**UHH Boat Operations;**

**Basic Research Techniques**

**Through Instructional Videos**

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**Abstract:** The instructional videos, UHH Boat Operations – Basic Research Techniques, is a new project. The videos were created to describe the research and teaching capabilities of the university's research vessels to new students. I am an Instructor of Marine Science at UH – Hilo. A primary component of my "locus of control" is the instruction of oceanographic techniques for undergraduate marine science students. Students in the MARE 201L course are primarily traditional college students in their freshman or sophomore year. Their exposure to oceanographic research techniques is commonly limited. The videos focus on the R/V *Makani Aha* and how research is conducted during the MARE 201L Course, Introduction to Oceanography. It is hoped by presenting the techniques, research operational efficiency and safety will improve aboard the vessel. Each technique is demonstrated in a three to five minute clip. The students were given a pre-test, following by a presentation of the videos, followed by a post test. Thirty two students participated in the exercise. Post-test scores increased by an average of 56% over pre-test scores, suggesting the videos were effective in familiarizing the students in the research techniques we use aboard the boat.

**Introduction**

The instructional videos, UHH Boat Operations – Basic research Techniques, is a new project. The videos are being created to describe the research and teaching capabilities of the university's research vessels. I am an Instructor of Marine Science at UH - Hilo, completing my fourteenth year of service. Additionally, I am "Captain of the Port", responsible for overall supervision of boat operations as well as Master (Captain) of *Makani Aha*, our 38' power cat Research Vessel.

A primary component of my "locus of control" is the instruction of oceanographic techniques for undergraduate marine science students. Students in the MARE 201L course are primarily traditional college students (aged 18 -22) in their freshman or sophomore year. Approximately 40 % of the students are from Hawaii, 40% from the United States, - Mainland, and 20% from overseas, primarily the Pacific Islands and Japan.

Their exposure to oceanographic research techniques is commonly limited. For this reason, the course starts with teaching basic concepts, such as navigation. The course then builds on the basic oceanographic concepts by adding a new research technique or two each week.

These initial videos focus on the R/V *Makani Aha* and how research is conducted during the MARE 201L Course, Introduction to Oceanography. Specifically, the videos are intended to help introduce MARE 201L students, by the use of the video clips to onboard research techniques before they conduct the actual research at sea. One study suggests that the use of video can be used to increase a learner's attention and thereby their comprehension (Ferdig 2004). Another study states that, “Instructional video works well when it is relevant to the topic, stimulates audience involvement, and is just plain well done". (Bell, 2010). A third study found that High School Chemistry students who had viewed short video clips as part of the course content had post - test scores three times that of their pre - test. This result can be compared to a two fold increase for those students who did not have access to the videos (Harwood).

The course is taught as a traditional face to face lab class. The class meets once a week for four hours throughout the semester, approximately fifteen weeks. The course is a two credit lab. In its current format, oceanographic concepts and techniques are introduced first in a classroom setting then the technique is practiced aboard the *Mahani Aha*.

Even though the reason for conducting the research is discussed prior to being on the boat, the students don't see the actual technique until we demonstrate it at sea. It is hoped by presenting the techniques, by means of video clips, research operational efficiency and safety awareness will improve aboard the vessel. Although safety is of the utmost priority, increased efficiency will maximize effort vs. time on the boat; boat time is expensive, *Makani Aha*'s charter rate is $1000.00/day.

**Methods**

This instructional design project was constructed using the ADDIE Model; analysis, design, development, implementation, and evaluation. Through analysis it was determined students needed to be introduced to the research techniques utilized on the boat before actually being on the boat. The instructors for the course defined that improved operational efficiency and an increased awareness of safety were the most important goals to address. Specifically, it was desired that students would be able to meet the terminal objective. The objective being; "Given a standard oceanographic parameter to sample, students will be able to choose the appropriate instrument, and then demonstrate how to prep and safely deploy the gear to acquire the specified sample".

A series of instructional videos were designed to meet these goals. The videos followed a common format. The videos showed instructors and students demonstrating the research methods aboard the boat. The instruments were first introduced, and then the methods used to sample, utilizing the instruments, were shown. Minimal captions were used. This lack of captioning will be revisited in the discussion section of this paper. Pre-test and post-test questions were also written to evaluate the perceived effectiveness of the videos.

Five research techniques were videotaped during development. After initial screening of the videos to colleagues and former Mare 210 L students, three were chosen for this initial phase. The videos clips, three to five minutes in length, were reedited based on reviewer comments following the initial screening. A study by Pomales - Garcia and Liu, suggest that short instructional videos were perceived to be more attractive and easier to comprehend than text based modules (Pomales - Garcia, Liu 2006).

In the implementation phase, the videos were shown to three sections of the Mare 201 lab. The videos were shown in class. A total of thirty – two students watched the videos. Prior to viewing, each student completed a pre-test and the videos were followed by a post-test. The pre and post - tests were administered by paper and pencil. The tests consisted of eighteen objective short answer questions. Each question had a definitive correct answer. Each correct answer was presented at least once in the videos. Student comments were also solicited regarding how to improve the videos. The test scores and student comments were used to evaluate the effectiveness of the videos.

**Results**

All thirty two students showed an improvement in their post-test versus their pre-test scores. (Figure 1.) No differences were detected between the three lab sections’ scores and the raw scores were then pooled. (Figure 2.) A two sample t-test was conducted. A significant difference was detected between the post-test versus pre-test scores. (Figure 3. and Table 1.) The mean number of correct answers increased from 3.3 correct in the pre - test to 12.8 in the post - test. Thus an increase of 9.6 correct answers. Stated another way, the students’ post-test versus pre-test scores increased by an average of 56 points. (maximum points = 100)

Figure 1.

Figure 2.

**Figure 3.**

**Table 1.**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Pre | Post | Raw Gain | Point Increase |
| Mean | 3.28 | 12.84 | 9.56 | 56.25 |
| ST. Dev | 1.73 | 2.07 | 2.50 | 14.71 |
| SQ. Root | 5.66 | 5.66 | 5.66 | 5.66 |
| ST. Error | 0.31 | 0.37 | 0.44 | 2.60 |
| Population 1 < Population 2: P-Value = > .99 |

**Discussion**

Based on the students’ improvement in test scores and a number of their comments, this initial phase of instructional videos seems to be an effective means of familiarizing MARE 201 Lab students with research procedures aboard the UHH Research Vessel. When answering the post-test question, “What are the three basic yet very important concepts to keep in mind whenever working on the boat?”, greater than 50% of the students answered all three correctly. For the question, “We most commonly use the YSI meter to measure?”, 84% answered all three correctly; temperature, salinity, and dissolved oxygen. The first time the Mare 201 L students were introduced to this information was via the videos. Answers to the questions, What are the two common methods we use to sample sediments?”, and “What are their primary advantages and disadvantages?”, also showed great improvement in post-test versus pre-test scores. Some of the more esoteric questions such as, “Which probe has a membrane that must be kept moist?”, and “The units we use to most commonly describe dissolved oxygen are?”, did not show as large as an improvement in post-test scores. Although the test questions were clear, and to the point, the answers to these two questions were perhaps not emphasized adequately in the videos. Overall, however, the videos are deemed to be effective at reaching their goal; familiarizing students with our research techniques and safety requirements aboard the UHH *Makani Aha.*

By reviewing comments from colleagues, prior lab students, and current students who participated in this project, some suggestions to improve the videos will be discussed.

A number of the comments suggested the videos are fine as is;

“They are great”

“The video is fine”

“Movie was perfect”

“Simple and straight forward”

“They worked well and don’t need any improvement”

“None – good video”

Appreciatively, some valuable insight in how to improve the videos was also obtained. The primary suggestion gleaned from the comments is to reinforce some of the important information by means of more text slides or graphic overlays. For example, the segment showing the units used to describe dissolved oxygen could have been strengthened by having a text overlay reading “mg/l”. These text overlays, or captions, would likely result in better post-test scores on the questions answered incorrectly in this initial phase of videos. After completion of the first phase of instructional videos, some other revisions to improve the videos have been identified. Due to operational difficulties with our primary Research Vessel *Makani Aha*, the choice was made to attempt to shoot the videos while acting as instructor, boat operator, and cameraman, simultaneously. This approach was not effective. It is highly recommended a dedicated videographer be employed to acquire high quality video and audio. Additionally, being familiar with and comfortable with the editing software chosen is essential. After trying four different editing programs, Sony Movie Studio Platinum was selected. This Sony product seemed to interface the best with the video acquired with a Sony HD camera. These and other suggestions will be taken into consideration for phase two, UHH Boat Operations; Basic Research Techniques through Instructional Videos. The use of this next set of improved videos will facilitate the ultimate goal of helping UHH marine science students to safely and efficiently conduct oceanographic research.

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