Learning by Design: Aquarium Kumu Training

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Abstract: The purpose of this instructional design project was to develop and evaluate the effectiveness of an online instructional module for training volunteers regarding marine biology at the Waikīkī Aquarium. The creation of a learning module to be completed by all appropriate volunteers provides consistency in content delivery, a higher level of accountability, a greater level of familiarity with pertinent information, as well as increased confidence with visitors. Waikīkī Aquarium Education Volunteers, known as Kumus, are volunteers who specialize in malacology, or the study of marine molluscs. Learning marine biology is an important part of providing a positive educational experience for Aquarium visitors. There was no formal online training program for Aquarium Kumus, and educational technology serves to bridge this gap, helping learners who have grown up using technology to stay engaged and focused in challenging topics. The modules were created using Canvas, a learning management system, as well as a combination of tools including: Google Docs, Screencastify, and YouTube. A constructivist design approach combined with proven multimedia learning principles were integrated into the design. This study involved eleven college level participants, with data analyzed and reported through the use of statistical and descriptive analysis. The results of the data indicated that after completing the online training modules, participants' knowledge of marine biology increased.

Introduction

The Waikīkī Aquarium (Aquarium) is located in historic Kapi`olani Park at the foot of Diamond Head on the island of Oʻahu in the state of Hawai`i. The Aquarium's mission is to inspire and promote understanding, appreciation, and conservation of Pacific marine life. Throughout the year, Aquarium staff rely on the assistance of volunteers to achieve that mission.

Training materials are currently provided for educational volunteers in the form of a folder with a variety of resources related to Aquarium objectives. It is the responsibility of individual volunteers to thoroughly read through the materials until they are comfortable with the content, with minimal assessment possible by limited Aquarium staff. As a result, individual training lacks consistency and the knowledge gained by each volunteer varies.

The purpose of this instructional design project was to develop and evaluate the effectiveness of an online instructional module for training volunteers regarding marine biology at the Waikīkī Aquarium. The creation of a learning module that must be completed by all appropriate volunteers will provide consistency in content delivery, a higher level of accountability, a greater level of familiarity with pertinent information, and increased

confidence with visitors.

Waikīkī Aquarium Education Volunteers, more commonly known as Kumus, are volunteers who specialize in an area of marine biology known as malacology, or the study of marine molluscs. All Waikīkī Aquarium Kumu volunteers are required to participate in basic marine biology training and pass an oral examination and practicum with the general public.

Learning marine biology is an important part of providing a positive educational experience for Aquarium visitors. There was no formal online training program for Aquarium Kumus. Educational technology can serve to bridge this gap, as it can help students who have grown up using technology to stay engaged and focused in challenging topics. An online module offers volunteers access to training anytime and anywhere, and reduces time intensive training demands on staff members. Henceforth, the purpose of this instructional design project was to create and evaluate how well an online training module can educate volunteers at the Waikīkī Aquarium.

Literature Review

Currently, there is an absence of online learning modules for such a specific subject as the taxonomy of major families of marine molluscs in the Hawaiian Islands. An extensive front-end analysis was conducted to determine the needs of the Aquarium. According to Fulford (2015), a thorough needs assessment can provide insight into the exact nature of training that will result in a solution to the problem. It is imperative that Aquarium volunteers have a solid foundation of basic malacology in order to provide an innovative new educational activity entitled "Sea Snails of Hawai`i," which provides a positive learning experience with various shells to all interested visitors, regardless of age.

Content knowledge is a necessity for volunteer Kumus. Many visitors to the Aquarium are from out-of-state or foreign countries and they have many questions about marine biology in Hawai'i. Without a marine biology degree, most volunteers strive to learn more about marine life but may be unable to sufficiently serve our guests. Grenier (2011) notes that while memorizing every specific fact is not vital, the general accuracy of knowledge is important. She adds that volunteers should be specific content experts in order to meet demands of the institution. With engaging online content combined with proper hands-on training, volunteers will improve job performance and have increased confidence as well (McArdle, 2011).

The versatility of online modules allows for anytime, anywhere access (Ngai, Poon, & Chan, 2007). The benefits of an online module also include the ability to easily incorporate multimedia learning principles. A study by Yuen, Lin, Huan, & Sheen (2012) found that multimedia improved student engagement leading to a positive attitude toward learning, increasing the likelihood of deeper learning.

In recent years, museum educators have urgently explored more dynamic ways to train gallery educators, paid or volunteer, that account for different types of learning styles and teaching practices. Palamara (2017) demonstrates how utilizing a flipped learning model, with online modules as the basic instructional content, collective growth and development in

a gallery educator training program occurs by making the practice of gallery teaching the primary focus of in-person training sessions.

Project Development

Instructional Design Framework

Assessing the most suitable methods for online learning combined with volunteer training, this project used a student-centered, constructivist approach that empowered participants to be active learners, build their problem-solving skills, and construct knowledge through content grounded in application (Bhattacharjee, 2015; Gagné, et al., 1992). Additionally, since this project sought to provide applicable informal educator training to volunteers, anchored learning was selected as the leading pedagogy because it emphasizes meaningful learning, problem solving, and situated learning and implementation (Bransford et al., 1990). Because this project focuses on malacological taxonomy, the theory of scaffolding was a secondary pedagogy used, as it emphasizes building upon a learner's prior knowledge of sea snail family characteristics (Jumaat & Tasir, 2014). An overall timeline for 2018-2019 was constructed to provide a reasonable schedule to meet the goals of this Aquarium Kumu Training Instructional Design Research Project, as shown in Appendix M. For approval, the University of Hawaiʻi Institutional Review Board (IRB) was consulted in November 2018 as well, and CITI Training Certificates were submitted accordingly (Appendix L).

Terminal Objective and Module Structure

This project's terminal objectives were to instruct volunteers to "identify sea snail families by shell shape" and "engage Aquarium visitors in an educational activity". The specific learning objectives for each module can be found in Appendix F, and the content outline is available for review in Appendix G. To view the online course, please utilize this Canvas URL link: **https://canvas.instructure.com/enroll/6JLMNL** to self-enroll and participate in the course.

Using the theory of scaffolding, the content-rich online training was divided into three modules. The first module is titled the "Kumu Volunteer Role." This module contains a synthesis of best practices on scaffolding and educating volunteers (Tofade, et al 2013). The next trio of modules are titled "Sea Snails of Hawai`i." Using malacological content from John Hoover's seminal work *Hawaiʻi's Sea Creatures* (2006), a comparative analysis of sea snail shells was included with exemplary instructional videos. Additional marine biology resources referenced include the State of Hawaiʻi Division of Aquatic Resources (DAR) Education Resource entitled *Hawaiian Tidepool and Shallow Reef Identification*. The final module is titled "Learning Activities," and ties together the relationship between various sea snails. A summative module is titled "Next Steps," a cumulative unit that integrates material from the previous units, but follows Olinghouse's (2008) suggestions on developing a student-centered learning environment with a Course Evaluation (Appendix H).

The online modules were designed to be untimed—allowing the participants to comfortably pace themselves throughout the training and most significantly achieve mastery. Each unit was designed to take 30-45 minutes to complete. In total, the modules would take about 1-2 hours to complete. The Canvas Learning Management System (LMS) was selected as the

platform to deliver the online training. This LMS was chosen because of its intuitive, engaging layout, features, free accounts, and seamless embedding of YouTube videos and Google Forms. After reviewing literature regarding online learning, this study aimed to address three areas identified by researchers, which include the following: 1) clear objectives, 2) engaging multimedia such as graphics and video demonstrations and 3) and application of learning objectives. Additionally, a simplified CASA approach (Menchaca, 2014) to designing online learning environments was emulated. There are four CASA elements that are key to this groundbreaking approach: incorporating (C)ontent, providing (A)synchronous as well as (S)ynchronous communication opportunities, and giving appropriate (A)ssessment. For example, a (S)ynchronous communication opportunity is present in the form of a "Talk Story Discussion Forum" (Appendix I).

Engaging Design and Graphics

The modules were designed to display basic icons for the participants to easily navigate through each page of the training. Likewise, different font sizes were incorporated to differentiate headings from the body text. The strategic use of legibly large size 14 point font or larger was leveraged throughout the course, for overall readability for all ages and an impactful design. A variety of colors were selected to ensure high contrast for participants who may be visually impaired. Navigational buttons were selectively streamlined with Canvas so the participants can easily advance to the next section, providing a crisp clean modern design without undue clutter. Graphics have been strategically designed using proven multimedia principles, such as signaling and cueing, that are appropriate and useful, to reinforce learning concepts, an example is shown in Figure 1. The "Welcome" page contains brief and easy-to-follow directional material to help the participants understand what to do as they progress through the training (Beethham & Sharpe, 2013).
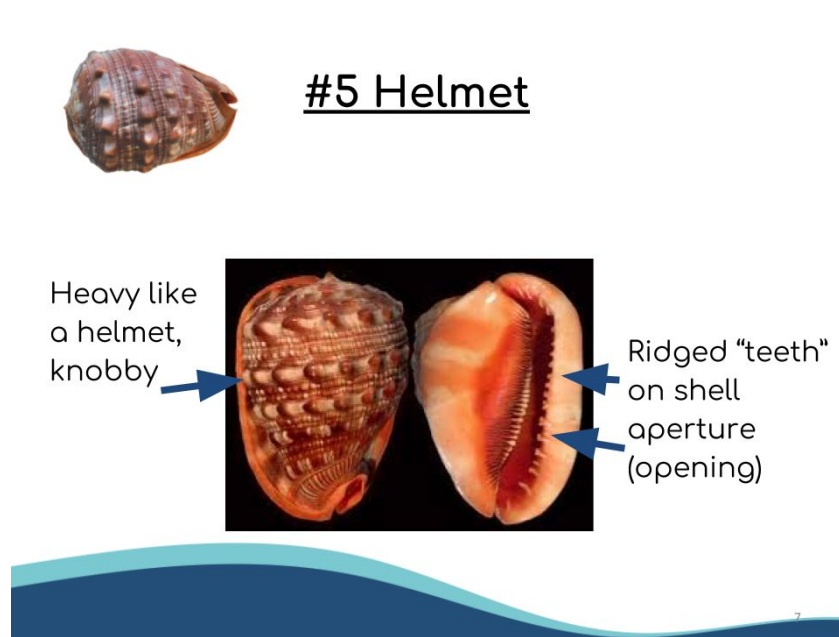
Figure 1. Screenshot of user interface with engaging features

Video Demonstrations

YouTube videos were integrated within each module that provide real life demonstrations of

educational activities (Holland, Grant & Donthamsetty, 2017). For dramatic effect, actual Shell Game demonstration audio was limited so participants must "fill in the blank" and decipher what was said for an engaging educational experience while viewing the video. Based on best practices indicated by training literature, each of the videos in the Canvas LMS were custom designed and produced, and then uploaded to YouTube. To develop the video demonstrations, dynamic Google Slides presentations were created, integrating animations, images, and other engaging visual features. With Screencastify, a Google Chrome extension application, a brilliant screencast of each presentation was recorded with narrative voice-overs, which offer guidance and direction for the participants. Additionally, YouTube's subtitle capabilities provide compliance with ADA requirements, allowing participants, particularly audibly impaired ones, to read the content within specific slideshow screencast presentation videos.

Methodology

Research Questions

The primary research question for this project was:

Using a pre-test and post-test, how effective is a new online module in developing basic malacology knowledge among Waikīkī Aquarium volunteers?

A secondary question was:

How effective is the delivery of instruction within the module units?

Content Analysis

Hawaiʻi is endowed with a rich plethora of marine molluscs, some of which are endemic, found in Hawaiian waters, yet nowhere else on Earth. Using a pre-test and post-test, the primary goal is to impress upon volunteers a firm foundation of malacological taxonomy, beginning with a dozen sea snail families found in Hawaiʻi. Sea snail families may be identified by shell shape, and with a cognitively-oriented module complete with presentations and embedded tests, volunteers will have an opportunity to engage in an innovative learning experience. In order to break down the components into manageable chunks, content was been analyzed to form groups of four sea snail families each, for a total of 3 modules. Upon successful completion of the new Aquarium Kumu Training modules (see Appendix A), volunteers are well prepared to share their knowledge with Aquarium visitors, using a Sea Snails of Hawai`i shell game and props (see Appendix B).

Recruitment and Participants

Recruitment of participants was via email and in person invitations, successful including participants who were interested in expanding their knowledge of marine life. The target population for this learning module was adult volunteers at the Waikīkī Aquarium. The age of volunteers ranged from eighteen to over forty years old. The youngest volunteers were generally college students who are performing community service for credit in a college course, and comprise over half the population, and were the target population in focus. Most volunteers have at least some college experience or perhaps a bachelor's degree. Ethnic and socioeconomic backgrounds vary as well with many having grown up locally, while others are from the mainland or another country. While the Aquarium provides learning opportunities for a wide range of people from college students to retirees, and from both local

and international locations, the focus was local college students as the primary learners and participants, please refer to demographics shown in Table 1. The general population of these local college classes consists of Caucasian, Asian, Pacific Islander, and mixed-race families. Learners come from both large and smaller public and private colleges from across Hawaiʻi, the mainland United States and worldwide.

Table 1
Participant Gender, Age, and Education Level

Characteristics	Number	Percent
Gender		
Female	7	64%
Male	4	36%
Age		
18-34	9	82%
35-50	2	18%
51+	0	0
Education Level		
High School	1	9%
College	10	91%

The participants span the range of undergraduate and graduate levels and experience. A majority of these learners have also demonstrated adequate proficiency dealing with new technology, such as the Canvas LMS. These students have grown up in a time when technology is prevalent and thus they have had significant early exposure to its use. Physiologically, these learners have mastered the intuitive interfaces common among online software applications today. Technology is seamlessly integrated into to their daily lives, from completing class work on the Internet to completing school projects and presentations digitally. All have computer access and a multitude of technological resources at home or publicly available from the library, for example.

The participants generally enjoy environmental and conservation education, and genuinely care about the Earth and its oceans. They are motivated to learn with educational technology and create positive change in their communities by volunteering at the Waikīkī Aquarium. They feel a need to help educate the public about marine biology and conservation issues such as climate change and ocean acidification, and how marine molluscs will be impacted with dissolving shells in an increasingly acidic ocean environment.

Evaluation Instruments

Instruments included pre-tests, embedded tests, and post-tests to assess student learning and progress. The Canvas Learning Management System (LMS) has been utilized to deliver the online content and modules, with relevant data being collected with Canvas analytics. The study data was tabulated with descriptive statistics and Google Sheets to be shared accordingly.

A comprehensive Course Evaluation was created with Google Forms and provided to all participants. In the initial phases of instructional design, several one-on-one sessions with peer colleagues were also conducted in order to ascertain the future iterative development process prior to full beta testing and module implementation. A pretest (Appendix C) and posttest (Appendix D) was created using the Canvas LMS in accordance with the famed systematic design of instruction model developed by Dick, Carey & Carey (2014). All collected data was stored within a secured and password protected Canvas LMS account. Embedded quizzes and learning activities (Appendix E) were placed within each module to assess the participants' knowledge integration (Behrend & Thompson, 2012). A comprehensive rubric will also be included within each assignment to guide participants through each of the assignment expectations (Andrade, 2008). Automated grading was utilized within the quizzes to provide immediate corrective feedback to the participants and then to tabulate group results.

Procedures

Eleven Aquarium volunteer participants were recruited via their Aquarium provided email account (Appendix J). Prior to training, the participants were asked to agree to the terms of a research consent form (Appendix K). After consenting, the participants were provided a Canvas course invitation URL link and received a detailed explanation of the steps required to complete the online training. Each participant completed the training modules as well as the Pretest and Posttest within three weeks.

The participants were asked to complete a Volunteer Pretest containing 8 questions, followed by a Shell Identification Pretest of 12 multiple-choice questions. After finishing the Pretest, participants began the online modules. In the final module, participants all completed a Volunteer Posttest containing 8 questions, followed by a Shell Identification Posttest of 12 multiple-choice questions that parallel their respective pretest questions and objectives. All modules in the training include activities and quizzes to assess participant learning and provide timely application of instructional material.

Design Implications

Based on an extensive front-end analysis, there were several design implications to be considered. These implications were used to help resolve the gap between what students typically know about malacology and what they need to learn to become successful Aquarium volunteers in the future. The analysis suggested that an online educational module could be available and that guiding e-learning with novice volunteers is a successful way of introducing online informal learning in a global voluntary organization (Williams, et al 2013). In order for our marine education to have an impact, the level of understanding with new programs must be improved. There is a need for volunteers and the community to become more involved and more educated about environmental stewardship. According to

Fulford & Fichelberger (2003), we can develop a "System of Reciprocity" to empower Aquarium stakeholders to optimize their educational technology resources and empower volunteer enrichment.

Results

There were eleven participants who completed the training, providing ample data to be analyzed in this study. To measure how well the training module educated volunteers, the results of the Pretest and Posttest were compared, following the completion of the entire training. Comparable questions were used in both tests, though the questions were slightly modified to prevent simple memorization. Data analysis was conducted throughout the entire iterative design process from the one-on-one formative evaluation phase to the final module delivery and implementation. According to a number of previous studies, utilizing an initial participant sample size has proven to be an accurate gauge of educational technology success, for example as shown by Holland, Grant, & Donthamsetty (2017). Instruments included pretests, embedded tests, and posttests to assess student learning and progress. The Canvas LMS was utilized to deliver the online content and modules, and data was reliably collected with Canvas analytics. Using Google Sheets and descriptive statistics, the data was carefully tabulated with bar graphs, comparative tables, etc.

Educating Volunteers – Pretest and Posttest

The pretest and posttest scores indicate that there was a noticeable effect on the participants' test scores. With regards to the Volunteer Pretest results, when comparing the Pretest to Posttest scores, showed that the participants, on average, scored a 41% on the Pretest whereas the average score on the Posttest was 85%. Markedly, on average, the participants scored over 40% higher on their Volunteer Posttest as compared to their Pretest scores (Figure 2).
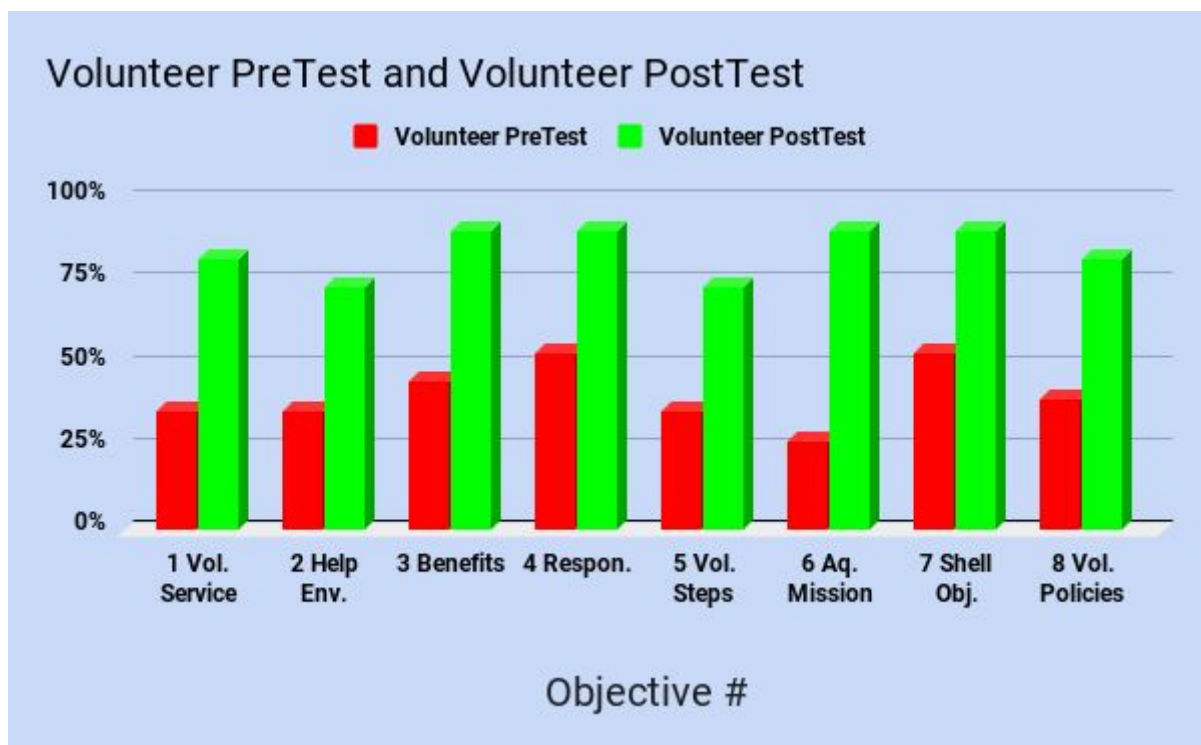
Figure 2. Comparison of Volunteer Pretest and Posttest scores by learning objective

For example, the Shell Identification Pretest and Posttest scores reveal the significant learning gains for the participants. With regards to the Shell Identification Pretest results, when comparing the Pretest to Posttest scores, showed that the participants, on average, scored a 35% on the Pretest whereas the average score on the Posttest was 83%. Strikingly, on average, the participants scored almost 50% higher on their Shell Identification Posttest as compared to their Pretest scores (Figure 3). These results suggest that the online volunteer training modules had a positive effect on the participants' knowledge. Specifically, these results imply that after completing the online training modules, participants' knowledge regarding volunteer policies and shell identification increased.
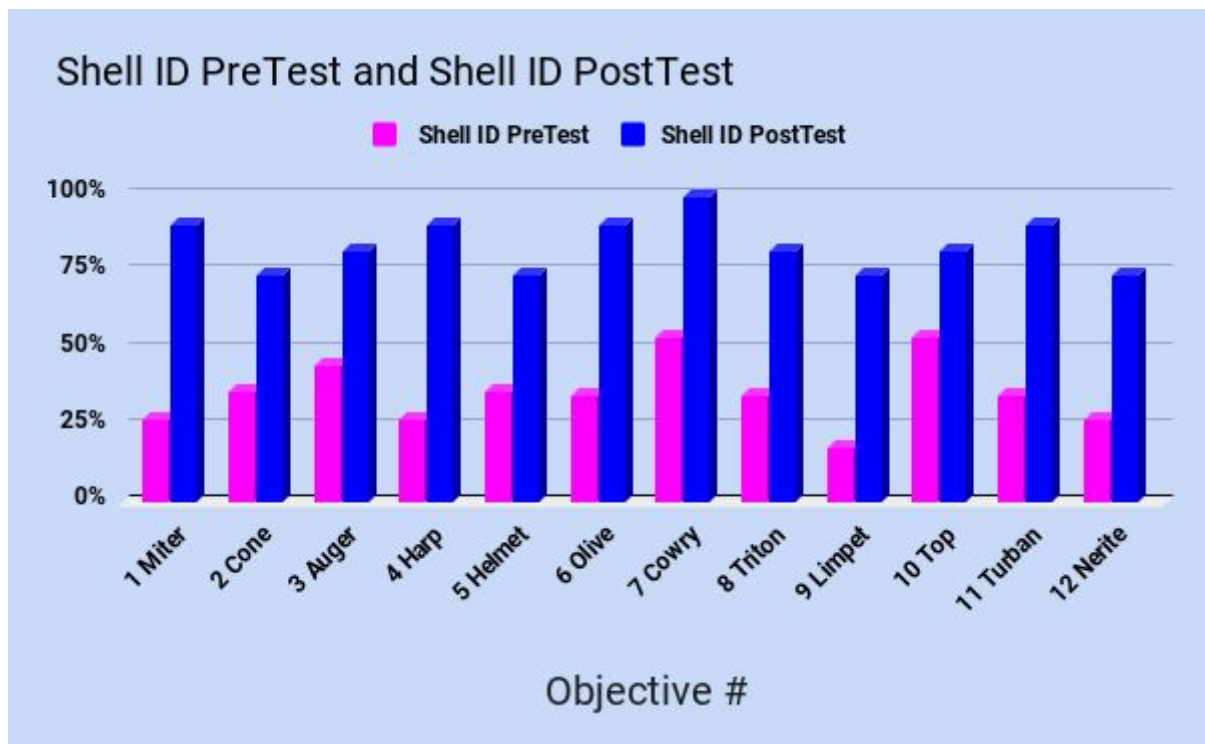
Figure 3. Comparison of Shell ID Pretest and Posttest scores by species learning objective

Pretest and Posttest Comparison Summary

To further analyze the data, please see Figure 4 below which shows for the Volunteer Pretest, the participants scores ranged from a low of 25% to 63%, with a standard deviation of 1.20, and an average score of 41%. With regards to the Volunteer Posttest, the participants scores ranged from a low of 75% to 100%, with a standard deviation of .98, and an average of 85% (Figure 5), providing data evidence of learning gains.

Quiz Summary

AQUARIUM KUMU TRAINING ▾   📊 Student Analysis

μ Average Score	↗ High Score	↘ Low Score	σ Standard Deviation
41%	63%	25%	1.20
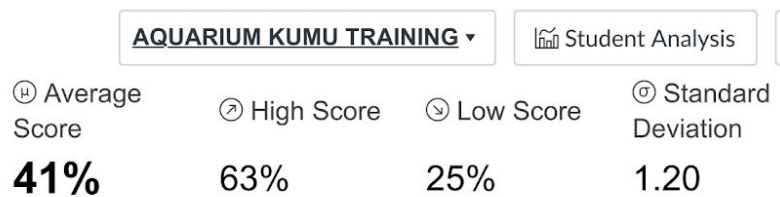
Figure 4. Volunteer Pretest score summary

Quiz Summary

AQUARIUM KUMU TRAINING ▾   📊 Student Analysis

μ Average Score	↗ High Score	↘ Low Score	σ Standard Deviation
85%	100%	75%	0.98
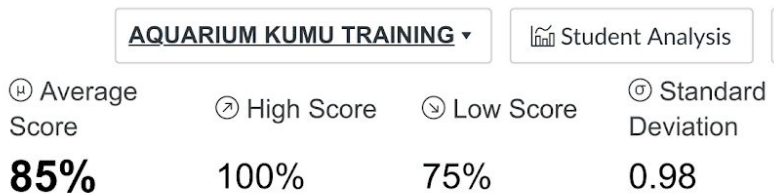
Figure 5. Volunteer Posttest score summary

With respect to the Shell Identification Pretest, the participants scores ranged from a low of 8% to 58%, with a standard deviation of 1.73, and an average of 35%, as shown in Figure 6. The Shell Identification Posttest reveals that the participants scores ranged from a low of 58% to 100%, with a standard deviation of 2.10, and an average of 83% (Figure 7), providing data evidence of learning gains.

Quiz Summary

AQUARIUM KUMU TRAINING ▾   📊 Student Analysis

μ Average Score	↗ High Score	↘ Low Score	σ Standard Deviation
35%	58%	8%	1.73
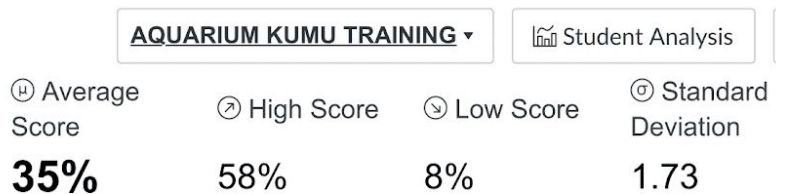
Figure 6. Shell ID Pretest score summary

Quiz Summary

AQUARIUM KUMU TRAINING ▾   📊 Student Analysis

μ Average Score	↗ High Score	↘ Low Score	σ Standard Deviation
83%	100%	58%	2.10
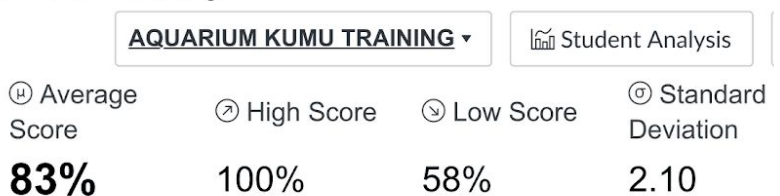
Figure 7. Shell ID Posttest score summary

Discussion

Findings

This study focused on identifying how well an online training module educated volunteers at the Aquarium. Based on the pretest and posttest comparisons, data collected from this study suggests that an online module can work well in providing specific marine biology training. As evidenced by their learning gains, volunteers can gain valuable education from online training modules. The findings from this study compare similarly to previous research in literature pertaining to design elements, pedagogy, and volunteer training strategies, echoing earlier findings by Behrend & Thompson in 2012.

Limitations

One limitation of this research study was the constitution of the sample population. Although representative, participants were not randomly selected from a larger population to participate in this study. This may have biased the sample, though one could conduct further studies with a larger volunteer population to ascertain that. An additional limitation is that there was no concurrent control group that did not study the online modules, yet completed the Pretest, followed by the Posttest three weeks later. The average time it took for the participants to complete the training was 9 days. Therefore, time may or may not have impacted the participants' abilities.

Finally, another possible limitation was the minor modification of questions on the Pretest as compared to the Posttest. Modifications of the questions were made strategically to curtail simple memorization; however, these modifications may have impacted the participants' responses due to the slightly modified content of the modified questions. However, the posttest question modifications assessed the same concepts as the pretest questions and careful consideration was given to ensure content consistency following best practices within the instructional design field.

Suggestions for Further Research

Educational researchers within the field of learning design and technology might consider conducting additional quantitative research to determine if virtual reality would work as a form of virtual volunteer practice. Researchers could design and develop virtual or augmented reality learning modules, which would test the volunteers responses to various prototypical members of the general public in a non-threatening environment. This would provide anxious or novice volunteers the opportunity to gain crucial experience prior to being subjected to the rigors of reality, with volunteers interacting with everyone from virtual toddlers to senior citizens.

Conclusion

In a wider context, this online training opportunity will provide a solid foundation for Aquarium volunteers to provide positive learning opportunities with Aquarium visitors. In a

mutually beneficial relationship, our volunteers will educate visitors about marine biology while instilling a sense of environmental stewardship. The satisfaction level among volunteers is directly correlated with their ability to engage in thoughtful dialogues with Aquarium visitors. Additionally, the field of learning design and technology will benefit from this project's ability to provide a solid case study of instructional design in action bridging the gap between marine biology and volunteerism, all while supporting a sustainable future of global conservation.

Additionally, during the course of this study, it has become clear that online volunteer training should contain both content instruction as well as video demonstrations of appropriate volunteer scenarios, such as working with infants and toddlers. This project supports the use of different outlets of content practice—rather than requiring text or verbally recorded activities—volunteers benefit from embedded quizzes of the content they learned from training. In the future, developing opportunities for practicing through virtual reality volunteering sessions will be a priority. Ultimately, with limited research in the realm of developing curriculum for online volunteer training regarding marine biology in Hawai`i, this study was a significant step forward. This project has demonstrated several methods that should be considered when developing online training for Aquarium volunteers, or volunteers in any informal learning environment such as museums and zoological parks. In reflecting on the need for more research and resources concerning online volunteer training, this project has been registered with Creative Commons, allowing other Aquariums to curate and even modify portions or all of the training to meet their training needs. By continuing to research, develop, and share resources and best practices for online volunteer training, Aquarium staff may gain valuable methods for providing online training to their volunteer base, and thus provide a positive learning experience for their visitors.

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APPENDICES

Appendix A Canvas LMS Modules for Aquarium Kumu Training

Appendix B Sea Snails of Hawai`i

SEA SNAILS OF HAWAI‘I

LIMPET (‘opihi)	TOP	TURBAN	NERITE (pipipi, kūpeʻe)
HELMET	OLIVE	COWRY	TRITON
MITER	CONE	AUGER	HARP

CLASSIFY & LEARN FAMILIES

Appendix C Volunteer Pretest example

Volunteer Pretest

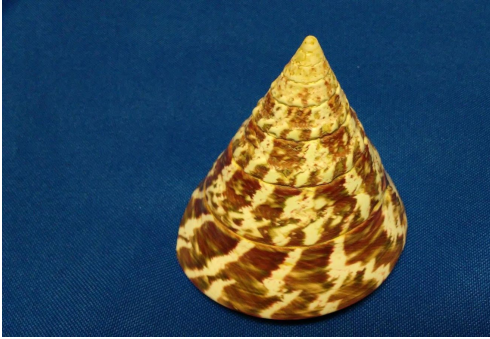| Objective #	Objective Core Concept
1	Describe the time commitment of Volunteer Service Hours
2	Explain how visitors can help the environment and ocean life
3	Describe three Volunteer Benefits
4	List three Kumu Volunteer Responsibilities
5	Explain three steps to becoming a Kumu Volunteer
6	Explain the Waikiki Aquarium Mission statement
7	Describe the Shell Game Objectives for children and adults
8	Explain three Waikiki Aquarium Volunteer Policies
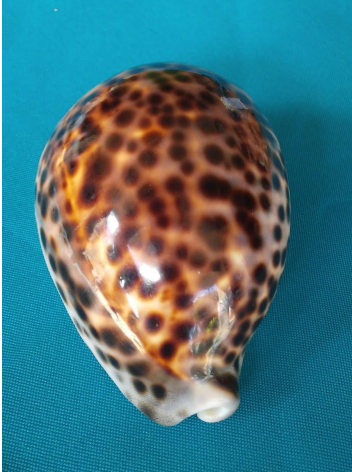
Appendix C Shell Identification Pretest example

Pretest
[Using the Canvas LMS, questions were developed that parallel the content below.]

Directions: Please match the shell with corresponding sea snail family name.

Sea Snail Family Name (Answers)	Shell
Helmet	

Turban	
Cowry	
Top	
Limpet	

Nerite	
Olive	
Miter	
Cone	
Harp	

Triton	
Auger	

Appendix D Shell Identification Posttest example

Posttest

Directions: Please match the shell with corresponding sea snail family name.

Sea Snail Family Name (Answers)	Shell Image Shown
Harp	

Miter	
Triton	
Olive	
Auger	

Top	
Cone	
Cowry	
Turban	

Nerite	
Helmet	
Limpet	

Appendix E Learning Activity for students to complete chart below:

Shell Family Chart

Shell Family Name	Shell Family Description	Shell Family Image
1. Example: Miter	➤ spindle-shaped, cylindrical shell ➤ "teeth" on the inner lip of shell aperture (opening)	
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		
11.		
12.		

Appendix F Learning Objectives

After completing Module 1: Kumu Volunteer Role, the student will be able to:

1. Describe the time commitment required to be an Aquarium Kumu Volunteer
2. Explain Volunteer Training Program expectations
3. Explain the primary responsibilities of an Aquarium Kumu Volunteer

After completing Module 2: Sea Snails of Hawaiʻi, the student will be able to:

1. Identify and describe 12 different families of Sea Snails in Hawai`i
2. Describe Shell Game Objectives for Infant to Adult Learners
3. Enjoy a real-life video of the Shell Game in action, and reflect on techniques

After completing Module 3: Learning Activities, the student will be able to:

1. Identify and describe 12 different families of Sea Snails in Hawai`i
2. Write a descriptive species report about a favorite sea snail species.

Appendix G Content Outline for Instructional Modules

- ➢ Welcome Module
  - ○ Introduction, Canvas LMS Resources
  - ○ Pretest
- ➢ Module 1 Introduction to Aquarium Kumu Training
  - ○ Waikīkī Aquarium Volunteer Programs
  - ○ Module 1 Kumu Quiz
- ➢ Module 2 Sea Snails of Hawaiʻi
  - ○ Sea Snails of Hawai`i Presentation 1, with embedded Quiz
  - ○ Sea Snails of Hawai`i Presentation 2, with embedded Quiz
  - ○ Sea Snails of Hawai`i Presentation 3, with embedded Quiz
  - ○ Study Guide
- ➢ Module 3 Learning Activities
  - ○ Shell Family Chart
  - ○ Species Report
  - ○ Post-test
- ➢ Next Steps Module
  - ○ Kumu Course Wrap-up
  - ○ Aquarium Kumu Summary
  - ○ Self-Reflection Report

Appendix H Course Evaluation

QUESTIONS   RESPONSES

8. Was the course grading policy stated clearly?

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

9. Were you able to track your learning progress during the course of the class?

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

10. Learning objectives are clearly defined

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

11. Course assignments support the learning objectives

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

QUESTIONS   RESPONSES

12. Course assessments align with learning objectives

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

13. Other Comments

Short answer text

Course Resources

This section includes evaluation of the readings, videos, and other resources of the course.

14. Course resources, such as videos, support the learning objectives

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

15. Links to all course materials work, and display properly

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

QUESTIONS   RESPONSES

16. Medium of course materials is varied, as appropriate (readings, videos, etc.)

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

Other Comments

Short answer text

Accessibility

This section includes evaluation of the accessibility of the course.

17. The Aquarium/UH Manoa Nondiscrimination and Accessibility Statement *
is included

○ Yes

○ No

18. Access to content is provided for Trainees with visual or auditory   *
impairments, such as Closed Captions on YouTube videos

	1	2	3	4	5

QUESTIONS   RESPONSES

19. It was made clear who to contact if technology issues arose. *

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

20. Other Comments

Short answer text

Collaboration

This section includes evaluation of opportunities for student interaction and engagement.

21. Did the instructor introduce himself and allow students time to introduce
themselves to one another?

○ Yes

○ No

22. Trainees have a clear opportunity to interact with one another in a discussion
forum

	1	2	3	4	5

Appendix I Discussion Forum

Appendix J Recruitment Email

University of Hawai`i
Consent to Participate in a Research Project
Guerin Earhart, Principal Investigator
Project title: Learning by Design: Aquarium Kumu Training

Aloha,

I'm writing to ask for your help in participating in a research project I'm doing as part of the requirement for my Master's program. The purpose of the project is to evaluate an online instructional module for Aquarium Volunteer Training. Therefore, I invite you to participate in this innovative new training course about basic marine biology, specifically malacology. I hope you will consider participating because of your desire to learn more about marine biology. As an expression of my gratitude for your time, upon completion of this educational experience, I will email you a $5 Starbucks eGift Card. Your willingness to participate is greatly appreciated because your feedback will help to improve the module for future use. Please review the attached consent form for more information on the study and what you'll have to do. If you agree to participate, please confirm receipt of the consent form with a brief email reply. Should you have any questions regarding the study, please feel free to contact me at any time.

Mahalo,

Guerin Earhart
Principal Investigator
gse@hawaii.edu

Appendix K Consent Form

University of Hawai`i
Consent to Participate in a Research Project
Guerin Earhart, Principal Investigator
Project title: Learning by Design: Aquarium Kumu Training

Aloha! My name is Guerin Earhart and you are invited to take part in a research study. I am a graduate student at the University of Hawai`i at Mānoa in the Department of Learning Design and Technology. As part of the requirements for earning my graduate degree, I am doing a research project.

What am I being asked to do?
If you participate in this optional project, you will be asked to complete a brief online course and multiple tests/surveys that are brief in nature and will assess your knowledge of sea snails.

Taking part in this study is your choice.
Your participation in this project is completely voluntary. You may stop participating at any time. If you stop being in the study, there will be no penalty or loss to you.

Why is this study being done?
The purpose of this instructional design project is to develop and evaluate the effectiveness of an online instructional module for training volunteers with basic malacology at the Waikīkī Aquarium. I hope you will consider participating because of your desire to learn more about marine biology. Specifically, this is an optional enrichment opportunity to learn more about sea snails and evaluate the online modules, you will not be graded.

What will happen if I decide to take part in this study?
You will receive an email with a Canvas course link to self-enroll and participate in the course and surveys. The tests and surveys will consist of multiple choice and open-ended questions regarding the course, including feedback on course structure and content. It will take about 1 hour to complete the course. Feedback will be used to determine any additional changes that should be made to the course in the future. Sample questions include:
1. What are three benefits of volunteering at the Waikīkī Aquarium?
2. Identify the sea snail family shown by photo.

What are the risks of taking part in this study?
I believe there is little risk to you for participating in this research project. You may become stressed or uncomfortable answering any of the test/survey questions. If you do become stressed or uncomfortable, you can skip the question or take a break. You can also stop taking the test/survey or you can withdraw from the project altogether.

Compensation
You will receive a $5 Starbucks eGift Card for participating in this study.

Confidentiality and Privacy:
I will not ask you for any personal information, such as your phone number or

address. Please do not include any personal information in your survey responses. I will keep all study data secure in a locked filing cabinet in a locked office/encrypted on a password protected computer. Only my University of Hawai`i advisor and I will have access to the information. Other agencies that have legal permission have the right to review research records. The University of Hawai`i Human Studies Program has the right to review research records for this study.

> **Questions:** If you have any questions about this study, please call or email me at the Waikīkī Aquarium (808) 440-9009 or gse@hawaii.edu
> You may also contact my faculty advisor, Dr. Grace Lin, at
> (808) 956-9989 or gracelin@hawaii.edu
> You may contact the UH Human Studies Program at 808.956.5007 or

uhirb@hawaii.edu to discuss problems, concerns and questions, obtain information, or offer input with an informed individual who is unaffiliated with the specific research protocol. Please visit http://go.hawaii.edu/jRd for more information on your rights as a research participant.

> **To Access the Survey:** Please go to this Canvas link

(**https://canvas.instructure.com/enroll/6JLMNL**) to self-enroll and participate in the course and surveys. If you agree to participate, please confirm receipt of the consent form with a brief email reply. Going to the first page of the course implies your consent to participate in this study.

> Please save a copy of this page for your reference.

> Mahalo for your support.

Appendix L CITI Training Certificates

CITI PROGRAM

Completion Date 21-Feb-2018
Expiration Date 20-Feb-2021
Record ID 25741511

This is to certify that:

Guerin Earhart

Has completed the following CITI Program course:

Human Subjects Research (HSR) (Curriculum Group)
Exempt Researchers and Key Personnel (Course Learner Group)
1 - Basic Course (Stage)

Under requirements set by:

University of Hawaii

CITI
Collaborative Institutional Training Initiative

Verify at www.citiprogram.org/verify/?w55910881-524d-4491-8ecc-4411f21da22b-25741511

Completion Date 23-Feb-2018
Expiration Date 22-Feb-2021
Record ID 26294825

This is to certify that:

Guerin Earhart

Has completed the following CITI Program course:

Information Privacy Security (IPS) (Curriculum Group)
Exempt Researchers and Key Personnel IPS (Course Learner Group)
1 - Basic Course (Stage)

Under requirements set by:

University of Hawaii

Verify at www.citiprogram.org/verify/?wc8073481-7015-499f-a5e1-41a855b563cf-26294825

Appendix M Instructional Design Research Project Goals and Timeline

Date	Task
October	- Begin writing detailed project plan - Begin the IRB approval process - Create data collection tools such as pretest, posttest, and surveys
November	- Continue drafting and revising project plan - Begin designing modules with content - Recruit potential participants
December	- Finalize project plans for approval - Continue designing modules with content
January	- Upon IRB approval begin project implementation - Complete final revisions to your project by Week 2 - Start implementation no later than the end of Week 3 - Conduct Course Evaluation of Modules
February	- Continue implementing project - Finish implementation no later than Week 7 - Finish data analysis and revisions by Week 8 - Administer pretest, collect pretest assessment data
March	- Conduct participant interviews - Administer posttest, collect posttest assessment data - Analyze data - Complete final paper draft
April	- Create TCC Presentation Slides - Conduct TCC Presentation
May	Complete final paper and submit to ScholarSpace