

CONCEPTUAL EXAMPLE

You are building an exciting 4X strategy game. Players must guide their civilization as they explore the game world, collaborating with allies, or surviving wars of conquest. The player must manage their economy, politics, and military; simultaneously, they must also manage the ecosystem in which they live. They must take care to avoid over-extracting from their region, as it can critically damage the environment and their ability to sustain life - which will impact their progress. In its current iteration, players are given steps to overcome their challenges.

To spark **experimentation and inquiry**, you can:

- **Make the environmental system more opaque.** The downstream impacts of player actions can be indicated through visual cues or context clues, but otherwise not explicitly surfaced. As players fail and try again, more of the system can be gradually exposed over time. By doing so, they can also become familiar with the way industrial progress can directly affect our environment in the real world.

- **Consider a branching narrative.** Players can have multiple success states, with their decisions impacting the relationships they have with other characters or players. This, in turn, can impact what access they can have to certain levels that unlock new world lore, resources, or events. Surfacing this can make players curious about the possibilities; with enough emotional connection to the content and a clear sense of reward, players may be compelled to play the game all over again to find out.

WHY USE IT?

Experimentation and Inquiry are special in games for many reasons. For the purpose of this Playbook, we'll focus on their importance in building **systematic knowledge**, **pro-environmental attitudes**, and **player identity**.

Experimentation builds (and is perhaps even necessary for) player knowledge of complex systems. In a game like *Clash of Clans* (Supercell, 2012) a player can experiment with new base loadouts and armies to learn how the system works. In *Portal*, the player has a virtual playground in which to learn the increasingly complex rules of play by trial and error. In games like *Fate of the World* or *Evergreen* (Hedemalm et al., 2017) a player can make environmental decisions; see how the system reacts; reason how they might have acted differently; and try again.

The ability to "play with" a system in a safe in-game space allows players the ability to infinitely reset and observe how their actions have direct or indirect impact on the greater system. This can lead to **model-based reasoning**, or when the player creates a mental model of how something works and acts based on their understanding (Clark & Martinez-Garza, 2012). For instance, a new player of *League of Legends* (Riot Games, 2009) may be able to have a general idea of how to choose a character and navigate the game map as a result of having played other games in the same genre. This is in contrast to reactionary reasoning, where a new player may be doing their best to keep up with the game, but is mostly just shooting at anything that moves because they are completely new to the genre.

The importance of mental models, and how we see ourselves in a given system, cannot be overemphasized. In 2006, Ben Stokes et. al. sparked the conversation around **low-risk experimentation** with identity in games - that players can experiment with new identities free from the pressure to conform based on what is considered socially or culturally acceptable. **Further research supports the idea that players can roleplay with new sets of values and ideologies that are socially driven, including environmentalism** (Swain, 2007).

Research supports the idea that players can roleplay with new sets of values and ideologies that are socially driven, including environmentalism.

Understanding this social aspect is critical for the forming and sustaining of **pro-environmental attitudes**, as what we perceive to be socially acceptable has a direct impact on our willingness to take pro-environmental action. Putting this in the same context as systematic knowledge - it can empower players to suspend disbelief, observe and deduct relationships, and consider alternatives. Systematic knowledge and psychological safety are some of the most important things we can provide to

a learner. When well executed, evidence has shown that mental models created during gameplay are so powerful that they can actually override pre-existing false-science models (Waddington & Fennewald, 2018). In other words, experimenting in a game with a climate realistic system can actually help someone overcome climate denial.

Evidence has shown that experimenting in a game with a climate realistic system can actually help someone overcome climate denial.

MORE ABOUT THIS TACTIC

The design of each game will determine the specifics of how you can enable players to experiment. However, there are some general guidelines that can be considered to maximize the potential meaningfulness of players' learning experiences:

- **Ill-Structured Problems.** While explicit directions to solve well-defined problems ("Go there! Get this!") can help players learn a specific lesson, it does not require players to re-examine their way of thinking. Providing players with an ill-structured problem that is complicated, vague, and/or has multiple answers can allow the player to explore and discover their own solutions. Consider the modern survival crafter game Subnautica (Unknown Worlds Entertainment, 2018) versus the 1990s point-and-click adventure game Grim Fandango (Tim Schafer, 1998). The latter has hundreds of fun puzzles, but each puzzle has a single solution. Experimenting within the game to find that solution does not teach the player anything about how to solve problems that pop up later in the game. Subnautica, on the other hand, has only one real problem: to survive. However, the player is dropped into a world with no instruction - and has to learn a complex, interconnected system of crafting and exploration to do so (Fabricatore & López, 2012).

- **Productive Failure**. The intent to focus players on feelings of hope and inspire pro-environmental behavior does not meant players should be kept away from the negative feelings that can result from failure. However, it is important to ensure that the fail states available in your game can still teach the player something. Failure is very useful for teaching players about cause and effect. For instance, if the player is experimenting with ocean conservation and makes decisions that result in their coral reef dying, they must have contextual cues that can help them understand what happened, how to improve, and how the knowledge can apply to their real lives (Hmelo-Silver, Kapur, & Hamstra, 2018).

- **Modding.** Games that enable direct modification of in-game assets and user generated content give players a direct opportunity to not only experiment, but to see their creativity come to life in a medium they deeply enjoy. Modding communities are often run and sustained by players passionate about sharing the outcomes of their experimentation. They also tend to have strong peer support,

especially for modders that are just getting started: the ability to share knowledge as a way to demonstrate skill is a key element of modding culture. If this kind of community support and growth mindset can be mapped to environmental impact, the benefit could be significant!

GAME EXAMPLE

Minecraft (Mojang Studios, 2011) is one of the most famous examples of a game affording extensive experimentation and inquiry. Players have taken a simple system and pushed it far beyond its original intent. Supported and empowered by developers to continue this inquiry, *Minecraft* has quickly become not only an entertainment phenomenon, but an effective vehicle for experiential learning and teaching (Nieto et al., 2021).

GAME EXAMPLE

Oxygen Not Included (Klei Entertainment, 2017) places the player in control of a space colony. The ultra-realistic systems which guide play include everything from caloric content of food to weight of gasses. The player must manage thousands of variables with no explicit explanation ever provided. Rather, by playing and failing, the player quickly learns through experimentation and self-guided inquiry.

PART THREE: THE BIGGER (SOCIAL) PICTURE

How might player-to-player actions and influences aid my environmental goals?

SOCIAL INTERACTIONS OVERVIEW

Players do not exist in isolation. Designers of all kinds know that individual gameplay is only one part of the broader user story. Players collaborate, cooperate, compete, discuss strategies, and generally socialize within games and in social spaces built around games—and this socialization is influenced by design. In fact, game designers can tailor social elements within and around games to affect climate messaging. This section discusses how that might be done.

The design tactics covered earlier offer numerous complex interactions and opportunities for climate messaging within games, but they're focused primarily on how individual players interact with games. Social elements and contexts can powerfully modify or enhance most tactics in some key ways. For the alpha release of this Playbook, we have decided to split these social interactions into two macro categories: **Social Play** and the **"Metagame."**

SOCIAL PLAY

Social Play refers to the in-game social interactions that affect the game or the player. In multiplayer games, players must often interact in order to accomplish a goal - be is shared or distinct. This interaction can be primarily competitive, like in a MOBA game, or it can be primarily cooperative, like in an MMORPG. It can also be a little bit of both as well. Regardless of the type of multiplayer mode, it is important to acknowledge that the art and practice of social design in itself is difficult; we as designers have less control over how players interact with one another. At best, players work together to align towards a shared goal and celebrate each other's successes. At worst, disruptive behavior can disrupt player trust, directly impacting both interest in continued play and the process by which they can become inspired to take pro-environmental action.

COLLABORATION

Collaboration refers to social gameplay in which 2 or more individuals work together to achieve 1 or more common goals. Whether collaborating with other players or non-playable characters, collaboration can lead to significant changes in players' mental models and perspectives. It can create changes in how players may prioritize both in-game and real-world goals, given the associated goals and incentives

carry a pro-environmental message that is translatable to real-world contexts.

CONCEPTUAL EXAMPLE

You are designing a game in which players build and grow gardens in a sandbox environment. Each player can harvest resources that can increase production and efficiency of their personal garden. Other players do share the space and can choose to compete or cooperate with each other. In your current design, there are no hard requirements necessitating either approach; the nature of each interaction is up to each player.

You can support **collaboration** by:

- **Creating a set of missions that cannot be completed alone.** For instance, players must collaboratively determine why their gardens are suddenly becoming unhealthy. Players can work together to gather observations, leverage each other's tools, identify potential problems, and solve them using what they collectively have available. By working together, players can determine that the water quality has decreased due to pollutants. One of the potential solutions can be to have the polluting factory in a nearby area regulated. In order to advocate for this, the game requires the majority of players in the garden to agree. Only by cooperating and gaining enough signatures can players address the root cause of the problems afflicting their gardens.

WHY USE IT?

Collaborative problem solving as a learning experience is highly effective in games; when it involves deep, strategic thinking, it can aid players in building a strong **systematic knowledge** of a topic (Horn et al., 2016). It can greatly increase the depth of knowledge and perceived self- and communal efficacy players can gain as a result of shared experimentation and inquiry. Collaborative experiences can expose players to alternative viewpoints (Jeong and Chi, 2000); when combined with psychological safety, they can aid in the direct normalization of **pro-environmental attitudes** and **goal-oriented thinking (hope)** in favor of a more environmentally conscious future.

In truth, collaboration strikes at the essence of one of the most important environmental messages: we do not have to do this alone, and we must cooperate with each other in order to survive and thrive. To see oneself as a lone actor in the face of a major existential threat is not only isolating, but ineffective.

MORE ABOUT THIS TACTIC

The power of collaboration is founded on the learning principles of **constructivist theory**, which posits that people create knowledge rather than it being taught. **Social constructivism situates knowledge creation in social spaces**; in other words, we build knowledge together as a community, rather than as individuals. We as designers can ask players to take on different roles (ex. classes or jobs), with the goal of scaffolding them into more effective

problem solving roles over time (Dunleavy et al., 2009). In many multiplayer games, players learn both by doing and by observing their team members' actions - adjusting their own actions and thinking accordingly (Squire and Jan, 2007).

The value of collaboration can also be enhanced and encouraged through discussion in and around the game (i.e. the **Metagame**). When games encourage and prompt players to discuss strategy throughout and outside of gameplay, the resulting social interaction can significantly increase understanding of game systems (Horn et al., 2016). If the game is designed to convey realistic environmental systems knowledge (see **Systems Realism**) and is discussed in places like social media and online forums, this understanding of the game system can make understanding of the real-world system more commonplace and normalized.

COMPETITION

Competition refers to social gameplay in which players must compete against each other to accomplish 1 or more goals. Competitive gameplay tends to have the same zero sum game pattern in which one player or group wins and the other loses.

Our industry does not often consider how competition as a concept within a given narrative or mechanic can affect player perceptions regarding a real-world issue. Research has shown that competition in games with environmental messaging can lead to a decrease in pro-environmental thinking and behavior because of this win/loss mentality (Chappin et al., 2017). As designers, it is important for us to consider how competition within our game may put players' goals at odds with the environmental messaging we seek to instill. At worst, competition without meaningful context has the risk of actively encouraging anti-environmental behaviors and thinking.

CONCEPTUAL EXAMPLE

You are creating a competitive turn-based strategy game in which players land on a planet untouched by climate change, undamaged by human actions. Players are compelled to fight for supremacy on the planet - controlling resources, building militaries, and negotiating complex diplomatic relationships.

Competition can elicit delight through a sense of conquest and achievement. However, **the mindset required has potential to create negative effects**:

- **The intense competition over who can extract non-renewable resources the fastest encourages players to adopt a "me first" attitude.** The game warns players that abusing the resource is likely to cause increase risk of environmental damage that negatively affects all players. However, without additional incentives to change course, players continue to abuse the resource - resulting in a tragedy of the commons where eventually no players can benefit (Chappin et al, 2017).

Alternatively, **competition** can be leveraged for environmental impact by:

- **Ensuring competitive advantage is gained through pro-environmental actions.** Design the turn-based competitive strategy game to focus on repairing environmental damage caused on the planet. A player's competitive position can be measured by citizen happiness, and strengthened by how much they have restored relative to players in other areas or even other planets.

- **Pairing it with Collaboration a la Player Versus Everyone (PvE) mechanics.** Design the turn-based strategy game to have each player or player group have a role with abilities distinct and complementary to the others. All players are challenged to have the highest environmental restoration score to win; however, they can all lose immediately in the event a natural resource critical to everyone's survival fails. This can encourage players to support each other while still seeking the best possible individual outcome.

MORE ABOUT THIS TACTIC

Games in which players can quickly succeed by engaging in anti-environmental behavior can, at minimum, be ineffective in creating impact; at worst, they can actively discourage **pro-environmental attitudes** and behaviors. To most effectively enable pro-environmental outcomes, competition must have the goal of conservation and/or restoration. A powerful example of a well organized competition is the immense field test of an energy conservation game deployed across five countries in 2017. The field test pitted entire buildings (both office complex and residential) against each other, reducing total energy consumption (Cowley & Bateman, 2017). Conversely, Chappin and colleagues conducted an experiment using *Settlers of Catan: Oil Spring* in 2017, investigating how the use of a powerful shared resource can affect player behavior. Even with multiple explicit warnings that using the oil can cause all players to lose, players continued to take from the oil resource - another tragedy of the commons. Chappin findings imply that competition that encourages anti-environmental behavior can offset any implied environmental messaging.

FACILITATION

Facilitation refers to the discussions held by players about game content before, during, and after gameplay. These discussions can be held informally during the game, just as a chat between players, or more formally via focus groups or moderator-led conversations. Formal and guided discussions can provide a more illuminating experience in that an expert facilitator or environmental practitioner can provide additional context, scientific data, relevant arguments, or even discussion games; having an intermediary help identify or signal nuance can create richness in the discussion. However, the more structured a conversation, the less organic it can become - decreasing certain players' willingness to explore and expand upon the discussion. We as

designers must decide what balance of guidance and organic exploration is right for our design intent and our target audiences.

CONCEPTUAL EXAMPLE

You are designing a game in which the main goal is for players to have the most productive farm. Players can employ a variety of strategies, but must all engage with different characters in the game to understand weather conditions, pick up missions, and monitor the state of their farm. The system has several climate change-based simulation mechanics built in.

You can leverage **facilitation** to make these mechanics more visible and valuable by:

- **In-game**, creating a new character that functions as a climate messenger. The character discusses how certain climate issues are directly impacting the farm. The player gains access to information and tools that can help them revise their strategy, in hopes of ensuring their farm is resilient to environmental threats.

- **Out-of-game**, hosting a weekly Twitch stream to generate conversation and capitalize on the popularity of the game. During that stream, developers on your team can play through the game while talking to climate experts whose work informed design and simulation choices. Viewers are invited to ask questions, and be rewarded with systems knowledge that may not be explicit during gameplay but can be applied in-game as professional strategies ("pro-strats") to increase farm productivity.

WHY USE IT?

Facilitation and communication are not easy goals to achieve, especially within commercial game design. However, evidence in serious games and games research related to environment education indicates that the presence of a facilitator can greatly increase the level of reflection players have about an experience (Flood et al., 2018). This personal reflection can directly increase the chance of transferring a **pro-environmental attitude** or applicable **knowledge** from in-game to reality.

MORE ABOUT THIS TACTIC

Embedding environmental and/or societal issues in gameplay as part of the narrative or mechanics can be incredibly powerful. It can also be strengthened through community management and moderation, as social support can reinforce players' knowledge and attitudes. However, it is important to acknowledge that creating safe spaces in which vulnerable conversations can happen is very difficult.

We as designers can incorporate discussion directly into the game. If so, the narrative context in which the conversation occurs has to be meaningful to the player's experience. If the player is not emotionally connected or lacks interest in contributing to the conversation, it is not really a conversation. As a result, the player is disabled from co-developing knowledge. On the other hand, if the conversation

feels inappropriate to the setting, the player will recognize the messaging as irrelevant or not crafted to their specific experience; more often than not, the player will tune it out.

Alternatively, or in parallel, facilitated discussion can happen out-of-game in the form of message boards, live streams, events, and/or social media. The moderators of these discussions play key roles in ensuring the discussion stays on topic and within the community guidelines set. Often, these are developers from the studio where a game is made. To take a more player-centric and driven approach, we as designers can directly engage players - ideally, empowering them to facilitate their own discussions. Let's discuss this further a la the **Metagame**.

THE METAGAME

The Metagame encompasses all of the social interaction outside of gameplay. This includes social media conversations, discussion forums, and player guides. This includes fan groups, Let's Play videos, esports events, modding communities, and everything in-between. If you can think of a place where more than one person interacts with information about your game, that's part of the metagame. While potentially uncomfortable to admit, it is not a space over which we have complete control. A large company can create and moderate discussion across multiple platforms; however, those spaces are still only a fraction of the metagame. The complexity of the metagame is too often ignored due to resource constraints. We as designers often labor over what is inside the game, but can struggle to ask how we can design to support the metagame experience.

An immense amount of learning takes place in the metagame space. This ranges from players forming entire formalized curricula to compete (Squire, 2012b), to in-game training runs for Planetside, to intense fandoms teaching players life skills (Gee & Hayes, 2012).

The metagame can help players acquire new patterns of behavior and action by socially supporting and affirming the value of those behaviors. Without a community to support a new environmentalist in their journey, social pressures can overwhelm an individual and cause them to de-prioritize environmental behaviors for those more favored by their community. Continued interaction with a supportive community is a key attribute in adopting and validating new behaviors for any individual (Leiserowitz, 2015).

Aside from attitudinal or behavioral changes, social support is critical for learning of any type. Studies have found that groups take on their own learning cultures and that people new to a hobby or skill learn differently when they are supported by a community of peers (Greeno & Engeström, 2014; Lave, 1991). These **microcultures**, often called **communities of practice** or **affinity spaces**, are a place in which

knowledge can be co-created and the training of new skills (e.g. learning to be a steward of our planet) happens naturally and effectively without the need for intervention by outsiders or formal education.

The metagame is not an in-game design aspect, but it is absolutely an aspect of your game space that you can choose to design with intentionality. It is a place outside of your game that the designer should consider as a tool for reinforcing an environmental message. When considering how you wish to engage your game's community with a serious message such as environmentalism, one should consider the following:

PURPOSE AND FORM OF THE COMMUNITY

You must first ask what the purpose of your community is and if that primary purpose can support engagement with a serious message like environmentalism. Messages that are at odds with the purpose of the community are rarely well received and may serve to harm the credibility of the person sending the message.

If the community can support this type of messaging, the community manager and designers should work together to create synergy between the messages in the game and the messages within the community. Environmental or other serious topics that cannot be directly tied to the content of the game can be seen as irrelevant and members of the community may disengage.

Civilization's community is an excellent example of a synergistic serious message. Though the game is not about sustainability, the game (especially recent mods and expansions) highlight sustainability and conservation by painting a grim picture of industrial impact. The inclusion of this content and messaging in the game creates organic opportunities to support conversations and actions around environmentalism within the Civilization communities, both official and unofficial.

HOW CAN I HELP CREATE A SAFE SPACE FOR PRO-SOCIAL BEHAVIOR?

We as game developers are always looking for ways to bring our games to life, and ensure the communities we create around them are welcoming to many different types of players. This is particularly important when designing for behavior change: disruptive behavior, be it non-consensual emote spam or direct harassment, can not only create discomfort in individual players - but increase harm against marginalized communities as well as disrupt the process of behavior change for the broader player

ecosystem. For more information on what is known about disruptive and harmful behavior in games, check out the **Fair Play Alliance's *Disruption and Harms in Online Gaming Framework***.

At a very high level, be mindful of the opportunities in which disruptive behavior may occur - in-game and through metagame systems. Explore opportunities to create incentives for the act and reinforcement of **pro-social behavior**, which includes but is not limited to:

- **Providing mentorship**, especially for players who are new to the game and/or genre. Peer support has shown to benefit the mental health of both the mentor and the mentee.

- **Celebrating other players, even when they do not win** (if in a competitive game). This type of behavior goes a long way to create the expectation that players do not have to be perfect every time to be valid and valued as part of the community. This has direct translation to every player's individual climate journey.

SUSTAINING THE COMMUNITY

Long-term behavior change is difficult without sustained engagement with a supportive community (Swain, 2007). In order to support the community, a designer or community manager needs to be aware of goals within the community that are connected to your environmental message. These goals may be learning or action outcomes, or simply normalization of the message. Whatever the case, sustaining a community that supports a serious message involves finding and supporting the goals that are important to the community itself, not prescribing goals that the company thinks are important.

There are multiple models for sustaining and supporting **communities of practice** (see: Hoadley & Kilner, 2005; Serrat, 2017). However, within the realm of games and game design to support environmental messages, we can strive to support communities through:

- **Allowing the community to drive inquiry**. As stated above and in earlier sections, consider a community-based participatory approach in which players have an active voice in guiding how the community is structured and maintained. Help reinforce community goals, norms, and behaviors that can help community members with different lived experiences and communication styles feel safe to participate, ask questions, and share ideas.

- **Provide opportunities for reflection**. Within the game or the community, provide content that lets

the player reflect on the environmental messages. Ideally, your content is both, creating moments in the game and in the community that are connected.

- **Provide opportunities to produce**. Discussion is important, but action leads to real behavioral change. If the community has identified a message or goal they value, the community manager or designers should provide the tools needed for the community to act on that goal. This could be in-game changes or real-world actions taken by the community members. Whatever the case, a major aspect of community sustainability is feeling that the community empowers the individual members.

DEFINING NEXT STEPS FOR THE PLAYBOOK

If you've gotten to this point of the Playbook, we cannot thank you enough for your time, energy, and willingness to dive in!

As we mentioned in the very beginning - this is the IGDA Climate SIG's **very first iteration** of the Environmental Game Design Playbook. When we started on this journey, we identified many pain points that have made it difficult for game developers from all walks of life to know where to start. In particular -

- There is an **absence of a core, shared, accessible body of work** that directly maps pro-environmental predictors of behavior to best practices in game design.

- Game developers in the industry often **do not have in-house expertise, knowledge, or resources** they can easily leverage to apply environmental psychology and pro-environmental predictors of behavior.

- Students who are in game design programs or have recently graduated **do not have the necessary training, resources, or professional network** they can leverage to get into a role in which they can get paid to make pro-environmental games they are passionate about.

We're excited to share this alpha release as a **starting point** for deeper cross-industry, interdisciplinary conversations about what it means to create environmentally conscious games with meaningful impact. **With the intent to build a strong foundation of shared knowledge, our next phase of work will involve validating that the Playbook can:**

FIRST AND FOREMOST, MEET GAME DEVELOPERS WHERE THEY ARE. We will be conducting developer research and executing pilots with game developers across the industry to gain feedback regarding whether the Environmental Game Design Playbook and accompanying Tactics

Quick Reference Guide are usable, relevant, and actionable within the context of their existing development processes.

IN PARALLEL, SUPPORT THE NEXT GENERATION OF GAME DEVELOPERS. We will be co-creating and executing pilots with higher education game design programs, incorporating these resources into curricula. We will seek feedback from students and educators regarding whether or not these support the proactive development of climate conscious design skills and competencies new game developers will need for when they enter the video game industry.

In particular, we are gathering feedback for whether or not the resources enable students to feel confidence and excitement in their ability to understand and leverage environmental game design tactics. The hope is that we will provide mutual value through access to these resources and industry practitioners. The resulting creation of student environmental game prototypes will be evaluated by the IGDA Climate SIG - not only to understand how the design tactics were applied, but to provide actionable feedback. We hope these game prototypes can become meaningful artifacts added to the **IGDA Climate SIG's Climate Games Database**, as well as additions to student portfolios that can be showcased when they enter the industry.

READY FOR NEXT STEPS?

If you are interested in contributing to the Playbook, providing feedback, and/or participating in our pilot program for new and upcoming developer resources, please join the IGDA Climate Special Interest Group Discord community (**tinyurl.com/IGDAClimateSIG**) or reach out to **climate-sig@igda.org**.

Excited to hear from you!

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