

# RISK COMMUNICATION AND PUBLIC ENGAGEMENT IN SEA LEVEL RISE RESILIENCE RESEARCH SERIES

**PAPER NO. 3**  
**A GAMIFIED APPROACH TO BUILDING RESILIENCE:  
THE RACE 2 MONARCH READY PILOT PROJECT**



COMMONWEALTH CENTER FOR  
RECURRENT FLOODING RESILIENCY

---

**PARTNERS**

---

 **WILLIAM & MARY**  
LAW SCHOOL | **VIRGINIA COASTAL**  
POLICY CENTER

 **VIMS** | **WILLIAM & MARY**  
VIRGINIA INSTITUTE OF MARINE SCIENCE

 **OLD DOMINION**  
UNIVERSITY

# RISK COMMUNICATION AND PUBLIC ENGAGEMENT IN SEA LEVEL RISE RESILIENCE RESEARCH SERIES

## PAPER NO. 3

### A Gamified Approach to Building Resilience: The Race 2 Monarch Ready Pilot Project

---

**Juita-Elena (Wie) Yusuf**

Associate Professor, School of Public Service  
Researcher, ODU Resilience Collaborative  
Old Dominion University

**Michelle Covi**

Assistant Professor of Practice, Department of Ocean, Earth and Atmospheric Sciences  
Researcher, ODU Resilience Collaborative  
Old Dominion University and Virginia Sea Grant Extension Partner

**Carol Considine**

Associate Professor, Department of Engineering Technology  
Researcher, ODU Resilience Collaborative  
Old Dominion University

**Donta Council**

PhD Student in Public Administration and Policy, School of Public Service  
Old Dominion University

**Jennifer Satterlee**

MPA Student, School of Public Service  
Old Dominion University

---

**ADDITIONAL PARTNERS**

---



**OLD DOMINION UNIVERSITY**

Resilience Collaborative

Suggested citation: Yusuf, J.-E., Considine, C., Covi, M., Council, D., Satterlee, J. (2018). *A Gamified Approach to Building Resilience: The Race 2 Monarch Ready Pilot Project, Paper No. 3 in the Risk Communication and Public Engagement in Sea Level Rise Resilience Research Series*. (Resilience Collaborative Occasional Paper Series No. 2018-3). Norfolk, VA: Old Dominion University Resilience Collaborative.

Old Dominion University Resilience Collaborative  
Norfolk, Virginia  
<https://www.odu.edu/impact/initiatives/resiliencecollaborative>  
<http://digitalcommons.odu.edu/odurc/>

CCRFR Report 5 | March 2018 | [floodingresiliency.org](http://floodingresiliency.org)



# TABLE OF CONTENTS

About the Risk Communication and Public Engagement in Sea Level Rise Resilience Research Series .....	4
Background.....	5
Conceptual Framework.....	7
Implementation .....	9
Social Media and Social Learning.....	10
Active Learning Through Competition and Earning Points.....	11
Summary and Future .....	13

# ABOUT THE RISK COMMUNICATION AND PUBLIC ENGAGEMENT IN SEA LEVEL RISE RESILIENCE RESEARCH SERIES



Improving risk communication is key to building resilience in areas at risk to all types of flooding. The National Research Council has defined risk communication as an interactive process of exchange of information and perspectives among individuals, groups and institutions<sup>1</sup>. Risk communication is a two-way dialogue that requires communicators to understand their audience in order to deliver the correct messages at appropriate times in order to achieve the desired outcome. Key to producing useful and actionable risk communications products is understanding audience risk perceptions, information needs and ability to respond to messages.



The goal is to examine key elements of risk communication necessary for effectively delivering impactful information about flooding, adaptation, and resilience.

Likewise, public engagement is a best practice in many fields of resilience including planning, preparedness, policy and decision-making. Public engagement leads to more informed residents; better actions, impacts and outcomes; more community buy-in and support; faster implementation and more trust in local government<sup>2</sup>. Since meaningful stakeholder engagement efforts require having informed and educated stakeholders and are based on effective communication of critical information, these two areas are closely linked together.

This research series focuses on communicating and engaging with stakeholders regarding vulnerabilities, risks, preparedness, and adaptation. The goal is to examine key elements of risk communication necessary for effectively delivering impactful information about flooding, adaptation, and resilience. The efficacy of information supply hinges on user adoption and having the correct

communication technologies and mechanisms in place. The studies in this research series focus on the factors driving use of information and specific approaches for communicating information and educating, and encouraging action. This research series include studies of modeling and visualization, adaptation preferences, information seeking, gamification, and social learning.

Studies in the Risk Communication and Public Engagement in Sea Level Rise Resilience Research Series are led by interdisciplinary faculty of the ODU Resilience Collaborative, a consortium of leading scholars actively engaged in research, education, and outreach on critical issues for resilience at the community, regional, national, and global levels.

This project, A Gamified Approach to Building Resilience: The Race 2 Monarch Ready Pilot Project, was funded by the Commonwealth Center for Recurrent Flooding Resiliency.

1. National Research Council. 1989. *Improving Risk Communication*. Washington, DC: The National Academies Press. <https://doi.org/10.17226/1189>.

2. National Research Council. 2008. *Public Participation in Environmental Assessment and Decision Making*. Washington, DC: The National Academies Press. <https://doi.org/10.17226/12434>.

# BACKGROUND

This project involves developing and implementing a gamified approach to engaging lay stakeholders (such as residents and community members) in obtaining information, learning about risk, and taking action to build resilience. This approach, operationalized through the Race 2 Monarch Ready (R2MR) pilot project, couples active learning and social learning mechanisms to motivate learning about and action to address risks, and gamification to encourage preparedness.

prepare for severe weather events through activities that support risk awareness and assessment, preparedness and, ultimately, resilience.

Building on social constructivist theory and the ARCS Motivation Model, the R2MR approach was designed to be effective by inducing learner motivation, connecting learning to resilience outcomes, and, through gameful experiences, embedding learners within a competitive community that increases confidence in their own knowledge and rewards learning and action.

R2MR was implemented on the Old Dominion University campus to help the Monarch community prepare for severe weather events through activities that support risk awareness and assessment, preparedness and, ultimately, resilience. This unique educational and engagement approach was unconventional, as it incorporated learning about flooding (and other hazards) and preparedness while participants earned points and competed amongst their peers.

Gamification, as a tool to help increase citizen participation and awareness in resilience, has been used by a few government agencies and other organizations.

The National Weather Service, for instance, has a program called Owlie Skywarn<sup>3</sup> that is designed to teach children about severe weather through games and activities. A collaboration between the National Oceanic and Atmospheric Administration (NOAA), the Federal Emergency Management Association (FEMA), and the American Red Cross produced the Owlie Skywarn Weather Book, an activity book that includes coloring pages, quizzes, and crossword puzzles to help children learn and retain important information about severe weather and preparedness.<sup>4</sup>

Oregon Sea Grant teaches tsunami preparedness by helping residents create and use self-guided evacuation routes through a treasure hunt approach.<sup>5</sup> In these hunts, which are called quests, residents follow a map and use a series of educational clues about their surroundings to walk to higher ground. At the end, they find a hidden box that contains a guest book and rubber stamp to mark their accomplishment. The aim is that by exploring these routes for fun in their free time, residents and visitors will later know where to go in the event of a tsunami.

3. For more information about this program, see <https://www.weather.gov/owlie/>

4. For an example of this activity book format, see <https://www.weather.gov/media/owlie/Owlie11.pdf> or <http://www.weathersafety.ohio.gov/Documents/JustForKids/Owlie%20Skywarn.pdf>

5. For more information, see <https://www.youtube.com/watch?v=TQvgSMiby7k>

Another example, the Zombie Apocalypse Disaster Preparedness Game, first took place in San Francisco. Players were given nerf guns and directed to run around the city completing missions sent to them on their smartphones. The missions were designed to foster basic disaster skills (such as learning how to bandage a burn wound or how to pack a survival kit, memorizing emergency radio stations, or planning evacuation routes). During the game actors dressed as zombies chased after the players, and the game culminated in a Thriller dancemob at a local park. Based on the success of this community event, The Go Game subsequently designed a week-long superhero-themed earthquake preparedness game for the City of San Francisco, a wildfire preparedness game for a town in rural California, and a tsunami preparedness game for a tech company in San Diego. The Go Game has since produced Zombie Disaster Prep games in Portland and New York, a bilingual earthquake preparedness game in San Francisco, and has worked with government agencies, private companies, non-profits and community leaders to turn disaster preparedness training into something that is accessible, memorable and fun.<sup>6</sup>

---

6. For more information, see <http://thegogame.com/>

# CONCEPTUAL FRAMEWORK

Gamification offers an alternative approach to traditional classroom education, and has gained recent attention as it can be used to engage students and learners in non-game settings using selected game elements. It is meant to amplify the existing educational experience, incorporating both internal and external motivation factors to increase learner engagement. Gamification, like games, presents clear objectives which can be further developed into short-term achievable goals.

The aim of this project's gamification approach was to support and motivate participants to perform tasks related to building resilience.

Much like the ability to progress to ascending levels in traditional games, learners in a gamified environment are able to earn points and rewards (intangible or tangible), and compete with others in a healthy competitive community. Added elements such as feedback, achievable goals and encouragement can be employed to create a more enjoyable learning experience.

This project's gamification approach built on key elements of learning posited by two theories or models: (1) the ARCS motivation model, and (2) social constructivist theory.

The ARCS motivation model proposes four dimensions of learning motivation: Attention, Relevance, Confidence and Satisfaction.<sup>7</sup> The ARCS model emphasizes how learner motivation can be induced by applying the four dimensions to encourage learning.

1. Attention: increasing the attention and curiosity of learners through the use of different media;
2. Relevance: emphasizing the relevance of the learning content to the learner;
3. Confidence: completing the learning task and building confidence through the learning process;
4. Satisfaction: providing satisfaction or reward during the learning process.

The aim of this project's gamification approach was to support and motivate participants to perform tasks related to building resilience. By providing a gameful experience, the R2MR makes the target activities more engaging by creating a feeling of mastery and providing intrinsic motivation. Building on the ARCS model, the R2MR approach adopts a gamified learning strategy and combines game elements to address dimensions of the ARCS model. Gameful experiences gain learners' attention, increases confidence in learning, and rewards learning. Relevance is achieved by directly connecting the gameful experiences to learners' own situations (i.e., own resilience).

7. For more information on the ARCS model, see Keller, J. M. (1983). Motivational design of instruction. In C. M. Reigeluth (Ed.), *Instructional-design theories and models: An overview of their current status* (pp. 386–434). Hillsdale, NJ: Lawrence Erlbaum Associates. For discussion of how the ARCS model can change learner motivation, see for example Karoulis, A., & Demetriadis, S. (2005). The motivational factor in educational games. *Interaction between learner's internal and external representations in multimedia environments*. Kaleidoscope NoE JEIRP, D21-02-01-F: Research Report, pp. 13-19 (<http://athanasis.karoulis.gr/Data/Science/Kaleidoscope/2-MotivFactorEduGames.pdf>).

Social constructivist theory focuses on learning as a learner-centered activity. Knowledge is established through interaction between individuals and their environments.<sup>8</sup> Specifically, individuals learn through interactions with others and with the environments within which they are located. Another key aspect of social constructivism is that learning is a social process, and meaningful learning occurs when individuals are engaged in social activities.<sup>9</sup> The R2MR approach embeds learners within a (competitive) community and connects learning about resilience to the environment within which learners reside. Through gameful experiences, learners complete tasks that related directly to their self-perceived resilience needs.

In summary, the gamification approach underpinning the R2MR incorporates active learning, social learning, and digital technology to more effectively create awareness, educate about risks and response, and encourage preparedness and resilience. Key features of the approach include:

- Participants actively learn while completing activities and reflect on the activity completed.
- Social learning takes place through dissemination and sharing of activity completion, reflection, and learning through social media.
- Use of digital technology provides for broader reach and anytime (24/7) learning at participant's convenience.
- Participants earn points and rewards for completion of tasks, then level up and increase their prominence on the leaderboard.

---

8. For more information about social constructivism, see Gredler, M. E. (1997). *Learning and instruction: Theory into practice* (3rd ed.). Upper Saddle River, NJ: Prentice-Hall.

9. See Prawat, R. S., & Floden, R. E. (1994). Philosophical perspectives on constructivist views of learning. *Educational Psychologist*, 29(1), 37–48.





## IMPLEMENTATION

R2MR and the gamified approach to building resilience was implemented on the Old Dominion University campus in the Fall 2016 and Spring 2017 semesters. R2MR participants included ODU faculty, staff and students. While limited to the ODU Monarch community, R2MR had broader reach since R2MR participants resided throughout the Hampton Roads region and were undertaking resilience-building learning and action that affected not just the ODU campus but their home communities as well.

# SOCIAL MEDIA AND SOCIAL LEARNING

R2MR utilized Facebook, Instagram and Twitter to engage participants throughout the project. These three avenues of social media were free, easy to use, and most importantly offered a modern and interactive way to engage with participants. Points were recognized when participants submitted evidence of task completion (photo or screen shot, for example) via e-mail, the Race 2 Monarch Ready [Facebook](#) page, or [Twitter](#) or [Instagram](#) by tagging @Race2Ready or using the hashtag #MonarchReady. Using the hashtag #MonarchReady allowed participants to join the conversation on preparedness via social media while posting pictures of them interacting in the various activities of the project.

## FIGURE 1

### Sample social media sharing via Twitter



# ACTIVE LEARNING THROUGH COMPETITION AND EARNING POINTS

An element to gamification is the ability for participants to earn points as they engage in action throughout the learning process. The ability to earn points was used as a motivator and intrinsic reward for participants to be more engaged in building resilience.

Participants could earn between 1 to 5 points for each activity that they completed, depending on the activity category. The point system for the different categories of activities was as follows:

- 1 point – Awareness activities
- 2 points – Education activities
- 3 points – Action activities
- 5 points – Preparedness activities

Participants were offered more than thirty ways to participate and earn points. These points were tracked using a Leadership Board (see Figure 2) on the R2MR website. With the Leadership Board, participants could see their cumulative points and how they ranked amongst their peers in the R2MR Pilot Project. The activities were organized into four categories, ranging from awareness to preparedness, with increasing points awarded for higher level categories. Examples of activities included:

- Awareness – signing up for apps such as Nextdoor and Waze, visiting the FEMA Flood Map Service Center to determine if they lived in a flood zone, or reading the Virginia Homeowner’s Guide to Natural Hazards;
- Education – taking online quizzes on climate change or insurance needs, watching resilience-related TED Talks, or calculating their carbon footprint;

- Action – participating in tours of wetlands and green infrastructure, volunteering for resilience-related service opportunities, or attending training events such as the National Weather Services’ SkyWarn class;
- Preparedness – undertaking preparedness activities including creating emergency kits and property inventory, identifying alternate parking locations for inclement weather, or talking to an insurance agent about coverage.

As participants earned points, they also progressively advanced through the levels of the R2MR game. The levels were as follows:

- 0-15 points: Baby Steps
- 16-40 points: Walking
- 41-75 points: Running
- 76+ points: Champion

Each week, a points champion and a “mover of the week” were recognized and received prizes such as ODU t-shirts, mugs, or notebooks.

**FIGURE 2**

**Example of the R2MR Leadership Board**

<b>Competitor</b>	<b>Points as of 2/27</b>
Carter Little	42
Destiny B.	26
Matthew D.	22
Heather Somervail	21
Nicholas Bowman	14
Destiny Jordon	12
Liz Gravedoni	12
Wade Belcher	8
Carol Considine	7
Hunter Woodard	6
Sujeivelis Rueda	6
Maria Bowman	5
WY	5
Kashia Williams	4
Macayla G.	4
Fallah Willie	4
Sharon Anderson	4
Samantha Kendle	4
Bryan A.	4
Lauren Edrington	2
OJ	1
Mikavla C.	1



## SUMMARY AND FUTURE

This project developed a gamified approach to encourage learning about vulnerabilities and risk, identifying actions that build resilience, and undertaking efforts to become resilient. Similar approaches using game elements have been utilized by other organizations, such as the National Weather Service, Oregon Sea Grant, and the American Red Cross, to encourage preparedness and resilience activities.

---

The gamification strategy used in this project incorporated elements of learning from the ARCS motivation model and social constructivist theory. Features of the gamified approach developed and implemented for this project include: the use of game elements to engage participants in non-game settings, the amplification of the existing educational experience, and the ability to earn points and rewards to compete within a community of others pursuing similar goals. Key to the approach were social media and social learning, active learning through competition, and incentives for activity completion or behavioral modification.

Beyond the R2MR pilot project, elements of the gamified approach have been implemented in stakeholder engagement efforts to support the City of Virginia Beach Comprehensive Sea Level Rise and Recurrent Flooding Analysis and Planning Study (<https://www.vbgov.com/government/departments/public-works/storm-water/Pages/pw-slr-8-2015.aspx>).

The ODU Resilience Collaborative project team incorporated gamification into the Action-oriented Stakeholder Engagement for a Resilient Tomorrow (ASERT) framework that underpinned the public engagement meetings that support the analysis and planning process. The project team designed and hosted Flood Resilience Game Nights that included a number of stations where residents (i.e., players) participate in activities at the stations. Players receive a game card, earn points for participating at the different stations, and win prizes.



COMMONWEALTH CENTER FOR  
RECURRENT FLOODING RESILIENCY

---

PARTNERS

---



VIRGINIA COASTAL  
POLICY CENTER



[floodingresiliency.org](http://floodingresiliency.org) | 757-683-5031 |

