

PLAYING WITH SCIENCE: GAMISED ASPECTS OF GAMIFICATION FOUND ON THE ONLINE CITIZEN SCIENCE PROJECT - ZOONIVERSE

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KEYWORDS

Gamise, gamification, play, citizen science, Zooniverse

ABSTRACT

This paper examines incidents of play, socialisation, fun and amusement to consider how these forms of social interaction relate to the serious gaming elements of the citizen science platform. Through an ethnographic study we reveal how participants of citizen science projects demonstrate aspects of 'Gamised' behaviour. 'Gamised' behaviour is defined as user generated play in a digital platform and contrasts to incidents of 'gamification' where a platform designer purposely embeds games into a computer platform. The paper therefore examines incidents of play, socialisation, fun and amusement and compares them with the serious gaming elements of the citizen science platform.

INTRODUCTION

This study explores aspects of gamification when interacting with fellow citizens in online citizen science projects. As a means of situating the work we define user generated play in a digital platform as a 'Gamised' activity. In particular we examine incidents of play, socialisation, fun and amusement and consider these forms of social interaction in relation to the serious gaming elements of the citizen science platform. Through an ethnographic study we reveal how participants of citizen science projects demonstrate aspects of gamification when interacting amongst online platforms and forums. The key question asked is what is the relationship between knowledge building - the overall objective of the site design and 'play' as a means for building interest and on-going commitment from the users. The specific platform under exploration is the crowdsourcing citizen science platform, Zooniverse.org; the specific projects discussed including Galaxy Zoo and Snapshot Serengeti. Other networked citizen science projects are drawn upon to broaden

applied examples of the play and gamification.

Citizen science is the name given to scientific investigations conducted by amateur or non-professional scientists. Usually conducted by volunteers, citizen science has been implemented across a variety of scientific disciplines in order to provide a solution towards the demands of conducting data rich scientific research amongst professional scientists; some of these demands include time, material costs and labour incurred, particularly for tasks which are not suitable for analysis using computer algorithms (Silvertown, 2009). Citizen science provides opportunities for people to collectively contribute to investigating large data sets therefore easing the demands that would otherwise slow the research process (Raddick et al. 2009). Many examples of citizen science projects in action can be found on the Zooniverse.org platform, which utilises crowdsourcing to engage and bring together citizen scientists to actively contribute towards investigations and research.

Crowdsourcing is a term originally coined by Howe (2006) to describe the activity of a large group of people, usually an online community, to collectively contribute towards content, funding, a project or service. Examples of some of the more than 20 projects found at Zooniverse.org are Galaxy Zoo (www.galaxyzoo.org), Old Weather (www.oldweather.org) and Snapshot Serengeti (www.snapshotserengeti.org). Galaxy Zoo asks participants to classify galaxies appearing in images taken by professional astronomical facilities, such as the Hubble Space Telescope and the Sloan Digital Sky Survey. The interface of the website can be considered to be fairly self-explanatory, with an image of the galaxy to be classified on the right and multiple choice questions about the features and characteristics of the galaxy on the left. The questions are purposefully kept simple and do not require specialised scientific knowledge in order for the participant to engage with the project. The Galaxy Zoo science team uses the information to search for rare types of galaxies

or analyse the galaxy population statistically. Snapshot Serengeti displays images of animals gathered from camera traps at the Serengeti National Park in Tanzania. The purpose is to study how a variety of species interact with each other and how they are distributed across the landscape. This also relies on an interface similar to that of Galaxy Zoo, asking the participant a series of questions on the animals they can see on the photo. Snapshot Serengeti also has a support mechanism in place to assist participants if they are having trouble identifying the animals.

Contemporary interest in crowdsourcing, citizen science and online gaming all have one thing in common, they are enabled through the networked capacity of digitized human interaction. All three also tread a fine balance when it comes to keeping their specific community of users coming back and continuing to contribute to a final objective that is predefined by computer and platform developers. This paper considers this balancing and therefore the significance of the use of gamification to build and maintain motivation in terms of an online citizen science platform. Furthermore we examine 'Gamified' activity as a means to explore user generated play and gaming as opposed to design embedded games and playing on a web platform. The site we examine is the Zooniverse.org with its stated objective "to produce projects that use the efforts and ability of volunteers to help scientists and researchers deal with the flood of data that confronts them" (Zooniverse, 2014). The Zooniverse currently has a registered over one million "Zooites", who contribute to the serious objective of categorizing and processing data so it can then be applied to wider research projects and build towards scientific knowledge. The Zooniverse in its entirety not only contains a suite of citizen science projects, but also "Talk" platforms from which further interaction can take place, a schools project element for within the education system (www.zooteach.org), and links to publications detailing some of the discoveries and subsequent discussion that emerge from the processed data. The question of serious or playful gaming swims just under the surface of the contribution pool that the citizen scientists provide. Firstly there is a balance between 'real' and 'citizen' science; and secondly there is a balance between 'work' and 'play'.

Play and gamification

Abt (1987) argues that for something to be considered a game it must possess certain qualities, these are outlined as an activity, an aspect of decision-making, an objective, and rules to limit the structure and activity of the game. Although this definition may be limited, games as a form of entertainment evolve, progress and differ in meaning depending on the context. For example, serious gaming adapts the role of play by changing the role of the game. Serious gaming describes games for uses other than solely entertainment purposes (Michael and Chen, 2006); the use of serious gaming could be applied to education, planning, health and even scientific exploration. Serious games are platforms that have been specifically designed to be a game in order to achieve a serious output (Connolly et al, 2012). For example, scientists at the University of Exeter have developed a game for citizen scientists to play to collect data on camouflage called 'Where is that Nightjar?' (Project Nightjar, 2014), which times participants as they attempt to find camouflaged birds. Another example is 'Foldit', which is an online puzzle game developed by The University of Washington, where players 'fold' the structure of virtual protein in order to discover new solutions that can be applied to scientific investigations (Khatib et al. 2009). Serious gaming differs from Gamification, which can be defined as "applying game-related ideas to non-game processes, issues and situations" (Shea, 2014 p. 4). This is supported by Deterding et al. (2011) who claims gamification is adding a sense of play and game design to something that is not a game. Therefore in regards to this study, it is important to make clear that the original intention of the Zooniverse interface was not designed as a serious game but as a tool to perform citizen science. This paper focuses on how users apply game like aspects to projects and tools within the Zooniverse as an online citizen science platform (examples of this can be found under section 'Citizen science, play and gamification' to illustrate this point further).

Burke (1971, p. 33) reminds us that the 'Random House Dictionary' lists fifty-three different definitions for "play" and thirty-nine for "work". Furthermore that if both are defined in economic terms an unsatisfactory dichotomy emerges, where work is whatever you get paid for and play is everything else. Burke concludes that the only way to define either 'play' or 'work' is to find formulations

which include as many of their usual uses as possible, especially the most common ones, under as few as possible clear, consistent concepts. To define either is a lengthy process. Gray (2008) on the other hand emphasises the importance of play for societies and in particular for children's development, physically, intellectually, emotionally, socially, and morally. Furthermore, he stresses that it is important to have the freedom to quit in relation to play. In contrast to Burke (1971), Gray (2008) states there are five key characteristics to play: firstly play is self chosen and self directed; secondly play is activity in which means are more valued than ends; thirdly play has structure or rules, which are not dedicated to physical necessity but emanate from the minds of the player; fourthly play is imaginative, non-literal, mentally removed in some what from "real" or "seriousness" of life; and lastly play involves an active, alert, but non-stressed frame of mind. For Gray (2008, p. 2) "play is actively conducted primarily for its own sake", believing that all characteristics of play have to do with motivation and attitude.

There is a growing body of research examining the blurring of work and play. Yee (2005) for example discusses the blurring between videogames and work play boundaries, expressing that the user now can average 20 hours per week playing video games to a point where they describe their participation in terms of obligation and tedium, which are the antithesis of fun and enjoyment. Extending these blurring concepts are the considerations presented by Zhang & Fung (2014) who question the State's role (in their case China) as an influencing force in consumer behaviour of both online game player in terms of labour being exploited and entrepreneurial invention as a secondary industry. A well considered and very reflexive paper that considers the economic significance of mass participation in games. Bundy (1992) also explores the notion of play as a leisure activity describing it as "a transaction or activity in which we engage only because we want to, not because we feel we must" (p.217). However it is determined by the player whether something can be seen as a game and the circumstances in which the activity is carried out because "without playfulness, all activities become work" (Bundy, 1992, p.217). The relationship between work and play has been explored by Greenhill and Fletcher (2013), who argue that as the difference between real and digital environments are becoming less apparent so are the differences between work and play.

This argument is supported by Anderson et al. (2013) who explore how some online gaming platforms may be seen to subtly influence the player into enjoying the work undertaken. This is achieved by the careful use of in-game mechanics such as the timing and layering of reward systems. Reward systems can include badges to encourage the player to continue playing amongst simulated ecosystems. The result is that "work and play are starting to become indistinguishable from each other" (Yee, 2005, p.70). According to Danbridge (1986) the value of organisations is to blur the boundaries between work and play to enable workers to experience the benefits of 'flow' associated with play activities. Danbridge argues that by de-emphasising the dichotomy between work and play within the workplace, workers are then able to draw upon 'fun' and 'enjoyment' into the ceremonies of work. This de-emphasizing therefore enables the incorporation of elements of playfulness into their daily working lives and improves job satisfaction. Danbridge (1986) goes on to explain that the work/ play dichotomy is enforced when we describe play as a 'process' and work as 'the end product' (p. 159).

With these thoughts in mind it might be argued that the seemingly blurred relationship between work and play may be applied in a similar manner to the participation and contributions towards citizen science. When a dichotomy is established between 'the process' of data categorization and science as 'end product', could an understanding of play as categorization and work as science emerge? If the definition is carried through in terms of understanding citizen science participation in an online crowdsourcing platform, a lowering of enjoyment must ensue and the sense of fun and enjoyment diminish. The blurring of the relationship between work and play is therefore a key consideration to this paper. The relationship and understanding of gamification as play should therefore equally not be considered as a dichotomy to that of the work towards the science outcome. We will return to these arguments later in the paper when we explore the complex relationship of seriousness and play elements to achieve as an end product. It is also important for our case to ask whether seriousness and play can coexist; i.e a serious outcome with play as a form of motivation? Or does play in the scientific 'end product' somehow reduce or lessen the validity of the outcome if play stimulates the activity? For the Zooniverse we ask 'Are people playing when they are categorising on the Zooniverse? Could the Zooniverse legitimately use online

gaming to build 'real' science? And can the online game be disentangled from the serious science outcomes?'

Serious 'Real' Science

Chalmers (1976) states;

"Science is highly esteemed. Apparently it is a widely held belief that there is something special about science and its methods. The naming of some claim or line of reasoning or piece of research "scientific" is done in a way that is intended to imply some kind of merit or special kind of reliability. But what, if anything, is so special about science?" (1976, p. i)

Ziman (2004) tells us science amongst other things is a social institution and that it produces quantities knowledge. He also states, "The peculiarity of science is that knowledge as such is deemed to be its principal product and service. This not only shapes its internal structure and its place in society. It also strongly colours the type of knowledge that it actually produces" (p. 5). Ziman (2004) questions whether the confidence and respect once held for genuine scientific enquiry may be becoming less apparent and acknowledges that not all scientific practice may be revered as faultless. However, Ziman also argues that there are defining aspects to real science in that it must be rigorous in intent and command respect in regards to the methods it employs by legitimately making a contribution towards a body of knowledge. Jackson (2013) considers the practice of citizen science to lack in this approach, that it may be considered just a novelty or trend with too much emphasis on the gaming aspects making science appear trivial. Concluding, it may be precarious to rely on its findings without fully knowing the potential impact it may have.

Others highlight the issues of accessibility in regards to citizen science in that it is only available to people with the knowledge and access to the technological platforms such as computers and access to the Internet (Mathieson, 2013). According to Bonney et al. (2009) lack of specialist knowledge or misclassification may result in errors within the data produced, although within Galaxy Zoo great lengths are taken to ensure the quality of the galaxy classifications, which are released for use in the wider scientific community (Lintott et al. 2011, Willett et al. 2013)

Although the practice of citizen science may not be entirely without issue, there is an element of control in regards to the data produced by the participants as they work within a system created with them in mind. For example, the interface on Galaxy Zoo provides limited options as to how galaxies can be classified, and guides the participants therefore controlling the margin of error. Any unusual activity is then filtered and flagged for further review. For Cohn (2008), the issue of whether citizen scientists can conduct real research is questioned through the reliability of the data recorded/produced, concluding that work achieved through these methods can contribute towards scientific studies overall by helping to gather data, develop guidelines and save resources. Citizen scientists have also been known to serendipitously make discoveries as people involved in a classification task continue to look for anything unusual and it also provides a multifaceted approach to exploring the data (Christian et al. 2012). This indicates that the practise of citizen science can legitimately make a contribution towards real science.

Citizen Science, play and gamification

Eveleigh et al. (2011) explore the concept of gamification in regards to Zooniverse project Old Weather, a project that asks users to assist in the transcription of handwritten ship logs from the 19th century. The team behind the project realised that many users found the task repetitive and the handwriting difficult to read, so they developed a ranking system to encourage participation and sustain volunteer's engagement. This system ranked volunteers by contribution from Cadet to Captain allowing for the "top transcribers in each ship to compete for captain" (p.1). The study discovered that some of volunteers enjoyed an aspect of gamification within citizen science for reasons such as to validate their work, motivate contributions and track personal progress. But they also found this particular system may have been too competitive and perhaps went against the ethos of collective achievement that encourages many to be part of a crowdsourced project in the first place.

Across a variety of online citizen science platforms multiple examples of play, socialisation, fun and amusement can be found which may be surprising considering the practice of science is usually regarded to be a serious discipline (van Dijk, 2011). As previously stated, this study focuses on Galaxy Zoo and Snapshot Serengeti. These particular

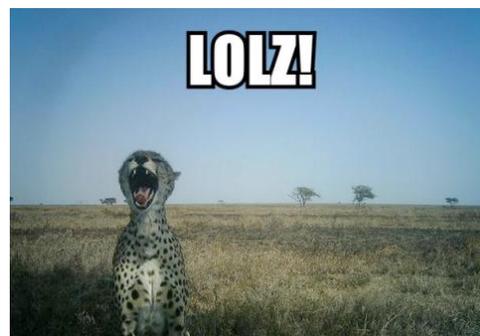
projects from the Zooniverse have been chosen to be studied for a variety of reasons. Galaxy Zoo was the first project of the Zooniverse and has since evolved over the years to meet the needs of the contributors. Galaxy Zoo has a strong and loyal following that consistently dedicate their time and labour to the project and as a result it has developed a rich history. Another reason why we decided to study the Galaxy Zoo project is because it focuses on a grand subject matter and by exploring the workings of this unique project it provides us with an exciting opportunity to be part of that. Much of the same reasoning can be applied as to why we decided to explore Snapshot Serengeti, as it is also allows us to be part of another unique project and allows us to view extraordinary photography of rare animals. It is something we consider to be fun and entertaining. We also feel that Snapshot Serengeti supports a noble cause by collecting information about wild animals in order to help protect them.

When exploring the surface of the Zooniverse it may at first appear to be a straightforward platform to conduct citizen science. However, due to the legions of committed contributors residing within an active and developed community, as well as the opportunities provided for rich social interactions throughout it's forums, blogs and other examples of social media, it appears that there is far more hidden within the Zooniverse than an initial view may imply. It has been highlighted that some members have found the classification systems within online citizen science projects to be dull and repetitive (Prestopnik and Crowston, 2011), so some members of the Zooniverse have been reported to invent their own games within the classification process to help motivate themselves and other users making it more interesting. For example, some members attempt to find and collect photos of all forty-eight animals listed within Snapshot Serengeti, while other participants have even been reported to attempt to find the rare Zorilla in order to complete their collection (Daily.zooniverse.org, 2014).



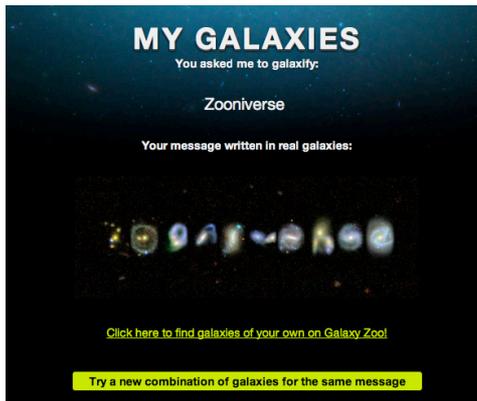
Photo of Zorilla - Snapshot Sunday (2014)

The team behind Snapshot Serengeti realised the popularity surrounding the element of play for their community. To encourage play, they drew on photographs that existed on the site and built a meme generator to allow contributors to create their own memes. The meme generator was designed to attract interest and encourage new users towards contributing to the project. The image below is a meme which has been created by a participant portraying a photo of a leopard looking like it is laughing with the caption "LOLZ".



Snapshot Serengeti blog (2013)

Another example of play which has been adapted from the photos from The Zooniverse is a website called MyGalaxies (www.mygalaxies.co.uk), created by a Galaxy Zoo team scientist, and which allows participants to create messages from photos of galaxies that resemble letters. Below is an example created through the website spelling the word "Zooniverse" through images of galaxies:



www.mygalaxies.co.uk (2014)

A further example of play using this format can be found in Pedbost et al. (2009) who for an April fool prank claimed that a new galaxy cluster had been discovered which spells “So long and thanks for all the fish”. These examples provide citizen scientists with opportunities to have fun and be creative with the images and data collected through the platform. They demonstrate how citizen scientists actively engage in play and gamification when participating within the Zooniverse. This study further explores aspects of gamification throughout online citizen science projects and discusses the relationship and impact this may have on real science.

RESEARCH DESIGN AND METHODOLOGY

To gain an in depth understanding of aspects of gamification within online citizen science projects we will be using multiple qualitative methods in order to collect data with an interpretivist approach. An ethnographic study is currently being carried out where the researchers are actively participating within the citizen science platform Zooniverse.org and keeping a daily diary of findings. This will also include content analysis of examples found across citizen science platforms such as games created specifically for the citizen science projects, blog posts, discussions on forums and other examples of play found within this domain. These examples will be used to further illustrate points and support arguments throughout the study.

RESEARCH AGENDA

We suggest such a research agenda shaped by the points raised above would have the following objectives:

1. To provide systematic empirical evidence concerning serious gaming and the relation play has when motivating to a serious networked outcome and a critical examination of extant diverse secondary data.

2. To develop an understanding of the processes of social interaction in the gaming context via:

- i. In-depth interviews regarding the kinds of play citizen scientists and online contributors undertake in relation to other serious’ forms of scientific categorizations in similar online platforms.
- ii. Narratives of (play) self motivation in relation to online gaming communities, science communities and other organizational communities via a series of visual ethnographies.
- iii. Analysis of the resulting data sets in order to assess the importance of issues of fun, entertainment, satisfaction, motivation, volunteering continuity, pride in contribution, a sense of connection with other citizen scientists.
- iv. Exploration of the resulting data set as to how these issues intersect with other demands on citizen scientists time and long term commitment and motivations.

3. To provide insights of practical and policy relevance to core social and scientific issues by communicating our assessment of the significance of citizen science and gaming in online environments as those agencies and business draw on the online platform to process manageable form of scientific data; and by providing evidence based recommendations which can be used to inform the development of strategies for organizing disparate citizen scientists.

CONCLUSION

Within the paper we have presented a number of examples of play, socialisation, fun and amusement that is happening in the Zooniverse citizen science platform. These examples are

predominantly examples of ‘Gamised’ activity. It is also clear from the examples presented that play, amusement and entertainment, as a form of social interaction, is important for some of the participants of the citizen science platform. It is also clear that the question of serious or playful gaming swims just under the surface of the contribution pool that the citizen scientists provide within this serious platform. There is a need to consider the balance between ‘real’ and ‘citizen’ science; and secondly there is need to further consider the balance between ‘work’ and ‘play’ when attempting to design for a serious objective within an online platform. The research proposed will therefore help to provide clearer answers to what is the best way to achieve a balance between ‘play’ and ‘work’ both from the users and developers perspectives. It will also build a robust body of work to further understand the importance of ‘Gamised’ and or ‘Gamification’ for citizen science and others considering using crowdsourcing a platform for online engagement.

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