

Sabbatical Leave Report

A. Applicant

Name: Nora Wheeler

Department: Mathematics

Type of Leave: Research and Project

Leave Dates: Spring 2018

B. Purpose of Leave

The purpose of my leave was to create mathematics-based puzzle-solving activities, both in the form of puzzle hunts and room escapes, for use in SRJC mathematics classes and for attendees of Day Under the Oaks, and to create a presentation about these activities to give at a mathematics conference. It will show our students and community that mathematics problem-solving can be fun, and it is the first step towards bringing an atmosphere of puzzle solving to SRJC which could potentially attract some excellent students and brilliant mathematics faculty.

C. Objectives

My sabbatical has brought (and will bring more) puzzling to SRJC in the following ways:

1. I created three mathematics-based room-escape activities with different difficulty levels to be used at Day Under the Oaks. I am now calling them “puzzle rooms” since no one is trapped. If Day Under the Oaks does not happen again this year, I will be offering the rooms to students at least twice next semester. In August, I did a trial run for SRJC faculty and staff and was able to raise \$150 for SRJC Mathematics Scholarships.
2. I created five mini-“puzzle hunts” to be used in SRJC Mathematics classes that reinforce topics taught in our classes. Our curriculum has changed, but the content in the activities is still appropriate for our new classes (Math 150, 154, 156, 25, 58, and 27). These are available for use to all interested SRJC Mathematics instructors.
3. I developed a presentation to give at a mathematics conference on how I incorporated mathematics into puzzle hunts and room escapes. My hope is to inspire other mathematics instructors to consider using puzzle-solving to make learning more fun and productive in their classrooms.

D. Narrative

In order to research how to create puzzle rooms that were fun, satisfying, and mathematical, I did 15 room escapes in 4 different areas (Boston, San Francisco, Las Vegas, and Los Angeles). I was able to vary the number in my groups from 2 to 9 to see the benefits and drawbacks of different size teams, and the types of puzzles that are better suited for certain quantities. It is important that all people be engaged throughout the event, and I wanted to avoid having someone feel like they were unable to contribute. I settled on teams of 2-4 and created appropriate puzzles for that team size.

The rooms also varied in the format of the puzzle-solving. Some rooms were linear, in that the puzzles needed to be solved in a specific order, while others had multiple puzzles that could be solved at any given time. I found that the non-linear rooms were more difficult, and that some team members inevitably missed part of the experience because they were not involved in solving one or more of the puzzles because they were working on something else. Since my rooms had to be shorter than the normal 60 minutes that escape rooms usually have, I felt that linear rooms would be more enjoyable, promote teamwork, and give teams a better chance of success.

Another significant way that escape rooms varied was the way in which hints were given. Some rooms were rigid about their hint rules and number of hints allowed, while other rooms were more flexible and were clearly more interested in giving what you needed to succeed. In order to promote success, while also keeping an eye on things for safety reasons, I decided to have a monitor with the teams at all times to give just-in-time hints. Struggling is part of the event, but if a team struggles too long, they can get discouraged. A monitor has the ability to judge the frustration level and help as needed.

Hardly any of the escape rooms I did had any mathematics beyond simple arithmetic. Since my goal was to infuse mathematics into my puzzle rooms, I had to use my own knowledge base to incorporate mathematics into the puzzle ideas from my research experiences. I wanted to push people slightly beyond their own perceived mathematical comfort zone and have them experience success in using their minds mathematically. Although I have not offered the puzzle rooms to students yet, the trial run with faculty and staff was extremely successful and I expect that students will find the experience enjoyable as well.

Part of my research into puzzle creation included participating in the MIT Mystery Hunt. The hunt had tons of puzzles that were all very difficult. Although it was an amazing experience, most of what I learned from it was that team sizes should not be too big, and that hard puzzles should only be given to people who want to solve hard puzzles. The level of the puzzles were far beyond anything that I would offer to my students.

Research into old puzzles that different hunts provide online was much more beneficial. DASH, in particular, provided puzzles that were at a more accessible difficulty level. Although there was very little mathematics in the puzzles, I was able to get ideas about puzzle formats that I could alter to include mathematics. I used these ideas and created the five puzzles that can be used in mathematics classes. Some of the puzzles involve finding a code to open a locked box to

receive a prize (homework pass, pencil, etc.). Others involve finding what a group of names have in common which requires the whole class to work together. I have been able to try two of them in classes so far this semester with success. Students were engaged and the mathematical concepts were reinforced by the activities.

In doing my research and getting ideas for my talk, I found that doing puzzles is far more fun than hearing someone talk about them. As such, my talk involves an introduction with some background information and explanation of my motivation, and a walk-through of a more difficult puzzle that I found interesting, but then is just sharing the puzzles I created with the attendees. Anyone in attendance who wishes to “steal” my ideas is welcome to do so, but I am guessing that those interested in bringing puzzling to their classes will have their own ideas on the best way to do that and my presentation may just be a starting point for them. I also hope to bring at least one of my puzzle rooms to the conference so that I can share that fun with them as well.

E. Evaluation Summary

1. How did this sabbatical leave enhance my work performance at the college?

The puzzles I have created for use in the classroom allow me to bring my excitement about puzzle solving to my students. I have found that students are much more engaged if I am excited about the class and genuinely invested in what I am presenting. I always try to stay engaged and try new things, and this sabbatical has allowed me to do this in a big way.

2. How did this sabbatical leave benefit students in my discipline?

The “aha moment”, when you finally figure something out after struggling with it, is a feeling that everyone understands and enjoys. The in-class puzzle hunts and the Day under the Oaks escape rooms incorporate mathematics content with fun puzzle-solving activities, giving students the opportunity to have that moment and connect mathematical problem solving with that positive feeling.

3. How did this sabbatical leave benefit my department?

The in-class activities are available for use in all SRJC Mathematics classrooms, allowing all instructors to motivate their classes using fun and relevant puzzle hunt activities

4. How did this sabbatical leave address the SRJC Strategic Plan and/or your department’s educational plan?

One of the Goals and Objectives of SRJC is “Engage students and spark intellectual curiosity in learner-centered environments”. The activities I created help students use problem-solving skills in a collaborative way. Rather than sitting in a seat listening to a lecture or quietly trying problems by themselves, they can be talking and moving around and brainstorming and trying and failing and trying and succeeding... Totally engaged!

F. Abstract for Board Report Summary

Nora Wheeler learned problem-solving techniques involved in puzzle hunts and room escapes. Based upon her experience, she incorporated mathematics into puzzles and created three puzzle rooms to be used during Day Under the Oaks, as well as five puzzles that can be used in SRJC Mathematics classes. She prepared a presentation based upon her experiences with puzzle-solving in and out of the classroom to be given at a mathematics conference.

G. Appendices

The following documents have been submitted with this report in an electronic format.

- Puzzles in the Classroom PowerPoint
- Classroom Puzzle Documents
 - Order of Operations
 - Properties of Real Numbers
 - Systems of Equations
 - Radians and Degrees
 - Trigonometry Binary Puzzle
- Puzzle Room Setup Files – SPOILER ALERT
 - Baby Room
 - Pirate Room
 - Sweet Shop Room