

The Game of Parasitism: A New Approach to Presenting Life Cycles

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Life cycles have been a standard in introductory biology instruction, but are met with less than enthusiastic responses from students. In a field such as Parasitism, life cycles are integral to understanding disease transmission and discovering methods of prevention. Life cycles tend to be complex, often requiring multiple hosts, stages, and environments. To address the concept of life cycles in way that uses active learning approaches, I assigned students to create a board game based on a specific parasitic life cycle. In small groups, they developed a game proposal and a materials list. They created a prototype of the game, including a board, playing pieces, playing cards, and instructions. In addition to presenting their game to the class, the games are played and evaluated by their classmates. This assignment is a multi-stage project that is integrated into the second half of the semester with final presentations and game evaluation occurring during the last week. The assignment is evaluated based on scientific accuracy and depth, division of labor, and quality of the final product. Examples of student projects will be presented and participants will have the opportunity to evaluate (play) them. This assignment incorporates active learning, team building, creativity, and peer evaluation to produce a finished product that demonstrates an understanding of the importance of life cycles in the field of parasitism.

Keywords: parasitism, life cycles, games, experiential learning

Introduction

Learning through playing games can serve as a method to reinforce course content presented through more traditional means such as lecture or readings. Games require students to retrieve learned information in a new way, providing them with validation for what they do or do not know (deep learning vs. short term learning). The creation of such games by students shifts their role from learner to teacher. To develop a game, students need to make decisions about accurate information in the proper context. Given that the players of these games are their peers who have shared their classroom experience, the creators need to consider a logical order for the game plan as well as the appropriate level for questions. This assignment requires the students to understand foundational facts and reconstruct what they have learned into a new format to meet the requirements of the game assignment. Working with the material in this fashion fosters a deeper learning experience for the student while disguising it in the format of play (Catapano, 2017, Osier, 2014, and Treher, 2011).

Additionally, while playing the game, students are presented with a low stakes method to reinforce their learning (Treher, 2011). Games play on their competitiveness to win but with little consequence to getting the wrong answer (who hasn't gotten a wrong answer playing Trivial Pursuit). The game format provides a way to learn from mistakes in an environment that is perceived as fun. The other students or players serve as an internal control for the creators to develop a game that is perceived as reasonable and fair in regards to the material covered in the course.

I adapted the game concept to emphasize parasitic life cycles for a 200 level college course in Parasitism. The assignment was used as an alternative for a final group project. Traditional assignments would require students to pick a current topic in the field, identify primary articles and work as a team to develop a presentation and/or paper. This assignment incorporates those elements but in addition, requires a prototype of the game to be created that will be peer-tested by other students in the class. Students create as well as evaluate. This assignment could be easily adapted for other organismal courses. The general concept of game could work for a wider range of course content with more revision.

Student Outline

Objectives

- Design a board game around a specific parasitic life cycle
- Interact as a team to develop a prototype of their concept
- Create a presentation for their game
- Critically analyze other team's board games using a rubric and their knowledge

Introduction

We have been approached by a board game manufacturer to develop prototypes for a new line of internal parasite life cycle games to teach children about the perils of parasites. The manufacturer is hoping these games will take off like the Giant Microbe Plush Toys have (originally an educational approach to get children to wash their hands).

In teams of three people (your choice), pick a parasite that will be the focus of your board game. Your board game should educate the players on the life cycle of the parasite and how it causes disease. It can be from the perspective of the parasite, the host(s) or third person. You need to integrate a question/answer card aspect into the game, but otherwise have flexibility in the game strategy. It should be fun in a scientific geeky way. Disgusting is ok as long as it is accurate. Use your creativity and have fun. Pitch it for 12-Adult audience.

Assignment

Part A: Selecting Your Topic

Prepare a design brief for your board game. In it, provide the organism of focus, a brief synopsis of the game (one paragraph), and the materials needed for construction. Please provide this assignment to your instructor for approval at least two weeks before the completion date for the game.

Part B: Game Prototype Creation

Guidelines for the board game include:

- one playing board
- minimum of 25 question/answer cards
- game rules
- playing pieces, dice, spinner, other materials

Game board design should relate to the life cycle featured in the game. Board game templates are available through an online search or consider visiting the CDC Parasite index. The game board itself can be made out of foam board.

Game questions should be incorporating into the format of the game. Develop at least twenty five questions and answers. Consider multiple choice, fill in the blank and true and false. Questions should be appropriate and reasonable for students of this class to answer. Arrange for a time to print your game cards on card stock with your instructor.

Game rules should be clear and concise. Please include a game introduction and synopsis to provide the background and purpose for your game. Consider how this game demonstrates the life cycle and the infectious process of this parasite. This section allows you to tell the story behind the game (2-3 pages) and should include internal citations (five quality references, minimum). The rules should provide step by step instructions that are easy to follow for someone who has not played the game before. Please consider the objective of the game (how to win), number of players, who starts, what happens during a turn, and the length of the game.

Consider other materials needed to play and design the game and work with your instructor accommodate your needs.

Evaluation

Part C: Presentations of Game Prototypes

On the day the board games are due, each group will give a 10-15 minute presentation on their game. Their presentation will include the background about their topic, the story behind their game, and how to play their game.

Part D: Peer Evaluation of Board Games

During the class period following the presentations, the class will evaluate and rate the games using a rubric. These peer ratings will be incorporated into the final grade for this assignment. A parasitic themed dessert will be served.

The final grade for this project will be determined based on the following criteria:

- 10% Preliminary Plan
- 40% Game Prototype
- 30% Class Presentation
- 15% Peer Ratings
- 5% Self-evaluation of team members.

Cited References

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Materials

Most of the materials for the creation of board games can be found at craft stores (Michael's,) or office supply stores. Foam boards were the preferred platform for the game. However, poster boards or file folders are inexpensive alternatives. Play cards were printed on colored card stock using the department printer. Playing pieces can be fashioned from polymer clay available at crafts stores or preformed plastic objects. Other materials, such as dice, colored markers and double sided tape are easily purchased through office supply stores or local retailers.

Notes for the Instructor

This assignment was designed for a 200 level Parasitism course with enrollment of 24 students (six to eight teams). The assignment substituted for a final group paper/presentation. The assignment balances creativity with content and that balance may be adjusted based on instructor preference. Grading rubrics for the game prototype and the presentation are provided (Appendix A).

Students were quite independent in the game creation and needed minimal assistance. Most of the creation occurs outside of scheduled class time, although some class time is used for planning. Please be aware that printing double sided game cards may need a practice run to be sure both sides line up. I arranged a time in which at least one group member is present to reformat files if necessary after a test print.

I incorporated student feedback into the evaluation of this assignment. To be successful, the game must be playable. Students are a good indicator of whether the directions are clear and the questions are at a reasonable level for the course. I also include evaluation of the team members in the grade to monitor an imbalance in work load. Student rubrics are provided (Appendix B).

There are a variety of resources online including game templates, guidelines for game creation and tips for instructors. Most of the examples are for K-12 but can easily be adopted for higher level learning based on content (Crisp, 2017, Young, 2017).

Examples of games students have created:

- -Dead End: a race between you and your liver fluke to the finish (of one species life)
- -Welcome to *Schistosoma haematobia*: Test your knowledge on the life cycle of the blood fluke
- -Guest in the Intestine: Test your knowledge on the life cycle of *Giardia*
- -Will you be the Next Host?: Test your knowledge on the life cycle of the lung fluke
- -Vectorland: Travel through the tropics and use your knowledge to avoid vector borne parasitic diseases

- -Mystery Parasite Game: Guess your opponent's parasite by answering a series of questions
- -Parasite Monopoly: Instead of acquiring properties, acquire parasites and their cures

If the instructor is so inclined to provide refreshments during the game evaluation, Dirt Pudding lends itself well to the theme of Parasitism. The basic recipe is to make vanilla pudding according to the packaged directions. Mix with Cool Whip and cover with crushed Oreos. After chilling for several hours, decorated with gummy worms and other candy that represents different stages in the life cycles of parasites.

Cited References

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Acknowledgments

Thank you very much to all of the BIOL 235 students who have helped improve this assignment over the last two classes.

About the Authors

Marilee Ramesh joined the faculty at Roanoke College in 2002 where she is currently a Professor of Biology. She teaches courses in general biology, genetics, and genomics, as well as supervising undergraduate research. Her research interests include meiosis, fungal transposons, and fungal genomics.

Appendix A

Biol 245

Instructor's Prototype Rubric

Team _____

Game Materials

Completed Game Prototype (board, 25 game cards,

rules, playing pieces, etc)

0 3 6 9 12 15 18 20

Overall Presentation, Appeal and Creativity

0 2 4 6 8 10

Quality and Science of the Questions

0 3 6 9 12 15 18 20

Background Materials

Connection to course content

0 3 6 9 12 15 18 20

Clarity of the Instructions

0 2 4 6 8 10

Coverage of basic guidelines

0 2 4 6 8 10

References (5)

0 2 4 6 8 10

Biol 245

Instructor's Presentation Rubric

Name _____

Length _____

Team Length _____ 10-15 _

0 2 4 6 8 10

Content

Story

0 2 4 6 8 10

Incorporation of Science

0 2 4 6 8 10

Game Strategy

0 2 4 6 8 10

Goals of Game

0 2 4 6 8 10

Delivery

Voice

0 2 4 6 8 10

Eye Contact

0 2 4 6 8 10

General Physical Delivery

0 2 4 6 8 10

Style

0 2 4 6 8 10

Division of Labor

0 2 4 6 8 10

Final Grade _____

Appendix B

Biol 245

Student Game Evaluation

Rate three games for playability and course content.
Peer ratings will account for 15% of the group's grade.
You will have 20 minutes to evaluate the game materials
and play the game.

Your Name _____

Game/Team Evaluated _____

Rate the ease of understanding the Game Rules.

0 2 4 6 8 10

Rate the playability of the game.

0 2 4 6 8 10

How long did it take someone to win? _____ mins.

Rate the quality of the questions.

Too easy Just Right Too hard

Rate the incorporation of science into the game.

0 2 4 6 8 10

Did you have fun playing the game (in a science geeky
sort of way)?

Overall grade for the game considering your
understanding

of the assignment and the playability of the game

A -/+ B -/+ C -/+ D-/+

Provide a celebrity quote for marketing.

BioL 245

Peer Evaluation Form

Board Game Group Project

Please rate the members of your group using the
following scale:

1 = Strongly disagree 2 = Disagree 3=Neutral/Don't
know

4= Agree 5= Strongly agree

- Agreed to do their fair share of the work load.
Self ___ TM#1 ___ TM#2 ___ TM#3 ___
- Completed their agreed-upon tasks in a timely
fashion.
- Self ___ TM#1 ___ TM#2 ___ TM#3 ___
- Completed their agreed-upon tasks in a
trustworthy fashion.
Self ___ TM#1 ___ TM#2 ___ TM#3 ___
- Helpful.
Self ___ TM#1 ___ TM#2 ___ TM#3 ___
- Dependable.
- Self ___ TM#1 ___ TM#2 ___ TM#3 ___
- Communicated their results or work to the other
members of the team.
Self ___ TM#1 ___ TM#2 ___ TM#3 ___
- Worked well with the other members of the
group
Self ___ TM#1 ___ TM#2 ___ TM#3 ___
- Contributed to a collaborative team environment
Self ___ TM#1 ___ TM#2 ___ TM#3 ___
- Contributed an appropriate share to the project.
- Self ___ TM#1 ___ TM#2 ___ TM#3 ___
- What grade does each member of the team
deserve for their work on the project?
Self ___ TM#1 ___ TM#2 ___ TM#3 ___

For yourself, please write a brief narrative explaining
your ratings.

What was your responsibility in this project?

For each teammate, please write a brief narrative
explaining your ratings.

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Citing This Article

Ramesh MA. 2018. The Game of Parasitism: A New Approach to Presenting Life Cycles. Article 52 In: McMahon K, editor. *Tested studies for laboratory teaching*. Volume 39. Proceedings of the 39th Conference of the Association for Biology Laboratory Education (ABLE). <http://www.ableweb.org/volumes/vol-39/?art=52>

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