

How a games-centric approach to eco education and engagement can help promote and engender energy efficient behaviours

Dr Paula Owen, Green Gumption/eco action games, London, UK

Abstract

Over the period 2013-2015, eco action games, a start-up social enterprise with a mission to educate and change behaviours through an innovative approach involving experiential game-playing, carried out a series of mass participatory experiments involving various sectors of society. The interventions involved exposing the participants to a series of facts, figures and environmental actions, pertinent to their lifestyles, though the medium of play and social, offline games. The hypothesis being tested is whether an approach that involves social participation, competition, positive messaging, non-judgemental advice giving, and even a little fun, can be an effective method of improving environmental literacy concerning resource use generally, and energy use in particular. It also tested its potential for being an effective behavioural change mechanism. The evaluation methodology to date has involved a series of self-reported questionnaires. The first of these is delivered before the intervention; to ascertain a baseline of current understanding of the issues, attitudes, opinions and pre-existing behaviours towards a range of environmental concerns, eg energy use, water consumption, transportation options and waste & recycling habits. Post intervention evaluation takes the form of a second questionnaire directly after the intervention where the participants have taken part in a series of eco themed games in a social setting. Here the methodology is seeking to evaluate the efficacy of the intervention in terms of its ability to successfully engage, educate and suggest new behaviours that the participants may want to subsequently adopt. The feedback includes: reasons for participation; enjoyment levels; the extent to which participants learnt new information and an understanding of the level of competitive spirit exhibited. Finally the players are asked to indicate if they will be adopting any new eco positive actions as a result of participating. A follow-on questionnaire is instigated approximately two to three months later. Participants are asked if they recall the event, what they remember about its content, what aspects they enjoyed the most and, crucially, had they subsequently adopted any new eco positive actions. This paper presents the preliminary evaluation findings from a series of games-centric events involving university students and the general public and invites further discussion around how the evaluation of such innovative and unconventional methods of behavioural change interventions can be widened and improved

Background to a gamified/games-centric approach to engagement & behavioural change

In 2005, a US-based start-up company began exploring the potential of using the established theories of social games and games mechanics, taking and translating the concepts and applying

them to non-game situations and sectors. This novel approach was seen to work successfully in a variety of contexts over the following years and, consequently, a new type of engagement concept was born. That company was called Bunchball and its founder, Rajat Paharia, coined the term ‘gamification’ for the first time to give the concept an identity and ‘brand’ (Bunchball, 2010).

Over the intervening decade, the high level concepts of gamification have taken off in a wide range of sectors. Gamification’s advocates claim it offers the potential for businesses and organisations to gain competitive advantage; deepen relationships with stakeholders, customers and/or the public and retain their interest in the topics under discussion for longer. On the employee engagement side it is claimed to help improve productivity; increase staff morale and lead to a more engaged, more hard-working and switched on workforce.

By utilising similar principles that makes traditional social games appealing and compelling; that is encapsulating a sense of fun, competition, achievement, gratification and rewards (McGonigal J., 2011), organisations and movements are looking to gamification to increase the success rate of that perfect triumvirate of successful campaigning, namely an increase in education, engagement and subsequent action (Chapman T., 2011). Crucially, it may also provide an alternative way to reach out to the younger generation, basically the strata of society born around and after 1990, brought up wholly within digital age and often nicknamed ‘the Millennials’. This group is often somewhat impervious to traditional methods of communication and engagement and need something much more interactive, novel and challenging to command their attention in a meaningful way.

Even the environmental sustainability sector has begun to embrace the idea of a gamified approach to help it find new and compelling ways to engage with the sectors of society that have been put off taking environmental action in the past (Accenture, 2012). This reluctance to take action can be arguably assigned to the typically negative, guilt-tinged messaging that has been the dominant paradigm over the last decades. If this is the case then the positive messaging and competitive approach that gamification provides could potentially be the antidote for such apathy.

Finding a dictionary definition of gamification that is universally adopted is difficult. The gamification wiki (Gamification WiKi), probably largest compendium of information on the subject, offers the following definition:

“Gamification is the concept of applying game-design thinking to non-game applications to make them more fun and engaging. Gamification can potentially be applied to any industry and almost anything to create fun and engaging experiences, converting users into players“

Indeed, already we have seen successful gamified applications in widely diversified areas: for example, in health and fitness,ⁱ where there is a whole host of online applications, such as myfitnesspal, FitBit and Fitocracy, that help individuals lose weight and take up more exercise through the use of online score (calories consumed versus calories burnt) keeping, sharing successes with friends in an online community and daily challenges. In medical research we see the phenomenal success of the Foldit project – a crowd sourced, point scoring medically-related challenge thrown out to non-professionals to accurately define and replicate an AIDs related protein enzyme a medical puzzle which had remained unsolved for a decade was solved within weeks of opening out to a wider group of ‘players’; and on to the financial sector where the online help tool Saveup.com, for example, allows people to more easily manage their money through making financial management into a game. Finally, there is even the ‘sexing up’ of mundane domestic chores a hitherto seemingly impossible challenge overcome by a simple online game, Chore Wars, which turns completing household tasks into a challenge within household or office environments of who can score the most points, top the leader board and hence win prizes by completing otherwise shunned and oft-avoided tasks.

The influential US-based Pew Research Center, as part of their ‘Pew Internet and American Life project’, in 2012 published a report (Pew Research Center, 2012) into the future of gamification

as predicted by a survey of over one thousand internet experts, tech analysts, critics and stakeholders. In it they concluded that the experts surveyed ‘generally believe the use of game mechanics, feedback loops and rewards will become more embedded in daily life by 2020’.

How can gamified approaches help increase the adoption of pro-environmental behaviours?

Various methods of behaviour change interventions have so far had limited success in motivating wider society into taking significant positive environmental actions. In the face of constant bombardment of messages regarding ice caps melting, sea levels rising, polar bears drowning, exceptional droughts, one hundred-year storm occurrences becoming more frequent, resource depletion and habitat destruction, it can be seen as surprising then that still a majority of the population do nothing more in this area than put the recycling out once a week and buy fair trade bananas from their local supermarket.

One of the theories for why people refuse to change their lifestyles and habits in the face of mounting evidence of harm is that, in the case of climate change in particular, the issue is still too disparate, difficult to pinpoint and, despite the efforts of hundreds, if not thousands, of the world’s climate scientists, still considered uncertain (in some small, but influential, quarters of the press and politics) as to the causes. In addition, the potential effects of a warming world are still too distant in both space and time to galvanise immediate action by individuals. If this is the case, and there is little in the short term that can be done about these opinions and attitudes in certain individuals, then there has to be alternative routes to educate and persuade people to change the way they live to become less resource-intensive and carbon-footprint-heavy.

This paper posits the hypothesis that a games-centric approach to behaviour change has much potential as a new method for engaging wider society in pro-environmental actions. But how is it different to what has gone before? Moreover, can it offer new insights into the complex area of motivation, retention and action for sustainability in the longer term? To frame these questions we briefly look back at the world of environmental campaigning and educating for behavioural change over recent decades.

Ever since the emergence of an organised, effective, issue focused, global environmental pressure movement in the early 1970s, through the creation of pressure groups such as Greenpeace, a predominant theme of campaigns to galvanise the public into action has tended to focus on the doom and gloom, ‘act now or pay later’ style of campaigning. For many acute situations and environmental disasters, such as oil spills or deforestation, company malpractices or single issue debates, such as Greenpeace’s early focus on ‘saving the whale’, inciting a sense of injustice, anger and possibly even guilt (i.e. implying that inaction could signify a passive acceptance of the situation) worked effectively in mobilising hundreds of thousands of latent activists across the globe to take action – whether directly or through a more sedentary ‘armchair activism’ approach of monetary donations to the cause.

The 1970s and 1980s, in particular, saw the rise of the amateur environmentalist – ordinary citizens with a passion for the issues and a strong understanding of the original cause of the problem and the ultimate effect that it was having, and how they could help to solve the situation by clear, unambiguous actions. Reasonably clear-cut, ‘cause and effect’ issues were the typical campaign route. They were typically localised (but not always), and generally had a clearly defined ‘enemy’ to be thwarted – be it the CFCs in aerosols that were destroying the ozone layer, or the pollution from dirty factories that caused ‘acid rain’ resulting in lakes and rivers hundreds of miles away becoming poisoned and lifeless. People could take action, whether it be banning aerosol cans from their lives, tuna from unsustainable companies or products from factories that were causing the pollution, they felt empowered and crucially believed that their action could and would make a positive difference.

The feedback loop also, although not by any means instantaneous, did report that slowly, but steadily, such concerted, individual actions were truly making a difference – the ozone hole was slowly repairing itself, poisoned lakes were coming back to life and fishing companies were changing their unsustainable practices.

Roll on to the early years of the twenty-first century and those clearly identified, reasonably unambiguous environmental nemeses of the past have been more or less superseded by a more obscure, disparate, multi-faceted foe. Issues that used to be neatly defined, pigeon-holed and dealt with through focused, results-driven campaigns now manifest themselves as much more complex, equivocal and harder to pinpoint the cause and effect. They are typically argued about endlessly on the TV, in print media and on that new, democratising medium of the World Wide Web.

We are talking, of course, about the environmental issue that has trumped all others in terms of its global significance and long-term potential for disruption – accelerated, anthropogenic climate change. It is with this globally weighty, but messy and indistinct issue that the environmental sector's players – those being the activists, campaigners and communicators – have missed a trick when it came to the vital task of informing, educating, inspiring and galvanising the wider public into taking positive, pro-environmental action against climatic change, predominately through reducing their carbon footprints by reduced use of energy in all its forms. Despite being a 'new' issue, the methods employed to communicate it remained firmly anchored in the past. Potentially a reflection of an 'if it ain't broke, don't fix it' mentality to this new challenge, the issue under discussion may have changed, but the tone and approach of delivering the message remained the same. The 'scare them with the bare facts and they are bound to take action' approach worked in the past, so who was to say it wouldn't work this time around?

Consequently, the approach to climate change communications, education and engagement has tended to focus on the 'doom and gloom' aspects – which, of course, are understandable: there is a lot to be gloomy about! However, the sheer vastness of the issue, combined with the non-acute, longer-term, probability-based range of potential effects, and continuing debates on the uncertainties of the science, did and still do little to inspire ordinary people into action. Indeed, the opposite effect can occur, with people arguing themselves into inaction as they do not believe that they alone, as individuals, can actually make any impact whatsoever in solving this particular issue.ⁱⁱ

Typically, calls to action on climate change related issues have tended to lean towards the 'misery messaging' end of the communication spectrum, with a large dollop of guilt thrown in for good measure. The 'change your ways or the polar bear will die' style of campaigning may work on small children and the 'charismatic mega fauna' enthusiasts amongst us, but is not a message that will inspire sustained, practical action in the masses (Marshall, G., 2014).

In the grand scheme of things, a bad news story, or a guilt-tinged messaging campaign will have some short-term success. It will have an effect on latent, would-be greenies who need that last nudge into taking action. For people who have guilt as a motivator in their lives this approach can also work. However, we posit, it is not an approach that alone will enjoy mass appeal and engage the majority to take action in the longer term.

This is where gamification and a games-centric approach may be able to help. As, by its very nature, it is a positive, competitive, action-oriented approach to education, engagement and ultimately behaviour change, it could be a major 'game changer' in the sustainability world. The appeal of games, in their broadest form and manifestations, are their wide multi-generational draw. Most people, at some point in their lives, have played and been absorbed by a game – from simple single-player cards games such as Patience and Solitaire to that kids' perennial favourite Trumps, and on to chess, Scrabble, Monopoly, Cluedo and Risk, all the way through to the earliest electronic games such as Tetris, Space Invaders and bringing it up to date with the hugely popular Massive Multiplayer Online (MMO) type of game such as World of Warcraft.

Games are fun, and unless you are a particularly sore loser, one's experience of playing them is typically rewarding, entertaining, occasionally educational (Trivial Pursuit, Scrabble or trump style

games, for example) and generally sociable. Hence the idea of using some of the underlying concepts that make up the theory and practice of games design and mechanics to bring a fresh approach to education and engagement in environmental issues seems, in theory at least, a reasonable starting point for a new method of engagement.

Although gamification is still a relatively new concept, it has already been adopted by some forward thinkers in the sustainability space and tested through a range of applications. To date, a good number of these have tended to concentrate on the home and the individual, for example, educating people to use less energy, recycle more, drive more efficiently and even to not throw rubbish and other inappropriate objects down the toilet (Owen, P., 2013).

The idea of using In Real Life (IRL) social games, games that are already familiar to the general population, and re-position them to be eco-educational tools, is at the heart of this study.

A games-centric approach to education and behaviour change

Methodology

The first phase of the research project fieldwork took place over the period 2013-2015. The basic aim was to engage a wide cross-section of audiences in playing environmentally themed games through a series of events and workshops. Generally the events, with the exception of events taking place within schools and at festivals, were aimed at people aged 18 and over, and the data are taken from questionnaires completed by adults.

Typically five different games were on offer, including environmentally-themed versions of traditional, well-known games such as top trumps, bingo, twister, snakes & ladders and the UK TV game show 'play your cards right'. The games have been re-engineered to become educational resources discussing issues such as energy use, water use, transport options, behavioural actions that reduce waste generally and other purchasing options. Attendees were encouraged to play multiple games covering the various topic areas and to discuss the issues highlighted with their fellow players and the facilitator for each game.

Large scale events were held in public buildings and festivals and were free for the public to attend. The research project launch was held in the Science Museum and hosted 120 people. Further events have occurred at the Science Museum, Natural History museum, St Paul's Cathedral, Houses of Parliament, political party conferences, outdoor summer festivals and at universities.

Other smaller events, such as sessions with the WI, Age UK day-care centre, and at schools, focused on particular sectors of society and/or community groups. Events hosted on behalf of organisations and companies were run exclusively for their staff. In total, approximately 1000 adult participants have taken part in events to date.

At a limited number of the events, baseline data was collected before the event commenced. This was to ascertain socio-demographic details and to gather existing attitudes, opinions and existing behaviours and habits regarding environmental issues.

At the end of the event, a further questionnaire invited comment on a number of topic areas. Questions covered the games themselves, motivations for play, level of enjoyment, the environmental actions discussed, views on the information learned and crucially what the participants might do differently in future as a result. Where permissions were granted, we followed up with participants, around two to three months later, to ascertain what they recalled of the event they attended and crucially what new actions and behaviours they had adopted as a result of participating, and, also, if they were considering any further actions in the future.

The 4Es theory of positive engagement through a games-centric approach

In addition and in parallel to the field research, a nascent working theory was developed to

attempt to assign a number of criteria to assess the efficacy of the approach. It was developed from an emerging understanding of behaviours while undertaking the early event interventions. Titled the '4Es theory of positive engagement through a games centric approach' it provided a framework to help analysis the results (eco action games, 2013). It is illustrated in Figure 1.

It is posited that a 'games-centric' approach to environmental behaviour change should ideally exhibit the following characteristics.

The approach should:

Entertain: Any communication tool using a gamified technique has to entertain its intended audience. If people are not enjoying the intervention, if they are bored or puzzled by the game, they will not be in a frame of mind where the learning will be productive. Participants need to enjoy themselves and consequently be in a relaxed state, receptive and open to the messages inherent in the game.

Educate: The second criterion for success in this approach is the requirement for the intervention to educate as well as entertain its players. The intervention will not achieve its goals if the audience is simply there to have a good time and 'win' the game and consequently no effective, educational messaging is effectively transferred to the recipient during the process.

Engage: For the technique to influence behavioural change, individuals have to engage with the process and the messaging. The players need to understand that the issues explored through the game mechanic, and the actions suggested, are relevant to them in either their home life, work environment or educational establishment. If that connection with their lives is lacking, then the intervention will not effectively engage them.

Embed: The final, crucial piece of the 4Es jigsaw is to what extent the process of learning and engaging through games and play can embed and engender behavioural change in the participants beyond the duration of the game.



Figure 1: the 4Es approach to positive engagement through a games-centric approach

The following discussion uses the results of two case studies involving different sectors of society and explores the level to which the intervention adheres to the aforementioned framework.

Results

We discuss the results of two pilot research projects that were undertaken with: adult members of the public and, secondly, a group of ‘Millennials’, first year University of Manchester students (19-20 year olds).

1. The general public

We hosted a number of public events at two well-known buildings in central London – two at the Science Museum and one at the Natural History Museum. They were evening events and open to anyone over 18. Over the three events we hosted approximately 250 participants. At the first event, as it was ticketed entry, we could use a pre-questionnaire to ascertain pre-existing attitudes, opinions and behaviours (n =89), at all of the 3 events we used a post-event questionnaire (n =120) and for the attendees of the first event we followed up with a third questionnaire two months later (n=30). We tested the efficacy of the approach against the nascent 4Es framework:

At the events, the participants were asked to rate their experience in terms of enjoyment, engagement with the games, educational content, whether they had learnt anything new about environmental issues and also if they had been inspired to take action(s) as a result of attending.

Each question was scored on a five point Likert scale: strongly agree : agree : neutral : disagree : strongly disagree : no opinion/not sure

Entertainment:

We first explored the potential of the games to sufficiently entertain an adult audience to a degree that would facilitate the next stage of the process, i.e. educating them about environmental issues. Although the idea of using educational games to educate children is not new, however the idea that one could successfully engage adults in such an approach is not so well researched.

- 97% agreed or strongly agreed that they enjoyed the event(s) they attended
- 92% of all attendees enjoyed the games they played (typically the attendees played around three games each during the event).

From these figures, all gathered immediately after the event through the post event questionnaire, we obtained initial indications of evidence that the first E of the theory is being satisfied – we are entertaining an adult audience through the approach.

We also asked how popular non-sporting games were amongst our attendees, and whether they played various types of traditional and online games generally. This question drew a strong positive response with 79% of all attendees agreeing or strongly agreeing that ‘they enjoy various types of non-sporting games and play at least occasionally’. This result is an interesting finding, and could reflect the growing popularity of ‘casual gaming’ and other online games. Indeed it is seen that around 70% of the UK population admit to playing casual games¹, with the average age of a gamer now reaching 35. It is not confined to the electronic variety either, recent reports show a strong surge in the sale of conventional board games, up ~20% per annum in recent years according to John Lewis (John Lewis 2013). This recent trend in the use of games and play in everyday adult life could be particularly useful to the adoption of games and play in environmental education and engagement techniques, as people will be familiar and open to this type of interaction, and not consider it predominately a children’s activity as may have been the case in the past.

Education:

We then explored to what extent the games provided useful, useable information regarding environmental issues and actions, as opposed to the session being about predominantly competitive

entertainment, where the main concern was winning the game. To explore this aspect we asked about people's motivations when playing the games. Were they mostly interested in the competitive element and trying to win? And/or were they motivated by what they could learn from the games they played? The results, again obtained in the post event questionnaire, are insightful in terms of helping to understand why people play and whether we can use the technique to effectively educate the players taking part.

- 67% agreed or strongly agreed that they particularly enjoyed trying to win.
- 26% was neutral on the subject of winning.
- 7% disagreed or strongly disagreed with the statement: 'I particularly enjoy trying to win'.

A further drill down into the responses shows a stereotypical breakdown of the sexes however. Male attendees show themselves to be much more interested in the winning than the females. Over one third, 36%, of men strongly agreed with the statement that they were keen on winning, as compared with only around a quarter of women, at 26%.

We then asked how strongly people agreed with the statement that 'when playing the games I enjoyed learning new information'. Overall:

- 86% of attendees agreed or strongly agreed with this statement
- 10% were neutral on the subject
- 4% disagreed with the statement.

Interestingly, there was no obvious gender bias present in this question. Over one third, 38%, of both sexes agreeing strongly that they enjoyed the learning aspect. This finding is particularly encouraging, as although people are obviously attracted to the games from a competitive aspect, especially the men, they also appear receptive to learning whilst playing.

Engagement

We then asked whether attendees had learnt anything new through playing the games, and, in particular, was it useful to them in their daily lives. This was to ascertain whether the games worked as an effective tool to deepen engagement and assist behavioural change.

- 59% agreed or strongly agreed they did learn useful new information through playing the games that they could take back home and/or to work.
- 20% stated that they did not learn anything new about environmental actions that they didn't know already.

We then moved on to ask about whether they felt they could actually do anything with the information they had learned through the games. We asked the question in two slightly different ways, whether they felt they **COULD** take action and then whether they **WOULD** take extra actions as a result of what they had learnt.

- 59% felt they **could** now take actions at home to become more environmentally friendly.
- 51% of attendees stated that they **would** be taking extra actions.
- 12% agreed or strongly agreed with the statement that they had not been influenced to change anything in their everyday lives

Embedding

The final piece was to establish whether this approach had lasting 'stickiness' in terms of

messaging and longer term behavioural change, well beyond the lifetime of the event itself. With the permission of the attendees from our first Science Museum event (n=89 pre questionnaire responses), we re-contacted them between two to three lapsed months after the event they attended and surveyed them on what they could remember of the event itself and crucially had they implemented any actions or were they planning on doing so in the future. We achieved a 34% response rate (n=30) with the follow-up questionnaire.

Overall, every respondee to the follow-up questionnaire had taken on new environmental actions. The average number of new actions adopted was stated to be four. This was particularly encouraging as the average number of actions subscribed to immediately after the events (n=120) was three. The respondents also stated they were planning on adopting, on average, two further actions, in the future.

The nature of the actions already taken versus actions that were being planned was not surprising. The majority of the actions already adopted were low/no cost behavioural actions, for example, washing at lower temperatures, putting lids on pans while cooking and reducing the thermostat by 1 degree. The actions being planned for the future tended to be the more costly and/or disruptive type of structural measure such as insulation and upgrades to heating systems.

Typically, the annual carbon saving for the actions that had been adopted, where it could be estimated, came in at just over 500 kg CO₂eq/year for each respondent. For actions that were being planned but not yet instigated, the average potential carbon saving per respondent was an extra 640 CO₂eq kg/year. Making a total of over 1 tonne of CO₂eq/year saved if all actions were adopted.

From this initial small study, and the data and qualitative responses received, we can theorise that there appears to be much potential in exploring further a positive, games-centric approach to environmental engagement and behavioural change.

Below, in figures 2 & 3 we see the actions that attendees both pledged to adopt subsequently to the event (Figure 2) and then the actions they self-reported they had adopted in the follow up survey (Figure 3). It can be seen that generally, the pledged actions post event are followed relatively closely by the self-declared adopted actions taken two to three months later – it must be kept in mind however, that the total numbers for these two graphs do vary widely (Figure 2: n=120, Figure 3 n=30). The biggest differences being seen in areas such as purchasing new equipment.

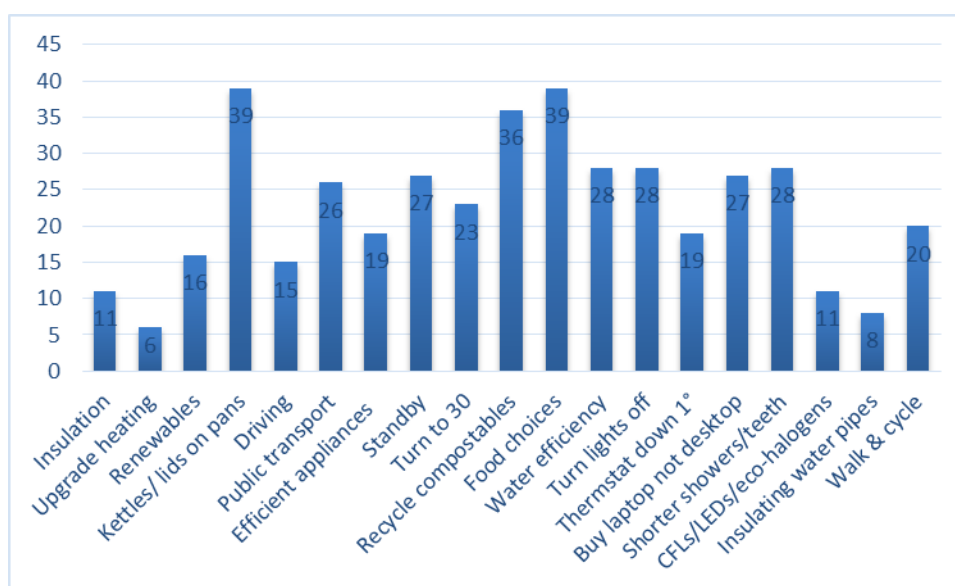


Figure 2: actions pledged by attendees post event

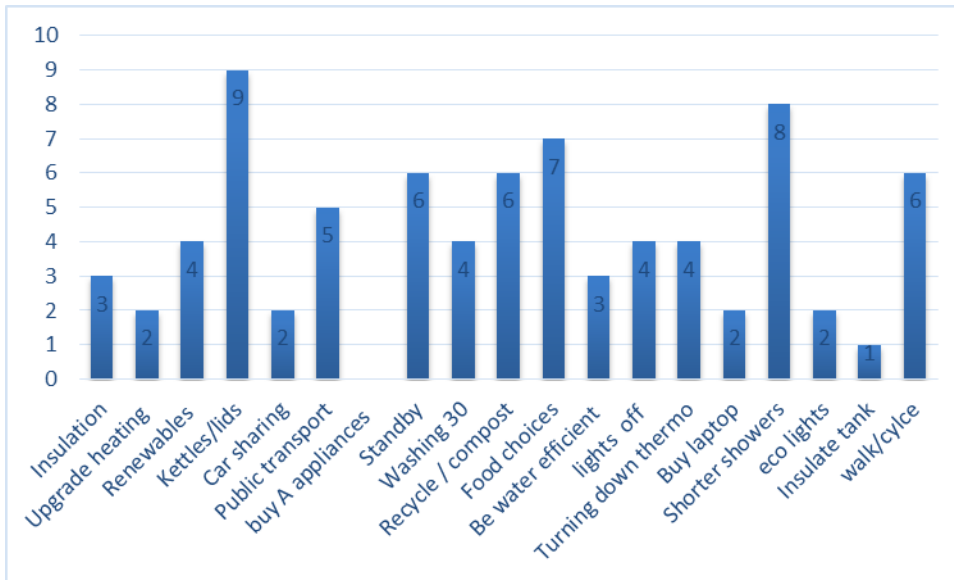


Figure 3 Actions declared as adopted post event in the follow-up survey

2. University students

In 2014, we worked with our partners the University of Manchester on a small study of first year natural science students, the so-called ‘Millennials’, investigating their existing attitudes and behaviours towards pro-environmental behaviours, and investigating whether a games-centric approach would be effective with this cohort.

The games event was part of a wider University of Manchester signature programme², entitled the ‘Ethical Grand Challenges’, which saw the University immersing its first year students in innovative, novel activities to confront them with key ethical grand challenges in the following areas: sustainability, social justice and workplace ethics. The ‘Grand Challenge’ games session was a ‘speed eco-gaming’ event that lasted approximately one hour, the participants were 46 first year undergraduate students from the Faculty of Life Sciences.

All participants were surveyed before they attended the event to enable us to develop a benchmark of attitudes, opinions and current behaviours and to create a profile of the ‘typical’ student attendee. They were also given a feedback questionnaire to complete immediately after the session. Once they had completed this they were also given a pack of one of the games they had explored in the session to take home. They were re-contacted approximately two months after the event to ascertain how much of the event they recalled, what they enjoyed most about it and had they actually adopted any of the eco positive behaviours that were explored during the games session.

Findings

There is a full report on our findings for this project available on the website (eco action games, 2015) We utilised a similar questionnaire as for the adult population for the post event survey for the student cohort. The findings from this post event questionnaire (n=46) are as follows:

Entertainment:

- 94% of the attendees enjoyed the event
- 91% of attendees enjoyed the games they played

² <http://www.socialresponsibility.manchester.ac.uk/signature-programmes/>

Education:

- 54% of attendees agreed or strongly agreed they particularly enjoyed trying to win. Interestingly there was a much stronger female bias in this case, with 69% of the females, agreeing or strongly agreeing they particularly enjoyed trying to win, compared to 51% of males
- 92% of attendees enjoyed learning new information while playing
- 85% of attendees agreed they learnt new information about actions they could take at university and home
- 7% stated they didn't learn anything new they did not already know

Engagement:

- 80% feel they have learnt new actions that they COULD take at home or university
- 78% said they WOULD take new actions at home and/or university to become more environmentally friendly
- 13% stated they had not been influenced to change their behaviours by what they had learnt through the games

Embedding:

The follow-up survey which yielded a response rate of 28% (n=13), sent two months later gave insights into how well the session was recalled and whether the students had been inspired to embed any new habits into their daily lives. Table 1 shows the actions the respondees claim to have adopted.

Energy saving action	% of students choosing action
Turning lights off when leaving room/house	67
Put lids on pans when heating things up	67
Not overfill kettle for one cup	67
Turning appliances off standby	59
Turning computers/peripherals off	48
Wash up in bowl not under running tap	46
Make sure home/room is not overheated	46
Make sure washing machine is packed full before use	41
Washing clothes at 30°C or lower	39
Drying clothes naturally where possible, not tumble drying	39
Buy a laptop rather than a desktop	39
Replace incandescent lights with CFL/LED/eco-halogens	35
Reduce the amount of water when having a bath	33
Turn off shower when lathering up hair	28
Showering for no longer than 4 minutes	28
Turn router off at night and when on holiday	26
Make sure dishwasher is on 'eco mode'	17

Table 1: positive eco actions students have claimed to adopt in follow- up questionnaire

Discussion

These preliminary findings from the initial field research show great promise for the potential of a positive, competitive, games-centric approach to changing eco-behaviours. However there is much more work to be done to prove its efficacy on a large scale. The limitations of the studies described here include both the relatively small size of the samples tested and the potentially self-selecting nature of the participants, for eg the Science Museum event was advertised through its newsletter and within the museum itself and participants applied for tickets to attend, hence the socio-demographic make-up of the group could be relatively narrow. Additionally, with the student study we were dealing exclusively with 1st year under-graduate science students, so again a narrow demographic is apparent.

The method of evaluating the actual behavioural changes made by the attendees is also problematic in that the respondees are self-selecting, for eg all of the Science Museum follow-up respondents had taken action. We didn't hear from any who had not taken action for example, and who may have been put off responding precisely because of their inaction. We also have no way of verifying that the actions have been taken.

Finally, another potential limitation is the lack of a control group within our research work. This is an aspect to the evaluation process that we are keen on incorporating in future studies, alongside much larger sample groups and the ability to study that sample group for a longer period post intervention to ascertain the 'stickiness' of the behaviours in the long term, for example a year on from the intervention.

In the immediate future, further ongoing live research comprises a larger scale research project involving school children (age range 6-14) and their families, where we are concentrating on behaviours surrounding water use and quality issues. In the pilot project, school year 2014/15, we collated over 1800 baseline questionnaire responses from the children, and over 500 from their families. The method of intervention for this project differs slightly from the method described in this paper, but the use of the games is consistent and the relatively larger scale of this project will reduce the uncertainties inherent in the small sample sizes of our previous work.

Another area of future work will be the development of a number of the games in an online format. This will then allow us to study the relative efficacies of In Real Life (IRL) games versus their online equivalents.

References

Accenture Dec 2012, *Scores, badges, leader boards and beyond: Gamification and sustainable behavior change*. <http://www.accenture.com/SiteCollectionDocuments/PDF/Accenture-Gamification-Sustainable-Behavior-Change.pdf>

Bunchball, 2010. <http://www.bunchball.com/about/milestones>

Chatfield Tom 2011, *Fun Inc Why games are the 21st century's most serious business*, Virgin books

Deloitte Tech Trends 2012, http://www.deloitte.com/view/en_US/us/Services/consulting/technology-consulting/technology-2012/index.htm

Eco action games 2013: *Can we play our way to a more sustainable future?*
<http://ecoactiongames.org.uk/reports/>

Eco action games 2015: *How effective is a games-centric approach to changing student eco behaviours?* <http://ecoactiongames.org.uk/reports/>

Gamification Wiki. <http://gamification.org/wiki/Gamification>

Gartner report on Gamification , April 2011 <http://www.gartner.com/it/page.jsp?id=1629214>

John Lewis 2013 (p38), John Lewis Retail Report 2013, <http://www.retail-week.com/Journals/2013/10/31/s/p/w/John-Lewis-Shop-Live-Look.pdf>

Marshall, G. 2014: *Don't even think about it: why our brains are wired to ignore climate change*. Bloomsbury, New York.

McGonigal , Jane, 2011, *Reality is Broken: How games can change the world*, Random House publishing

Owen, Paula, (2013) *How gamification can help your business engage in sustainability*, Do Sustainability publishing, London.

Pew Research Center, (2012) *Gamification: experts expect 'games layers' to expand in the future, with positive and negative results*; published May 18 2012