

Comparing a Game v. Non-Game approach for plant provenance public education

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Abstract:

Plants that are imported bring the risk of non-native threats that can cause environmental and economic harm. Introducing Serious Games is a novel approach to teach the public about the importance of plant provenance. Our study compares the presentation of information in via a game and non-game approach. We assess learning via a quiz completed immediately after the experience, then again three weeks later. We find that enjoyment in Phase 1 is an indicator of better performance in Phase 2.

Context:

The introduction of ash dieback to the United Kingdom in 2011 led to joint agreement between England, Scotland, and Wales that more needed to be done to engage the public to help protect trees and plants [1]. While games have been used to varying degrees in public plant health communication, there are no published studies of the use of Serious Games in this domain.

Plant provenance is an important issue as imported trees and plants may introduce invasive pests and/or pathogens that native species have no natural defence against. These threats can cause environmental, ecological, or economic damage. An example can be seen with the introduction of Oak Processionary Moth in 2005 [2].

While we have seen the use of serious games in the tree and plant health sector, e.g. Caledon [3], we have yet to see this combination explored in academic study. Therefore, we approach this from a perspective of: does the use of a serious game to present information influence the ability of the participant to learn information when compared to the same information in a non-game context.

The structure of the experiment is outlined in Figure 1.

Targeted Issues:

Traditional methods of public engagement include posters, displays, and talks. We are interested in the comparison of the Game v. Non-Game contexts in order to begin examining whether the introduction of a Serious Game where one currently does not exist has any benefit compared to the information on its own.

While we are interested in the short term retention of information, we are also interested in the long term retention of information given to the public. Given that the government strategy outlines more engagement in public facing areas, e.g. botanic gardens [1], there may be some time between information being learned and being required in practice.

Previous, unpublished, work indicates that the enjoyment a participant has during their experience – regardless of whether they are playing the game or not – has a positive impact on their ability to learn information.

Proposed Solution:

In the study we randomly assign the participants to one of two groups 1) Non-Game and 2) Game. These groups are kept consistent between the two phases of the study, with participants unable to move between them.

To ensure parity of information between participants, every single participant is presented with the same information to learn. This information is presented on screens that look exactly the same. These information sets cover: Plant Provenance, Emerald Ash Borer, Oak Processionary Moth, and *Xylella Fastidiosa*.

All participants must read each of the four information sets at least once before they can complete the experience. Non-Game participants can view the information sets in any order they wish, e.g. 2 – 3 – 1- 4. Whereas, the Game participants must view an information set on Plant Provenance first.

The Game has players role playing as someone responsible for completing the landscaping of a local park. They must make a selection of plant products, their country of origin, where to plant them. The choices made here will give a score, with lower levels of introduced threat leading to a higher score (Figure 2).

We give all participants the same end of experience quiz, consisting of 16 knowledge questions and associated demographic and enjoyment questions. Phase 2, conducted 3 weeks after participation in Phase 1, re-uses the same 16 questions and introduces 6 new ones. With the new questions drawn from the same data sets used in Phase 1.

Relevant Innovation:

The innovation here is the introduction of a Serious Game to the tree and plant health public engagement context with a focus on plant provenance. Plant provenance is an issue that the Department for Environment, Food, and Rural Affairs, FERA Ltd., and others have spoken about at events like the Chelsea Flower Show [4].

Typical engagements at gardening shows, and botanic gardens, do not allow for extensive capitalisation of a member of the public's time. Furthermore, soliciting their details for follow up engagements can be difficult. The online nature of this game, played from the comfort of their own home, allows for capturing time and details that otherwise would be missing in this space.

We also present an opportunity to compare the traditional presentation of text to that bolstered by gameplay, which is not a usual offering in these settings.

Project Outcomes and Results:

In Phase 1 we had a total of 42 participants, split into Game (24) & Non-Game (18) categories. 23 participants returned to Phase 2, Game (12), Non-Game (11).

In Phase 1, when we compare the likelihood of the game having an impact on the ability of a participant to answer questions correctly when compared to the Non-Game treatment, we find some weak evidence ($p < 0.05$) that the game is more likely to lead to a lower score.

When we look at Enjoyment as an outcome, we again see some weak evidence ($p < 0.05$) that the game treatment is more likely to lead to lower enjoyment, as is being in the 28 to 27 age group, when compared to 18 to 27s. However, we also see that self reporting a gain in knowledge of "a lot" compared to "none" is more likely to enjoying the experience more, as does winning in Phase 1 ($p < 0.05$ for both).

Interestingly, we define winning internally as getting more questions correct than incorrect. Participants were specifically not told of their performance in Phase 1 to preserve the integrity of Phase 2.

In Phase 2 we see some evidence ($p < 0.05$) that participants who had levels of enjoyment in Phase 1 corresponding to Enjoyed or Very Enjoyable, when compared to Disliked, were more likely to score better in the repeated questions from Phase 1. We also see the same effect for all questions in Phase 2 for an enjoyment value of Enjoyed.

We do not see any significant evidence that the game treatment is any better or worse than the non-game treatment for long term retention.

Conclusion:

From the results we can conclude that there is some slight influence of the game treatment compared to the non-game treatment in Phase 1 in terms of both participant enjoyment and the ability to recall information.

It would appear that participant enjoyment is a stronger indicator of long term retention than the treatment they were exposed to initially. This raises questions around enjoyment, specifically how an enjoyable experience can be built for a wide section of the public.

Perspectives and Needs:

The introduction of research in this field will hopefully start a dialogue between researchers and tree & plant health professionals.

Future iterations of this experiment would focus on understanding how to create an enjoyable experience. We also suffered some technical issues that prevented users accessing the experiment from mobile devices – these issues should be resolved for future iterations.

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