

# RISE 2016-Using Web-Based Games to Promote Learning and Engagement in Biology

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## Abstract

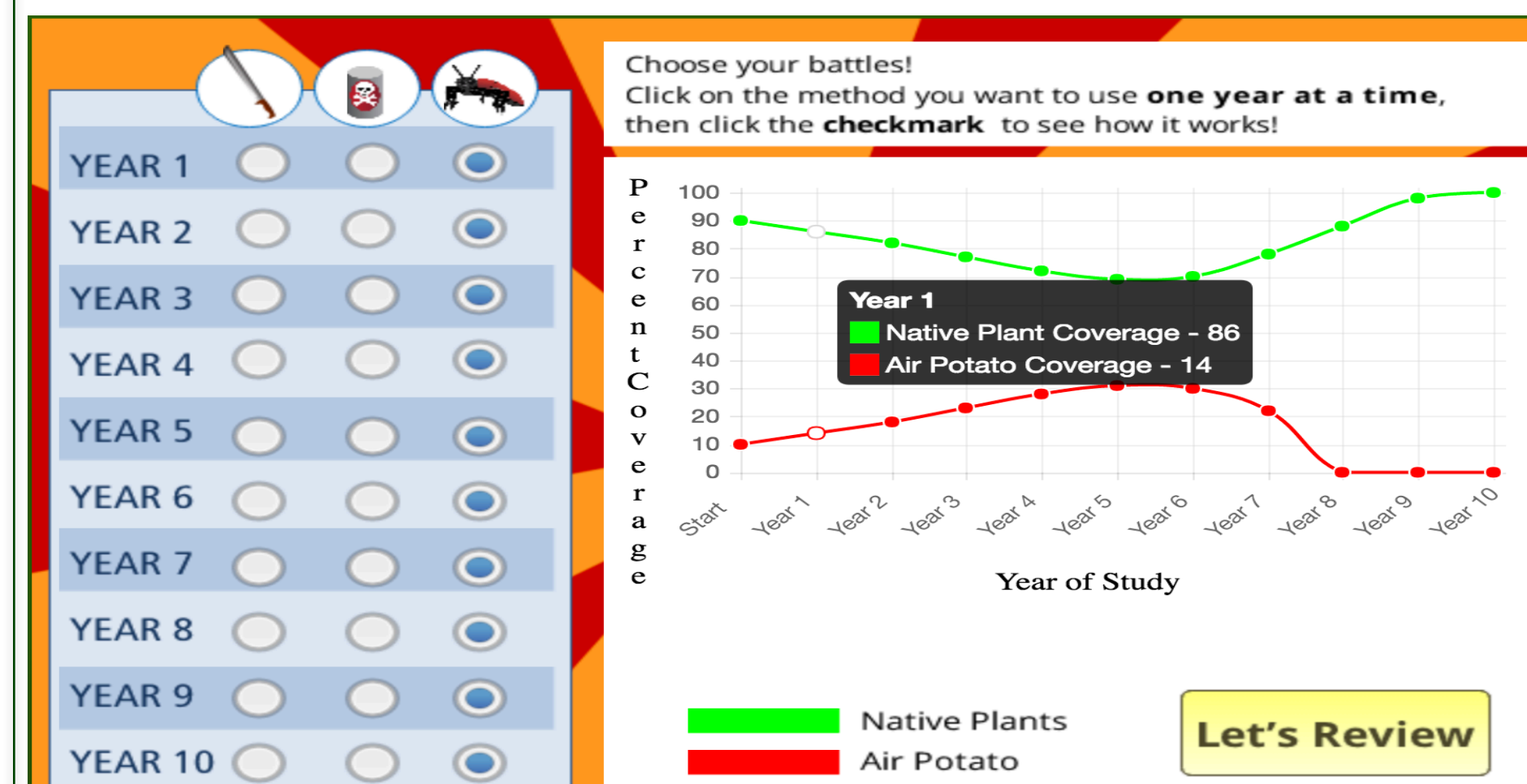
Dr. Prevost's research group has created a biology-based online game for middle school students called the Air Potato Invaders. This game was designed to help make essential connections between biological concepts that have been identified as problematic for students (Prevost et al., 2016). We will invite 20 USF students, consisting of 10 non-biology majors and 10 biology majors who are currently enrolled in biology courses. Students will be asked to play the game, answer specific questions regarding the game, and allow us to interview them to learn their impressions of the game. In doing so, we will be able to directly examine their interactions with the game to determine what changes need to be made. We expect these students to be receptive to the game and look at it as an effective way of learning.

## Objectives & Research Questions

Through this study we will collect and analyze students' impressions of the game.

Our research questions are:

- What learning gains are derived from playing the Air Potato Invaders Game?
- How receptive are college students to biology-based learning games in comparison to high-school students?
- How do college students evaluate the Air Potato Invaders Game?
- In what areas can the game be improved?



## Background





- Learning Challenges
  - Students have a difficult time making important connections between biological concepts in ecology (Evagorou et al., 2009).
  - Understanding ecology requires systematic thinking because of the relationships between different concepts which can be difficult for students to grasp (Assaraf & Orion, 2005).
  - The concepts that K-12 teachers identified as the most challenging within life sciences are (Prevost et al., 2016):
    - Food Webs
    - Organismal Interactions
    - Resource Competition
- Addressing the Challenges With the Air Potato Invaders. The game will help:
  - Students make essential connections between biological concepts.
  - Simulate a scientific experience by making observations and analyzing data.
- Middle school teachers agreed that this game is an effective teaching tool (Prevost et al., 2016).
  - 93% agreed or strongly agreed that their students would be able to learn key concepts from playing the game.
  - 77% felt that the game was effective or very effective.
- Fifty-six 9<sup>th</sup> grade high school students participated in playing the game and giving their feed back (Prevost et al., 2016).
  - 91% agreed or strongly agreed that they liked the game.
- Students were asked 2 open-ended questions upon completing the game.
  - *Which method for combating the air potato worked the best? Please explain you choice.*
  - *Why is the air potato considered an invasive species?*
    - Along with demonstrating understanding of these key biological concepts, students made connections as well.

## Approach

- We will conduct semi-structured interviews of undergraduate biology students.
  - 10 non-biology majors and 10 biology majors
- Students will complete pre-interview assessment of content knowledge about ecology and invasive species.
- Students will play the Air Potato Invaders game
- Students will complete post-interview assessment of content knowledge and students impressions of the game.
- Interviews will be recorded and transcribed
- Transcripts will be coded for major themes

## Conclusions

- This study is still ongoing.
- We will be coding for the following themes during analysis:

Code	Examples
 <b>User Friendly</b>	<ul style="list-style-type: none"> <li>■ Users find that the game is very simple to navigate</li> <li>■ The pace may be too fast or too slow.</li> </ul>
 <b>Aesthetics</b>	<ul style="list-style-type: none"> <li>■ The design of the game is aesthetically pleasing.</li> </ul>
 <b>Effective way of learning</b>	<ul style="list-style-type: none"> <li>■ The game helps players make connections between ecology concepts. By doing this, the game encourages critical thinking by the user.</li> <li>■ Connections in the game are not challenging enough for undergraduate students</li> </ul>
 <b>Scientific Experience</b>	<ul style="list-style-type: none"> <li>■ Students can manipulate the variables to rid the forest of the invasive species.</li> <li>■ Players demonstrate scientific skills such as making observations, interpreting data, and reflecting on results.</li> </ul>

## Referenced Resources

- Assaraf, O. B.-Z., & Orion, N. (2005). Development of system thinking skills in the context of earth system education. *Journal of Research in Science Teaching*, 42(5), 518–560. <http://doi.org/10.1002/tea.2006>
- Evagorou, M., Korfiatis, K., Nicolaou, C., & Constantinou, C. (2009). An Investigation of the Potential of Interactive Simulations for Developing System Thinking Skills in Elementary School: A case study with fifth-graders and sixth-graders. *International Journal of Science Education*, 31(5), 655–674. <http://doi.org/10.1080/09500690701749313>
- Prevost, L., Moon-Michel, L., Romero, M., & Lou, Y. (2016). Air potato invaders: Scenario-based digital games for science inquiry learning and assessment. Paper presented at the Society for Information Technology & Teacher Education International Conference