Trinity College Dublin
Coláiste na Tríonóide, Baile Átha Cliath
The University of Dublin

School of Computer Science and
Statistics

'Climateers': A game to educate and encourage young people's sustainable behaviour and activism

Ross Gerard Donnelly,
Computer Science &
Business

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Project Introduction

In this project, a tool was created to teach young people about the consequences of their actions in relation to the Climate Crisis and empower them to enact change. The game will provide players with a fun and immersive experience, while also encouraging them to think critically about sustainability issues and take action in their own lives.

The issue of sustainability has become increasingly urgent in recent years, as the impact of climate change and other environmental challenges become more apparent and material in our lives. Sustainability is becoming perpetually ingratiated into our society; our consumption, our transportation and especially our education. As this pillar of society continues to rise it becomes increasingly important to warrant young people's development in societal efforts as a viable and necessary force against the climate crisis. The climate crisis poses the largest known prevailing threat to the next generation. As young people establish themselves as leaders of business and governments orchestrating consumption and inscribing legislation in the coming years, they must find themselves properly poised with sustainable education and motivations at heart.

Unfortunately, young people's sustainable development and their attitude to the planet are not sufficiently encouraged or positively reinforced. The project aims to encourage sustainable behaviour in young people and empower them to affect actual positive change in the world through activism and sustainable action.

This generational change will require behavioural modification to ensure young people value pro-environmental behaviour and sustainability enough to enact action against climate change. Behavioural modification especially targeted at sustainable behaviour is in its infancy but emerging technologies act as an axis for change. This behavioural change must be encouraged and nurtured alongside any form of growth. Gamification has proven a promising avenue for reinforcing sustainable behaviours and visualisation will be key to reaching young people. Through both education and positive reinforcement it is hoped that the game would initiate an uptick in sustainable behaviours in young people.

The structure of this project mirrors the processes under which it was created. After the initial conception of the idea for the game, the three pillars of the project emerged; young people's relationship to sustainability, behavioural modification and Gamification. These pillars structured the literature review which unveiled significant insights into the topics under examination. These insights then informed the design rationale and the requirements of the project which were then achieved by the project developments implementation. This implementation was then examined and discussed in the final chapters of the project.

To summarise, young people need to be informed on sustainable practices and activism but it can be difficult to engage young people in these activities. Games and gamification practices

can play a powerful role in cognitive development and behavioural modification. Through the development of this game, this project will add to the growing movement of sustainable behaviour encouragement and motivate a generation of young people toward eco-activism and pro-environmental behaviour.

Literature Review

Introduction

In this project, a tool was created to teach children about the consequences of their actions in relation to the Climate Crisis and empower them to enact change. Proper legislation, regulation and corporate social responsibility will be key in making true the commitments laid out in the EU Paris Agreements in 2016. Younger generations must be empowered to take climate action and informed of the power of their actions in curtailing the climate crisis. This empowerment will need to work in tandem with any cognitive development but steps must be taken to establish a mindset motivated by sustainable objectives and pro-environmental behaviour. Gamification has been shown to be an effective tool for reinforcing behaviours and overcoming some of the barriers to education and cognitive development in young people. Gamification and visualisation will be key to reaching young people. Through both information and motivation presented through a game, it is hoped that young people would be more likely to lead a sustainable lifestyle and encourage others to do the same.

Method Scope And Purpose

This project addresses the issue that young people's sustainable development and their attitude to the planet are not sufficiently encouraged or positively reinforced. Humanities efforts against climate change call for sustainable action amongst all individuals. No one group more perhaps than those inheriting the planet, young people. As our next generation grows in size and maturity so to does their responsibility to care for the environment. It is more imperative than ever that proper education and sustainable behaviours are developed in young people from an early age. The inherent resistance towards sustainable development is a major hindrance in the climate crisis and without change could be humanity’s undoing.

Many young people are not sufficiently encouraged to adopt sustainable behaviours. Whilst education on the environment is advancing every day and the information being passed on to our young people in schools is attempting to keep up there are insufficient supports or efforts to establish a generation of eco-conscious consumers.

Many organisations are incorporating environmentalism to far greater effect in their work with young people. Many community organisations or groups such as the scouts make frequent efforts to allow a green perspective to prevail or ensure a relatively sustainable approach is utilised. These ideals are reflected throughout the levels of an organisation leading to many of the values of the organisation being reflected in the values of its individual participants. Subjects such as C.S.P.E. (a module to improve the Civic, Social and Political Education of secondary school students) have taken strides to prioritise pro-environmental behaviours as part of their curriculum.

But with the advent of new technology, tools to ensure the overwhelming behaviour of the next generation is towards caring for and saving the environment around us. Many applications have adopted techniques of behavioural economics and paired them with technology to promote sought-after behaviours or habits. It is now time for a similar process to be undertaken to encourage sustainable behaviour and activism.

The purpose of the project is to both educate and empower young people to realise the power their decisions have on our planet. The game must educate its users on sustainable practices and encourage the growth of sustainable behaviour. By demonstrating the potential action users can make in combat the climate crisis the game will modify their behaviour and more importantly their decision process towards pro-environmentalism. A system of gamification will attempt to ensure the information and encouraged behaviours to translate to real-life sustained action in the user's lives.

The purpose of this state-of-the-art will be to inform the efforts to achieve the former so that the necessary design principles and objectives can be upheld and ensure the problem statement is solved. The literature review will contextualise the work undertaken throughout the project and detail the topics being delved into throughout the development process namely; sustainability, behaviour influence & gamification. Furthermore, This information will support the findings of the project and ensure that the development process remains within the relevant ethical and creative bounds. This was achieved by research through both Scopus and the Trinity College Stella search. Search strings included but were not limited to 'sustainability young people', 'sustainability gamification', 'technology behaviour', 'behaviour modification' & 'sustainable behaviour'. The research was divided into the three topics of contextualization and relevant topics were compiled into a literature database. Upon examining the literature relevant findings were utilised throughout the literature review to contextualise the project as a whole and the decisions made throughout the design and development process.

Young people & Sustainability

Young people have a critical role to play in sustainability. UNESCO's Global Action Plan for Education for Sustainable Development has identified children and young people as agents of change and has included the empowerment and mobilisation of younger people as one of its five priority areas (UNESCO, 2018). Sustainable ideals mustn't be overlooked during young people's cognitive and social development.

Young People's Sustainable Development

The next generation, the future decision-makers of our planet are burdened with environmental responsibility from birth and thus have been targeted as recipients of education for sustainable development (Singh et al., 2020). During childhood and adolescence, children gradually develop the abilities of reasoning, including moral judgment, in processes that include cognitive and emotional maturation (Kohlberg et al., 1964; Piaget, 1965). This development is coming from various sources in their environment; school, family, peers, and media.

Whilst currently primarily introduced and contextualized in a formal setting environmental thinking is becoming interwoven with a child's overall development and socialisation (Harris Jr. et. al 1995). These early years are crucial and can influence the personal attitude of an individual in choosing which behaviour to adopt. The development of environmental problem-solving in young people should not be limited to traditional educational methods and should instead work concurrently to elevate the overarching message and influence.

Studies show that children define engagement with environmental issues as a promise to protect the environment in the longer term, and whilst the children demonstrated varying levels of cognitive, their emotional, and behavioural engagement in the environment, were noted as the predominant influence on their sustainable viewpoint (Schill et. al 2022). This connection orientates their lifestyle alongside a variety of triggers - education, peer groups - establishing sets of beliefs which modify young people's patterns of behaviour. By understanding these triggers and young people's connections to their environments we can influence these behavioural patterns thus creating a deeper connection to their planet. This connection will then in turn harbour increased pro-environmental behaviour.

Young People's Role in the Future of Sustainability

Almost from birth, individuals are targeted as consumers by marketing and policy making (Mau et al. 2014; Schor 2004). In their developmental years, young people develop values that may influence their behaviours as adult consumers, allowing them to positively influence their future (de Araujo Gil et al. 2016). Their recognised role as consumers from an early age signifies the part young people have to play in environmental issues that challenge our idea of a sustainable relationship with consumption. (Larsson et al., 2010; Walker, 2017).

The current risks of young people reaching unsustainable overconsumption are high, especially in industrialized countries (Fischer et al. 2017). There is a responsibility to equip young consumers with the attitudes, knowledge, skills, and infrastructures to make consumption decisions best suited to their well-being while respecting their financial situations and environmental boundaries. Anticonsumption practices may support environmentally compatible, socially just, and individually beneficial sustainable development (Ziesemar et. al 2020).

Young Peoples affect on sustainability

At the age of 10, a person has sufficiently developed to independently reflect on their values and determine the righteousness of different actions and behaviour (Zeiske et al., 2020). This rise of informed judgement couples with increased influence on the environment.

Children may be provided with sustainability knowledge and experience through their learning at school, from the media, or from peers, giving them the information to use in persuasion attempts with their parents (Gentina & Muratore, 2012). However, avenues for behavioural change have yet to be fully utilised to ensure pro-environmental behaviour develops despite the clear impact the next generation will and in some cases already have on our planet.

Young people have been noted as potential agents for change in their family's sustainable behaviours (Easterling et al., 1995). Reverse socialisation has been seen to take place, for example, Singh et al. (2020) work with families in India, where teenagers' education about the environment in school led to requests and suggestions for a more sustainable home life. These included saving water, reducing energy consumption and purchasing eco-friendly products.

Reverse Socialisation demonstrates the influence sustainable education, promotion can have on a child and their immediate environment. Young people's influence is already evident. They must be equipped with the necessary knowledge to take action in the future but we must also rectify their decision process to consider the environmental impact on their current sphere.

Young People's Valuation of Sustainability

Like nearly all their ideals, young people's perceived value of environmental responsibility follows basic customer value theory. CVT proposes that consumption decisions are made by considering multiple values (Kabadayi et al., 2019). The values of the most concern to this project in the environmental context are functional, emotional and relational valuation.

Functional value is defined by what young people consider to be the functional and practical benefits derived from pro-environmental actions (Alexander and Beushausen, 2019). The development of functional value is widespread; in schools, community groups etc. It's logical and can be conveyed through many ways to appeal to different forms and levels of learning both physically through science experiments in school or theoretically through reading. Young people who adopt primarily functional values require pro-environmental knowledge to apply their values and knowledge throughout their daily socialisation. To develop functional value, it is essential for young people to understand how pro-environmental actions benefit themselves, and society in a defined and tactile way.

Emotional value refers to the positive feelings young people experience when engaging in pro-environmental behaviour, such as pleasure, relaxation and enjoyment (Lu and Hsiao, 2010). Emotional value is embedded in pro-environmental experiences to encourage a positive mindset in young people. These experiences are often linked with an emotionally valuable figure in their lives such as a parent or mentor but often relate to young people's opportunities to interact with nature: the resulting belonging, excitement, pleasantness, enjoyment or affect they experience may elicit or develop emotional value (Kabadayi et al., 2019).

Relational value is related to the connections and relationships young people build with like-minded peers by participating in pro-environmental behaviour(Engel et al., 2020). Interactions between young people that lead to mutual and sustainable relationships create relational value (Basu et al., 2020). The influence of relationships especially from that of peers has been noted in its ability to shape young people's social norms and practices. Young people adapt to forge new relationships or affirm current relationships. This adaptation often epitomised by imitating behaviour can be utilised to encourage sustainable behaviour. This encouragement must come from an instantiated correlation between a young person's emotional, relational and functional value to a pro-environmental attitude.

By understanding and targeting the value creation influences in a young person's mind the value of sustainability can be demonstrated and encouraged in the most effective way possible.

Encouraging sustainable Behaviour

Evidently, sustainable behaviour is determined by environment and cognitive valuation. Each environment and person is unique and will come with its specific barriers to sustainability. Before we examine the best ways to urge young people toward's sustainable behaviour we must first inspect the limitations and challenges associated with influencing a person's sustainable mindset.

Psychological Barriers

Most people consider climate change and sustainability to be significant problems, but too few global citizens engaged in high-greenhouse-gas-emitting behaviour are involved in enough mitigating behaviour to stem the increasing flow of greenhouse gases and other environmental problems. Gifford (Et. Al 2011) identified 29 of the "dragons of inaction" as principles that that common in those that wish to address sustainability issues in their lives and in their environments but perhaps don't do so to great if any effect.

- **LIMITED COGNITION**
  - ANCIENT BRAIN IGNORANCE
  - ENVIRONMENTAL NUMBNESS
  - UNCERTAINTY
  - JUDGMENTAL DISCOUNTING
  - OPTIMISM BIAS
  - PERCEIVED BEHAVIOURAL CONTROL/SELF-EFFICACY
- **IDEOLOGIES**
  - WORLDVIEWS
  - SUPRAHUMAN POWERS
  - TECHNOSALVATION
  - SYSTEM JUSTIFICATION
- **COMPARISONS WITH OTHERS**
  - SOCIAL COMPARISON
  - SOCIAL NORMS AND NETWORKS
  - PERCEIVED INEQUITY
- **LIMITED BEHAVIOUR**
  - TOKENISM
  - REBOUND EFFICIENCY
- **SUNK COSTS**
  - FINANCIAL INVESTMENTS
  - BEHAVIOURAL MOMENTUM,
  - CONFLICTING VALUES, GOALS AND ASPIRATIONS
- **DISCREDENCE**
  - MISTRUST
  - PERCEIVED PROGRAM INADEQUACY
  - DENIAL
- **PERCEIVED RISKS**
  - FUNCTIONAL
  - PHYSICAL
  - FINANCIAL
  - SOCIAL
  - PSYCHOLOGICAL
  - TEMPORAL

Table 1.1: The 29 Dragons of Inaction towards climate change, (Gifford et. al 2011)

Many people are engaged in at least minimal action that helps to limit the emission of greenhouse gases. Some People are much more active than others. However, most people could do more than they are doing, and in some pilot studies, almost everyone agrees that they could do more. This project will address users' barriers caused by limited cognition primarily, as genuine ignorance reduces the efficacy and meaning of action. Ideologies are in a far more malleable state in young minds and developing a young person's worldview towards sustainability will be an integral component of the project. Similarly eliminating the perceived risks of sustainable behaviour and making clear the risks of climate change as an alternative will be significantly impactful on motivating sustainability.

Social Barriers

Social barriers such as climate-averse infrastructure or the high cost of new sustainable alternatives can act as structural barriers imposed on those considering sustainable action. Similarly, many developing countries lack the resources or political leadership to enact climate-friendly plans. In many cases, motivation towards sustainable behaviour is fruitless due to the environment set before them making no effort to words greener futures. However, rises in sustainable activism and increased public opinion favouring sustainable objectives may trigger great change on a governmental level.

One of the most common reasons that people may not make efforts to mitigate climate change is that they lack first-hand experience of its potential consequences (Spence 2011). From this perspective, individuals who have direct experience of phenomena that may be linked to climate change would be more likely to be concerned by the issue and thus more inclined to undertake sustainable behaviours. The research found that people who have suffered from climate change respondent flooding express more concern over climate change (Spence 2011). Survivors of flash floods and mudslides brought on by adverse weather conditions due to global warming naturally see it as less uncertain and feel more confident that their actions will affect climate change. Importantly, these perceptual differences also translate into a greater willingness to save energy to mitigate climate change.

Behaviour Change Techniques through Technology

While the opportunities to modify human behaviour through technology are currently explored in academia, the recent commercial availability of many wearable and ubiquitous technologies are opening new horizons for behaviour change systems. The opportunity of increased tracking and data collection in individuals sparked research into the potential for behavioural economic theories to compel desired behaviour in individuals. Due to the challenges in measuring behavioural change and retention in the long term, HCI researchers were employed to develop various systems to test systems of behavioural change.

For example, BinCam, a social persuasive system that aims to change recycling habits by increasing users' perceived behavioural control, follows principles according to the Theory of Planned behaviour;

The Smart Garden Watering Advisor (Pathmanathan et al. 2011), relies on the idea of persuasion outlined by Fogg (2003), tracking and displaying tailored information to convince users to increase their pro-environmental behaviour;

Villamarín-Salomón and Brustoloni (2010), instead, used Operant Conditioning, one of the fundamental methods of learning in applied behavioural analysis, to reward users' secure behaviour in a security-reinforcing application;

These studies despite their diverse behavioural control techniques all yielded results in part due to their gamification strategies. Rapp (2017a, 2017b) showed that gamification strategies framed in behavioural, cognitive and social practice theories yield a 'gameful' behaviour change. This behaviour modification technique is specific to the goal of each study. The game-like structure has been seen to be key to warranting both user engagement and behavioural alteration,

Behaviour change is a complex, long-term process with high relapse rates: to convincingly demonstrate that technology contributed to such a process requires large-scale, long-term studies that typically cannot be done with early-stage prototypes developed in HCI are warranted. However, there is evident technological power to influence behaviour but the true potential is dependent on the behavioural modification techniques put in place.

Gamification

Theory & Techniques

The term gamification, introduced in the early 2000s (Marczewski, 2013), provides a complementary perspective to serious games. This approach uses game elements to enhance non-entertainment applications to foster behavioural change, engagement, motivation and soliciting participation in activities (Dicheva et al., 2019; D. Johnson et al., 2016; Paiva et al., 2020; Ryan et al., 2006). It began gaining popularity and rapidly spreading in a wide range of domains that benefit from the increased engagement of their target users in 2011, such as health and environmental awareness, software engineering, education and training, everyday challenges, and so forth. The motivational power of gamification has been heavily utilised in health with the proliferation of wearable technologies and fitness-tracking applications such as Strava.

One goal of the use of gamification in education is to lead students to desired psychological outcomes (e.g., engagement, motivation, fun, or autonomy (Majuri et al. 2018)); however, some studies have also reported that gamification can have negative effects on students' behaviour but this may be as a result of insufficient testing, especially when considering technological barriers requires most gamified systems to be developed with a "one size fits all" ideal. This means that the users' preferences are ignored and normally the designers create a universal gamified environment to suit all users, thus possibly negatively affecting their experience.

Gamification and Behaviour

Due to its ability to educate whilst curtailing many psychological barriers to information collation, there is a wide interest in adopting gamification solutions for supporting and promoting positive behaviours and behaviour change (e.g. quitting smoking, ecological behaviours, food choices, civic engagement, mental healthcare, sustainability, etc.).(Basanelli 2022)

In the context of board games, researchers have emphasized specific principles by offering a multitude of roles for problem-solving, which mimic the interactions of society. By influencing users to envision other goals and their response to them, players reflect on their behaviour. (Douglas et. al 2021). This reflection is invoked correctly can lead to value creation influencing the player's decision process towards a desired narrative.

Gamification and Sustainability

Gamification has also been used to promote pro-environmental behaviours. Such principles have been implemented in board games, team competitions, electronic games, smartphone apps, and apps that researchers developed primarily to collect data. To return to the board game example, 'Settlers of Catan: Oil Springs' led to increased pro-sustainability attitudes and self-reported sustainable behaviours. Graduate students who played 'Factory Heroes,' a game designed to improve sustainability leadership in the context of manufacturing, reported increased knowledge of sustainable manufacturing practices (Gatti et. al 2018). Board games and games in general, act as effective tools for researchers measuring environmental attitudes when working with children.

There has also been a multitude of applications utilising gamification to encourage positive behaviours across several facets of sustainability. Apps such as Energy Cat and Cool Choices demonstrate to children the advantages of responsible energy usage. Others delve into Transportation and Air-quality, for example, the 'Kids-Go-Green' app improved students' knowledge about sustainable travel methods. Interestingly research found no app emphasizing the shared benefits to an individual's health and the environment from transportation methods such as biking. Other apps were primarily informative like WasteApp used to locate recycling bins in several cities. Apps that use elements of gamification, such as providing feedback or earning points for behaviour, are generally rated more positively by users than apps that attempt to change behaviour by providing information alone.

White (et al. 2019) propose the SHIFT model for adopting pro-environmental behaviours and shrinking the attitude-behaviour gap. Games can be useful in overcoming the social influence/norms, habit formation, and tangibility components of behaviour change described in the SHIFT model. Another component of the SHIFT model is habit formation. By practising pro-environmental behaviours in the context of a game, an individual might repeat that behaviour after the game ends, thus turning the behaviour into a habit. The SHIFT model argues that because the effects of climate change are not immediately palpable, individuals may not feel compelled to change their behaviour. Games and apps may alleviate this barrier by giving tangible pro-environmental goals with immediate rewards for completing the desired behaviours. Gamification can lead to longer-term psychological engagement than other behaviour change methods such as nudging.

Discussion

Gamification as a model for behaviour influence is still in its early stages. It is still unclear why certain attempts at gamification are more effective at promoting behaviour change than others. It's difficult to measure the level at which fun as opposed to pure information has on a user's behaviour. There have been several applications revolving around the topics of transportation and energy saving due to their simplicity and perceived ease of application when habit forming. However, other areas such as sustainable diets, just transition and the circular economy have yet to receive the same attention as their gamified counterparts. This research attempts to encompass multiple areas of sustainable behaviour however it is unknown whether gamification has a greater impact on encouraging environmentally conscious transport or sustainable business practices for instance.

Some conflicting research in the gamification sphere is a result of no industry standard being developed. As the number of gamification efforts to change or promote positive behaviours has grown significantly many of their findings contradict somewhat with the only prevailing conclusion being that some short-term behaviour change was measured. This is in part due to the failure in promoting a standard guideline, and the lack of employing adequate methodological rigour (such as sample size selection and controlled experimental research methods) (Douglas et.al 2021). These inadequacies call for further research into new solutions and design methods to develop a standard for utilising gamification to influence behaviour, which was unfortunately outside of the scope of this project.

Less is known about young people's attitudes toward the environment than adults. This project chooses to focus its efforts on the younger generation since they have grown up with the reality of climate change, despite some research demonstrating a declining environmental engagement throughout those aged 7-12, speculating that the pandemic pulled away focus from environmental issues for this generation. Conversely, the younger generation exhibits increased scrutiny towards environmentally-friendly packaging and responsible manufacturing policies. Older generations also had a decreased call for corporate social responsibility than Gen-Z (Singh et. al 2022). However the behaviour influence of those further in their cognitive and worldview development warrants research in the future.

How the problem statement will be solved

The project will guide the user through the cognitive development of sustainability but remain engaging throughout its gamification model to inform the user's worldview before attempting to influence it, thus overcoming both the barriers of ignorance whilst issuing their potential environmental numbness through entertainment. A user is issued with a problem, given the tools on how to solve it and has the freedom to do so in a creative way. Through this gamification of tasks and positive reinforcement upon exposure to positive behaviours, the users should then carry over these behaviour patterns in their daily life.

In order for this to take place the user must feel empowered. Much of the motivation of previous sustainable gamification models were drawn from the user, to track and measure their carbon footprint, recycling habits etc. What differs in this project is the call to action, as the user progresses through the game they are continually given resources and encouragement to put what they are learning into practice. Whilst not imperative to progress in the game, real-life practical application of sustainable practices is the overarching goal of the project and should be sustained hand-in-hand with the enjoyment of the game.

Literature Review Conclusionary Remarks

The world is in need of change. This change will come from a myriad of sources in our respective environments. Our family must motivate us to do better. Our schools must motivate us to do better. Our technology must motivate us to do better. Broadening a young person's worldview or showing them the potential they have to curtail the climate crisis is a complex task with fortified barriers and a series of possible solutions and outcomes. But gamification poises itself as a suitable device for motivating sustainable thought and thus action.

Design Rationale

Following the research made in the state-of-the-art, careful consideration was given to the design and implementation of the project's idea. The literature review process instructed how the design will achieve the objectives of the project. The literature informed the three pillars of research and with this understanding established, the development could begin building upon these pillars. As this implementation grew in complexity and began to take shape, careful consideration was made to ensure the purpose and values of the project were not lost in these intricacies. The literature reflected that the core requirements of the game were:

1. Educate young people on sustainable issues and practices
2. Invoke Value in Sustainability & Emphasize sustainable principles
3. Reinforce the impact of sustainable behaviour and sustainable decision processes
4. Portray the impact Young people have on the world
5. Encourage Sustainable Activism
6. Provide an enjoyable entertaining experience through gamified elements
7. Overcome psychological and social barriers to pro-environmental behaviour

Educate young people on sustainable issues and practices

This led to the establishment of the character C.A.S.S or the Climateer Automated Support Suite. At first, CASS leads the player through the functional mechanics of the game. At other points, CASS may offer advice and learning opportunities. These normally occur after completing a task such as bringing your reusable containers to the shop triggers information about single-use plastics or inspecting the cut-down leads to information about afforestation.

These learning opportunities take the form of larger more detailed boxes of texts with CASS pictured explaining the topic. Some learning opportunities may inform future decisions in the game whilst others are just an opportunity to share a sustainable topic or practice that the player may not be aware of. It was important to utilise accessible language to appeal to the young demographic when introducing new topics.

Must Invoke Value in Sustainability & Emphasize sustainable principles

Creating Functional Value

Functional value can be shown effectively on a wide range of levels of complexity and subject matter to appeal to many children. Examples studied included; biodiversity explorations and scientific demonstrations in science classes to educate young people on carbon sequestration and the relevance of deforestation to the climate. The game incites functional value primarily through the impact of the decision-making process in the game. Only sustainable decisions advance the game's progress and thus provide functional value to the player.

Upon making sustainable decisions they are also positively reinforced through congratulatory messages. It was highly important to use simple language to ensure the functional value of their actions was not lost.

Creating Relational Value

Relational Value was slightly more challenging to convey in the short time period of the game. However, opportunities arose throughout the interactions in the game. Whilst many of the interactions are merely text boxes to progress the game, others take the form of street vendors, bakers or workers at a building site. The opportunity for a user to relate the experience in the game directly back to their own life. The characters of the game were kept as neutral as possible to appeal to all social backgrounds and focus on encouraging potential relational value with users.

Creating Emotional Value

In order to create some sort of emotional connection between the player and their avatar time was taken to establish customisation in order to emulate the first-person experience which research suggested resulted in increased climate awareness and sustainable behaviour.

The emotional and psychological benefit of being in nature was noted during research as a key motivator of pro-environmental behaviour. This unfortunately is not possible within a game. Sound effects and tones were used in order to connect this animated two-dimensional world to the player's real experiences in similar circumstances and create a somewhat disjointed connection to nature.

The emotional counterpart of the player comes ironically from the automated computer program within that game, C.A.S.S. CASS provides emotional support and reward throughout the game when completing tasks. She begins as a guiding figure establishing herself as a mentor (in order to establish an emotional connection) before allowing the player to guide themselves in order to have the praise of her reward all the more emotionally valuable.

Reinforce the impact of sustainable behaviour and sustainable decision processes

Positive reinforcement of sustainable behaviour

The research relied heavily on the project's aims to show the impact of young people's actions on the environment not only to add to the functional value of a sustainable decision but in order to emphasize the impact they may have on the world were they to incorporate this decision process into their lives. The impact of the player becomes clear towards the end of the game as they complete more and more of their tasks the sustainability of the town improves. Trees begin to grow in the park and the dump is converted into a facility for renewable energy.

The impact of the next generation was often muted in educational examples researched, perhaps in order to not portray the true weight of the climate crisis, however in order to be truly encouraged to

make a lasting change in their behaviour, the impact of the individual needed to be reflected in the game. This meant the conclusion of the game needed to be portrayed in such a way as to encourage the player to return to the world and emulate the change they enacted in the game. This was done by issuing the player one final task to "return to the boat and spread the word". Upon embarking on the boat a more detailed message of congratulations and further encouragement would be communicated.

Repeated Behaviours & Habit Forming

The cyclical structure of the game can seem repetitive however this repetition is a key aspect of gamified routine-forming models studied. By repeatedly practising pro-environmental behaviours in the context of a game, an individual might repeat that behaviour after the game ends, thus turning the behaviour into a habit according to the shift model examined in the literature.

These actions must be repeated and repeatedly palpable otherwise individuals may not feel compelled to change their behaviour according to the shift model. The level design and narrative structure see themselves suitably poised to achieve this. This structure is continually solidified by the antagonists established in the final fights, which concurrently but arguably unsubtly establish the villainous triggers of sustainability in the real world in legislation, corporate life and social life.

Influencing the decision process

As young people approach maturity both cognitively and emotionally so too do their skills for reasoning & moral judgment. Noted in the literature was the need to rectify young people's decision process to consider the environmental impact on their current sphere. The addition of choice boxes to the game demonstrated the benefit of accomplishing functional and sustainable objectives through a well-informed decision process.

The design of the choice boxes throughout the game challenges the player's instincts, whilst remaining rudimentary enough as to not invoke frustration towards the subject matter. The game exhibits three different types of text boxes.

Some choice boxes allow the player a sustainable option or a non-sustainable option, where a player must use their own judgement coupled with what they've learnt. For instance, when ordering a hot dog the player, where the player can order a plant-based or meat-focused meal. The next is a simple one-option choice box, often used when the player must first complete a primary task hindering their progress, e.g packing their reusable containers to be able to access the store. Upon completing their primary task a second choice box appears allowing the player to progress. The last example of choice boxes offers two sustainable options; taking the bus or walking, choosing between two vegan pastries. This leads the user to learn more about their choice, whether afforestation or the benefit of public transport, this education allows players to further engage with environmental issues. This engagement reinforces the promise to protect the environment in the longer term found in the literature review. This promise represents the predominant interpretation of sustainability by young people.

Encourage Sustainable Activism & Practices

The general narrative of 'Climateers' was inspired by UNESCO's Global Action Plan identifying young people as agents of change in the climate crisis. It consistently reinforces the need for sustainable practices in order to fortify the need for sustainable considerations in every decision.

The game cannot be completed without making sustainable choices and the narrative reinforces that. It does so rather directly in some cases such as refusing to let the player drive to town instead of encouraging them to walk or take the bus.

The game's culmination in the protest 'boss battle' reinforces the need to call young people to approach sustainable activism. It does so in an extremely gamified way but continues to reinforce the ideals the game has been addressing throughout.

Scoring System & Operational Conditioning

Examples of behaviour-modifying gamification models that provided feedback or earn points for behaviour are generally rated more positively by users than apps that attempt to change behaviour by providing information alone. The scoring was kept simple to focus on the message of the game rather than the actual point systems.

This project uses a binary scoring system where rather than earning points the player crosses tasks off a task list in order to progress. Despite these tasks having various levels of difficulty, the player must complete them all for seemingly the same reward. This demonstrates the value in any and all steps towards a more sustainable lifestyle.

This should, in turn, be reflected in the modified behaviour. Similar to their levels of difficulty the tasks have multiple solutions. The game guides the users decreasingly throughout the game and at least one solution should be clear but the user must exercise their own judgement. By utilising what they have learnt through the game and what they may already know, the sustainable path is rewarded with tasks being crossed off and the game progresses.

More complex scoring systems have been seen to add a layer of influence over behaviour especially when utilised in a setting where players can compete with their peers motivating them to better themselves not only in the game but also in the behaviours the game is reinforcing. But this design focussed on rewarding the desired decision process so long as it was sustainable.

This invitation and encouragement to take up sustainable activism must start from a want to overcome the aforementioned limited cognition and should be spurred on by the ending screens in the game provided by CASS.

Provide an enjoyable entertaining experience in order to create the psychological connection of gaming

In order to benefit from the psychological advent of gamification, and its ability to advance the impact of behavioural modifications, efforts would need to be made to ensure the game remained engaging. Despite the level of information and psychological influence, the project entailed 'Climateers' needed to remain a game. By utilising gamified elements such as mechanics and aesthetics inspired by other games such as 'Stardew Valley (2016)' and 'Untitled Goose Game (2019)' the game would be made engaging for the young demographic. Efforts to encourage this entertainment value involved the

addition of sound effects and background music as well as character animations and opportunities for humour in the dialogue.

Overcome psychological and social barriers to pro-environmental behaviour

Along with the gamified elements the customisation element and the design of the levels would assist heavily in overcoming the psychological and social barriers detailed by Gifford (et. Al 2019) referred to as the dragons of inaction.

Customisation and Level Designs

The social barriers to sustainable behaviour were duly noted. Those more likely to be physically affected by the consequences of the climate crisis have been shown to be more open to developing sustainable behaviours and practices. This first-hand experience needed to be replicated.

The game needed to appeal to a large user base and their respective backgrounds. This greatly influenced the avatar and level designs. The environment of the game needed to be as accessible and applicable to as many players as possible. Similarly, players needed to be reflected in the game, despite restrictions, each player is relatively customisable to establish an emotional connection between the avatar and the player.

Addressing the Dragons of Inaction

A level of uncertainty of course must be employed to challenge the user's judgement and their level of understanding of sustainability accrued during the game targetting their potential environmental ignorance. As detailed earlier the first-person nature and customisation were key in simulating first-hand experience of the climate crisis throughout the game. An emotional numbness has been made apparent, especially in the younger generation (Gifford Et. Al 2011) One of the most common reasons that people may not take action to mitigate climate change is that they lack first-hand experience of its potential consequences (Spence 2011). This inspired the character customisation as well as the design of the secondary characters to appeal to as many user bases as possible. The characters were kept as universal as possible to appeal to multiple worldviews but in order to overcome the potential sustainable indifference of our player base, users must connect to the environment they are in and the design of these characters was key.

The design rationale of the game stood as a unique challenge for the project. The game not only had to appeal to its demographic and provide an enjoyable gaming experience but do so in such a way that would achieve and hopefully exceed the requirements of the project.

Implementation

The implementation needed to effectively and efficiently uphold the rationale laid out in the design chapter. Implementation ran through multiple versions and in turn led to some adjustments to the design rationale. The requirements established by the research undertaken however were consistently worked toward.

The Game's Core Functionality

The game was rendered and executed through HTML with functionality added through javascript. The HTML established the map as a canvas in the participant's window and the necessary images of the background, avatar etc. are overlaid with a script tag. Libraries used included the GSAP library utilised for the transition animation between the fight and the regular map. Version control was maintained locally however a backup was established on the researcher's GitHub.

Hosting The Game

The game operates locally on the researcher's machine using the live server extension on visual studio code. As all of the planned testing to evaluate the game would be carried out in person with the researcher present there was no need to host the game on an external server. This being the case the features of the game were easier to demonstrate for presentation purposes as the game could be advanced manually to exhibit sections of the game quickly without having to complete required objectives; for instance, in the game, you can only go to the store before you go back to your house and attain your reusable containers.

Third-Party Game Assets

The levels were compiled from scratch and based on rudimentary sketches based on the researcher's hometown, nicknamed 'Climatown'. Asset packs from game developers were downloaded from itch.io, a huge database of assets for constructing games. The design aesthetic was inspired by games such as 'Pokemon' and 'Stardew Valley' with adjustments to ensure the player remained grounded and didn't lose the connection being reinforced between their environment and the environment of the game. This was reinforced by the assets downloading allow for realism such as bus stops, fountains and parking meters.

Tiled: Flexible Level Editor

The level backgrounds were designed in Tiled: a dedicated level editor. Tiled allowed me to edit each 32x32 tile in the map and create the world our player would inhabit in the planned design aesthetic. The program allows multi-layer editing and ease of expansion. The latter was especially integral due to the fluid nature of the map in both the design process and the final iteration of the game. I began by building simple layers; the sea, the ground atop and the road and land details. Before adding more and more complexities to ground the world and in some cases add to the fun. Drafts were completed along with designs of levels that were not expanded upon such as inside the player's home.

Tiled was also used to great effect when establishing the collisions and interactions in the game. Each 32x32 pixel tile in the game that could not be advanced against, i.e walls, fences, and cliffs were marked with a uniform tile colour. This map could then be converted to a JSON file where the boundary positions could be constantly compared against the player's to ensure any movement and animation halted when faced with a collision in a particular direction. Challenges occurred when added details such as streetlights were added however it was ensured that the player's progress was not faltered when their movement was. The collisions feature also saw the need to fix certain visual aspects. A player could reach the back of a building but would need to be obscured by the roof and ascending floors so that a player's displacement was accurate for the game. A layer of roofs, tops of lamposts, buses etc. were added They remained impartial to collisions and would hide the player's avatar where necessary.

Interactions operated similarly (tile by tile) however each interaction would need to be colour coded. This led to the establishment of a switch statement that would declare the relevant dialogue boxes and choice boxes dependent on whether the player was interacting with the boat on the dock, the shopkeeper or the fountain. These interactions formed a key aspect of the game and ensuring that they all worked across the board was integral to clear communication with the player.

Graphic Design Tools and Use of Images

Design and Aesthetics quickly became of note to the project so in order to capture the game's vision a number of graphic design tools were utilised. Canva was used to draw the dialogue box images to a greater detail than could've been possible with CSS. The vintage game aesthetic with a bright welcoming colour palette was adopted and the necessary images for the dialogue boxes, choice boxes, teaching boxes, cursor and welcome screen were created with ease. Once designed in Canva the alternate versions of these boxes were imported as images for use in the game's interactions and animations.

Player Movement

Player movement was done through event listeners and the 'keypress' function. Instead of having the player move throughout the established canvas, the background image actually moves underneath the player as a sort of treadmill by changing its position. This enables the game to be played on different sizes of screens on multiple devices. It became an issue that the player could glide diagonally through the map affecting the player's animation and the collision function. Thus opposing keydown, keyup functions were used establishing a last key pressed which ensured the player could only move in four directions with the relevant key i.e WASD for up, left, down & right respectively.

Player Animation

In order to capture the walking and fighting animation across four direction planes sample 32-pixel animation frames were downloaded from itch.io and used as a base. These were then expanded upon using Gimp Illustrator so they would align with the desired customization and theme of the design. Three character models - Brendan, Lisa & Charlie - were established. The walking

animation cycled through four frames in each direction. The fighting animation was slightly more complicated but cycled through animation dependent on each sprite's max number of frames.

Task List

A task list instructs the user throughout the game along with C.A.S.S and the other characters of the game such as the taco truck worker. The task list is toggled from its mini icon with the 't' key. The task list will then display itself. The tasks themselves will cross themselves off and reduce opacity upon completion by changing the frame of the image.

Choice Boxes

The creation and the differentiation of the various dialogue boxes have been detailed, but the dialogue boxes which warranted a response were a recurring function. Each choice box was itself an object with its own necessary offset position and booleans as to whether they were selected and whether they were the correct choice for the task list. Depending on the interaction code the relevant choice boxes along with the clicker are displayed. The user can move the position of the clicker with the o and p keys and a selection made with 'return'. The choice is then communicated back to make the necessary change to the task list.

Background Music and Sound Effects

To add to the design aesthetic and improve the entertainment aspect of the gamification music was added. The Howler library was used to play the background music which was downloaded online from a WOW-Sound a royalty-free music provider. Sound effects were also added to the game to add a sense of reality to the game, for instance, the door of the shop door rings when you visit and there is a splash from the fountain when a coin is thrown in. These sounds were invoked similarly using the Howler library. Each sound warranted a new Howl object which was called during the relevant interaction.

Transition Animations

The transition was relatively simple and utilised the GSAP library. When the player chooses to partake in the climate action protest the GSAP library flashes the screen white allowing the necessary time to load the 'battle' background, which is similarly faded in through GSAP animations.

Battle Sequences

The fights are also projected onto an HTML canvas. Once the image backgrounds transition, the fight begins. Two fighter objects are established equidistant from each other. The setup is inspired by classic arcade fighter games such as 'Mortal Kombat (1992)' and street fighter. Each player can move right and left, jump and attack. All actions have corresponding animations. Each fighter class have a health attribute which corresponds to two bars in the upper section of the screen which decrease upon

receiving an attack within the distance of their enemy. Losing the fight ends the game and transitions the player back to the town map where they started. Winning the fight results in the game ending on a 'you win' screen at which point the player is transitioned back to the town map with some changes. Upon victory and completion of all their tasks, the map transforms in sections. The abandoned building site/ dump becomes a renewable energy factory which players can inspect and learn more about the subject of renewable energy. They also find upon learning about afforestation earlier in the game the trees have been replanted and the biodiversity of the park is blooming once again. The game then encourages the user to spread the message of what they've learned by making their way to the boat docked up beside their house and completing the game.

Evaluation

This project proved challenging to evaluate due to the lack of quantitative data. Projects in this field have faced the same challenges, thus processes to produce qualitative data to gain an objective review of the work produced was established. This chapter will break down the prospects and shortcomings of the finished product reflected in the project demonstration.

External Evaluation

Unfortunately, ethics approval was not received on time in order to make use of the planned further testing. The planned process of evaluation is detailed below and the ethics application is available in the appendices of the project. The previous internal evaluation was undertaken by the researcher to reflect the objective level of success in reaching the objectives of the project.

Internal Evaluation & Critique

An evident minimum viable product acting towards the sustainable development of young people and cognitive behavioural modification through a gamification model was achieved. Whilst there is room for improvement, the effort towards achieving a pleasing aesthetic and gamified functionality was commendable. Each aspect of the design encouraged and reinforced sustainable behaviours whilst overcoming the pitfalls of a behavioural modification tool.

The game closely targets the value systems of young people and repeatedly influences them and teaches them to value sustainability throughout their decision process. The game's opportunities for education were at times overly verbose and unsubtle but managed to contrast well against the moments calling the player's sustainable judgement into question. This creation of value was only possible through gamification's ability to resonate and connect with young people. By creating a first-hand experience the value and impact of their decision are felt immediately. This idea permeates throughout the game and is used to high effect.

The aesthetic itself was bright and welcoming and added aided in the gamification of the subject matter. Similarly, the entertainment of the story structure and elements kept the game's tone fun whilst still remaining true to its goals of sustainable behaviour modification.

Functionally, as a player, the game was easy to understand and could be picked up rather intuitively. The character's interactions and movements throughout the game were clear, concise and kept to a high standard from the dialogue to the animations.

In regards to the impact on players' sustainable viewpoint and their desire to uptake sustainable activism, both seem to be difficult to measure and impossible to quantify especially the latter. There was an unfortunate lack of metrics for behavioural modification, but teaching aimed at encouraging pro-environmental behaviour will sow the seeds for greater planet conscientiousness action which is a step in the right direction.

There is no industry standard for gamification and in most cases, its effectiveness relies on the developer's judgement and creativity as well as each of the game's individual players' preferences. The project made sufficient effort to appeal to a wide proportion of its demographic, despite its innate diversity by ensuring neutrality and a widespread appeal. This appeal however is focussed on the experiences of the developer's own environment and could benefit from expanding its design to include settings familiar to other cultures or nationalities. This is attempted to good effect on the customisation capabilities of the game. However the game chose to predominantly maintain neutrality in its design to prevent from stealing the spotlight from the issue at hand, the fight against the climate crisis. Participants will most certainly feel some impact from the game and further development would certainly spark a significant uptick in their pro-environmental behaviour.

Planned Process for External Evaluation

Participants

As underage participants venture outside the recruitment scope of the project the recruits consist of industry professionals; Child behaviour specialists, Teachers, and child psychotherapists. These were found through internet research as well as personal connections to potential recruits. By utilising the opinions and feedback of those well-versed in child behaviour and psychology, the hurdle of underage participants is overcome. Research proved to prioritise younger, late primary school-age children as their influence on the world around them is beginning to take shape. Thus, primary school teachers were prioritised. A mixture of psychologists and teachers was used to ensure that the educative and influential factors of the design were equally weighted.

Potential procedures of testing

Participants would be introduced to the concept of the game before a brief demonstration by an experienced user for approximately 3 minutes. Following this participants will now be free to play the game by themselves and experience it first-hand. If any relevant features were not seen or utilised by the participant, the experienced user may give a second demonstration to make clear all the features of the game.

The participants would be asked to complete an anonymous questionnaire (1-5), collected by the researcher in order to equate the overall value of the design. Following this, an interview would take place between the head researcher and the participant to gain a greater understanding of the successes and shortcomings of the procedure. The interview and survey questions are listed below.

Questionnaire

1. Rate the potential for this game to be used in a teaching environment
2. Rate your enjoyment or entertainment level during the gameplay

3. Rate how much you feel the game encouraged your own sustainable behaviour
4. Rate how much you feel the game encouraged your own sustainable socialisation in your personal life/work life/ social life
5. Rate how much you feel the game encouraged your own drive toward sustainable activism

Interview protocol

1. What was your general reaction to playing the game/How was your experience/first reaction to the game?
2. How do you think playing this game would affect a young person's sustainable education?
3. How do you think playing this game would affect a young person's sustainable Behaviour?
4. How do you think the game could be improved to better achieve its goals?
5. Would you utilise a tool like this game in your area of work? If yes how would you?

Whilst the participants in the evaluation of the study are not the target demographic, they do hold a unique perspective and have attained a great understanding of the demographic from first-hand experience. This understanding would hopefully affirm that the aims of the project have been achieved. Given their experience they are more qualified than many to evaluate sustainable behaviour encouragement, sustainable education and the potential for the game to empower and motivate young people, especially towards sustainable activism.

The questionnaire and the first three interview questions were devised to evaluate functionally how well the game achieved these goals and participants' general reception and reaction toward the game. These reactions coupled with the remaining interview questions are more focussed on the potential shortcomings of the game and how future iterations of the game can improve and be further expanded upon.

Strengths and Limitations of the Project evaluation procedure

Clearly, this evaluation is limited by both the time restraint of the project and the unfortunate failure to receive ethics approval. Given more time, both the research and the accompanying testing and evaluation would've been heavily expanded on.

The project has achieved its functional goals and done so through an efficient implementation which respects the undertaken research. As this research expanded it continually informed the design process to ensure the project objectives were constantly being strived toward but presented in a satisfactory manner for both the user and the developer.

Discussion & Conclusion

Project Limitations

The project faced some inherent limitations, most notably the time restraint. Secondly, being a student-driven project by a sole developer - along with supervision of course - was an obstacle. The majority of the researcher's experience was in working in development teams however the project resulted in an eye-opening opportunity to add to the researcher's limited experience. In the hands of a more experienced developer or collaborative team of developers, the project from concept to implication would have reached further complexity.

Similarly, the evaluation process could be significantly expanded upon. It was of course an unfortunate drawback to not be granted ethics approval. The projected insights uncovered from the planned testing would have been extremely valuable to the project and its future iterations. The entire evaluation process was forced to take place internally. It was rather challenging to detail an objective opinion on one's own work. Moreover, the opinions of the planned participants would have been of significant interest to the researcher personally as well as extremely informative to the project evaluation and further iterations of the game.

Lastly, if it had been possible studying the qualitative behavioural changes of participants over time would have significantly aided the evaluation. Early research discovered that one of the challenges of researching behavioural modification techniques was quantifying behaviour retention and regression. It was a key pitfall of many healthy-habit-forming apps and in many cases was impossible to keep track of. Proper evaluation of whether participants experienced and maintained an uptick in their sustainable behaviour and the behaviour of their peers around them would be extremely insightful. The data would inform the research topic and future iterations but unfortunately evaded the scope of the project.

Despite these limitations, the research was spurred on resulting in its current state. These limitations along with further research will similarly motivate and inspire further work in this sphere and potential future incarnations of the game and the surrounding research.

Future Work & Iterations

The future iterations of the project may diverge significantly when considering what direction and new horizons to aim towards in development. The game upon future testing may prove more capable or impactful as predominantly a behavioural modification tool, an educational tool or simply an opportunity for recreation. Of course, there will always be elements of the three aspects in all future iterations. Whether one comes to the forefront of the project is dependent on the developer's response to further testing and evaluation.

Relative Expansion and Increased Complexity

Were the game to remain balanced amongst its three pillars of sustainability, behavioural modification and gamification, the game would simply continue to develop its internal complexities. Expanding in such a way may see the emergence of more levels perhaps, extending the game's narrative into a

larger cityscape or towards more specific opportunities for sustainable development within the home, the school or peer group. The interactions within the game may advance technically through animations and dialogue. With these technical advancements, the subject matter may similarly expand allowing for more in-depth education and analysis of topics already explored in the project's current form.

Lastly, the game would simply overcome one of its most potent limitations, time. With no time restraint, features and concepts unexplored during the project's development can be implemented. Features such as a temperature gauge within the game. The gauge would have to be maintained below a certain level by committing sustainable actions in the context of the game. The gauge would symbolise agreements from the Paris Accords 2016 to stabilize global temperature at or below 1.5°C above pre-industrial levels and simultaneously add a gamified pressure for players. A simpler example would see the automated fighting techniques advanced to make the game more challenging to older or more advanced players, enhancing the gamification experience. There is no end to the improvements that could be made to the already present features given time.

Exploring different methods and viewpoints of sustainability

The concept of sustainability is a constantly evolving subject. Thus the teaching of sustainability must adapt alongside the subject itself. In future iterations, the game could fold in new emerging technologies and innovative methods of sustainable behaviour.

This adaptive approach would give the game an opportunity to express its inclusivity. Different cultures and nationalities have wildly differing opinions and approaches to sustainability. The emerging generation signified a unique perspective on sustainability and diverse international viewpoints should be of equal consideration to the sustainable teachings of the game.

Expanding the Game as a behavioural modification tool

Behaviour modification techniques are being researched and advancing at a similar rate to new technologies and environmentalism. As emerging behaviour methods emerge it may be worth incorporating them into the game along with existing unutilised techniques. During the literature review, alternative behavioural modification practices were found but not utilised in the final project. Features such as negative reinforcement, for instance, had been effective in promoting behavioural changes but there had been occurrences of behaviour regression when utilised in gamification.

Operant conditioning i.e utilising a reward and punishment system was used to great effect, in examples of healthy-habit-forming applications but was a significant challenge to implement effectively in the design. The game could begin to further develop itself as a method for behavioural modification by incorporating a more intricate point and penalty system to utilise these conditioning methods.

By incorporating some of these other behaviour-altering methods, the game's increased potency and influence on the behaviour of young people may lean the tool towards other social behaviours that may need perfecting in young people such as anti-bullying or road safety.

It may further promote the efficacy of gamification tools in the world of education, especially for those promoting social responsibility. Programmes like this have existed for years taking the form of

anti-drug campaigns and healthy eating campaigns. The emergence of a generation that accepts and embraces technology as an integral part of everyday life makes way for the advent of more complex gamification and behaviour modification than ever before. But this may only fully come to light through further research.

Expanding the Game As an Educational Tool

The potential for the game becomes especially evident when explored in real-world settings such as the classroom. It could be paired with environmental education in its current form in schools. Real experiments demonstrating carbon sequestration or renewable energy could elevate the game's teachings or vice versa. Young people's education could be spurred on by the game's implementation and a greater connection be made between what young people are learning theoretically and the decisions and behaviour they adopt that influence the environment. The game may be similarly implemented in youth groups especially those with established ties to environmental consciousness and activism such as scouting Ireland.

Technology has been slowly implemented into education programmes with considerable resistance, this project could potentially combat this resistance and display the effectiveness of gamified technology in social education whatever its respective settings. The psychological benefits associated with physically connecting with nature that would be potentially available in these settings will allow the message and efforts of the game to grow more impactful.

Expanding the game as a recreational tool

All further testing would benefit the project. The instruction and partnership of specialists in the worlds of sustainability and behaviour modification would guide future iterations and research. Further testing could involve experts in not only young people and sustainability but also professionals well versed in game development. Hyperfocus on the subject matter and engaging the mind of young people for learning may reduce the impact of a game as it loses the essence of what makes gamification an effective tool in the first place. By purely fixating on the subject matter gamification stops being enjoyable to the user, it stops being a game. This insight may also increase the advent of the game as recreational material for young people, arguably diluting its message but increasing its appeal. This approach would require an expansion of the gamified elements and entertaining aspects of the game.

The future of the game and the project is as of yet unclear. However, the paths available to it are fascinating each with its own challenges and opportunities. The potential to advance the development and research of this project stands to lend credence to the potential of the original idea.

Conclusionary remarks

This project undertook the task of advancing cognitive development as well as integrating itself amongst influential relationships and triggers to manipulate worldviews to focus on sustainability. By establishing a connection between a user's actions and their environmental impact both positive and negative, the game will carry over into real-world application. It became abundantly clear that the project appealed to its demographic by creating a balance between fun, engagement and intrigue with also its informative, educative goals.

Behavioural modification does not happen in a vacuum and this project provided a suitable opportunity to advance the decision processes of young people toward a greener planet-conscious mindset in preparation for the climate change challenges they shall face in the future.

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Appendix

1. Ethics Approval Application

SECTION 1 – Project Description

1. Title of study

Climateers: A game to educate and encourage young people's sustainable behaviour and activism

2. Dates and duration of study

September 2022 – April 2023

3. Purpose of the project including academic rationale.

Sustainable behaviours are not sufficiently nurtured in young people despite their extreme importance for tackling the climate crisis that lies in their future. Can creating a game designed to instil sustainable activism succeed in encouraging action whilst remaining informative and ethical?

4. Describe how participants will be recruited, how many you seek to recruit (and statistical justification if relevant), the type of participants you wish to recruit, and the inclusion and exclusion criteria.

As underage participants venture outside the recruitment scope of the project the recruits consist of industry professionals; Child behaviour specialists, Teachers, and child psychotherapists. These were found through internet research as well as personal connections to potential recruits. By utilising the opinions and feedback of those well-versed in child behaviour and psychology, the hurdle of underage participants is overcome. Research has shown to prioritise younger, late primary school-age children as their influence on the world around them is beginning to take shape. Thus, primary school teachers were prioritised. A mixture of psychologists and teachers was used to ensure that the educative and influential factors of the design were equally weighted.

5. Procedures of the study.

Questionnaire following LIKO format (strongly disagree, disagree, indifferent, agree, strongly disagree) to gain a general opinion of the game and its ability to achieve its goals.

Short interview questions were utilized in order to gain a greater understanding of the success and shortcomings of the procedure.
6. Debriefing arrangements following the study.

Thank participants for their engagement and inform them of the importance of their opinion and the influence it will have on aspects of the project. You will be informed of the specific goals of the particular demonstration you undertook to give a broader understanding of the questionnaire and interview.

Participants will be informed that their results will be utilised in finalising the design and influencing the conclusion basis of the report. The report will be published and free to access on the project website. We will also email the final report to all participants upon its completion.

7. A copy of the intended questionnaire/survey/interview protocol and screenshots/representative materials as appropriate. If your questionnaire or survey is online, you must provide the related URL.

SECTION 2 – Ethical Concerns

Describe and discuss all ethical issues relating to the study (including any relating to participant autonomy and personal data). As part of this you should:

1. Describe any potential benefits and potential harms to participants, and how they are addressed.

The core potential benefits to participants are a better understanding of their sustainable impact and an increased drive to take action against climate change.

However, the information sustained by participants can be emotionally taxing and at times depressing. Despite efforts made to ensure the experiment is a generally enjoyable experience for participants, it is understandable that some participants may be negatively affected and suffer some emotional discomfort by the subject matter. The general design pre-emptively takes away from the at times darker subject matter and creates a playful, inviting environment that ignites change rather than the inevitable powerlessness linked with opposing the climate crisis.

In the case of a failure in the experiment, the participants may develop a disregard for sustainability in response to a poorly executed experiment. They may link their negative approach in the game to their sustainable approach in life thus deteriorating their behaviour. Therefore it was imperative the experiment remained dynamic and led the participant to achieve their goals and that they aligned their goals with the message of the experiment.

2. Describe any conflicts of interest and how they will be addressed.

Some of the participants will be relatives of mine and whilst I understand taking advantage of my existing relationships in order to make progress in your research will have an effect on the outcome. However, I have urged participants to remain unbiased and confidently believe that as members of the industry of child behaviour and psychotherapy level heads will prevail and their judgement will remain undeterred by our personal connection.