

**Marine Advanced Technology Education Center
Summer Institute in Professional and Curriculum
Development
Teachers and Technology: ROVing the Oceans**

**Report for 2000
Nicole Crane & Sandra Butcher
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I. Introduction:

The MATE Center hosted its second annual NSF-sponsored summer institute in professional and curriculum development July 23-28, 2000. Faculty members from high schools, community colleges and four-year universities all gathered at California State University, Monterey Bay (CSUMB) in Seaside, CA for the purpose of gaining a better understanding of the uses, design, fabrication, and classroom applications of Remotely-Operated Vehicles (ROVs). The goals for the summer institute were for instructors to work with other instructors and with technical experts from industry and research organizations to:

- Experience and understand the type of work that ROV marine technicians do now and in the future.
- Experience and understand the types of emerging technologies used and their general application in the marine environment.
- Create interdisciplinary technology-rich curriculum modules that address real-world marine problems.

The specific objectives of the institute were for participants to:

- Develop a curriculum module using ROVs as the theme (and the activity), while incorporating information from the MATE Center, the Monterey Bay Aquarium Research Institute, and other marine-related resources.
- Incorporate industry guidelines and SCANS guidelines into the curriculum module.
- Develop assessment strategies for the curriculum module.
- Determine curriculum outcomes that can become more complex as they are applied to high school, community college, and university courses (2+2+2).
- Develop teaching and learning strategies to integrate marine-related problems and issues into curriculum (problem-based learning techniques).
- Gain a deeper understanding of ROVs: uses, applications, and design.
- Work in small teams to build an ROV.
- Design and carry out a mission for the ROV.

II. Overview:

A. General summary:

For the most part, we were able to follow the agenda and achieve our daily objectives and over all institute objectives. Participants did feel that they should have had more time to put together their curriculum modules and that this part of the week should have been done all at one time. Participants also stated that it would have been useful to talk about the module expectations during the Monday morning session. They thought that this would have helped them to focus better throughout the week.

The presentations on Monday were great, but should have allowed more time for participants to stretch, get snacks and drinks, and go to the bathroom. A break every hour and a half would have been great. The site-visit to MBARI was great; participants listened to talks, saw the ROV *Ventana* on board the research vessel *Point Lobos*, and watched an AUV being launched and recovered.

On Tuesday morning, Chris Hasegawa of California State University Monterey Bay talked about pedagogy, curriculum development, and learning outcomes. These two days set the stage for the two primary concurrent activities of the institute: building ROVs, and 'building' curriculum modules to go along with the ROVs.

Tuesday afternoon, participants began building their ROVs. The Instructors began with ROV design and building protocols, as well as a safety briefing. Design, fabrication, and mission development were left up to teams of 3-4 teachers. Harry Bohm's book, "Build your own underwater robot" was available as a guide. The building went very well and lasted through the evening. The teams of teachers, where possible, included a mixture of teachers with an electronics background, with those who were more science oriented.

Wednesday began with time for participants to work on their curriculum modules. They were given information about the MATE Center's Knowledge and Skill Guidelines, as well as guidelines for module development. The afternoon was set aside for more building time.

Thursday's schedule was changed so that participants could have the opportunity to see the Monterey Bay Aquarium in the morning. In the afternoon, Amy Driscoll of CSUMB gave a workshop on assessments, learning outcomes and pedagogy. Institute participants were given a chance to work on their own curriculum modules during the workshop.

The culmination and certainly the highlight of the week took place on Friday at the Monterey Peninsula College swimming pool, where participants were given the opportunity to complete their missions. After each mission was complete, we set up an obstacle course so that each of the groups could compete against each other. They were required to maneuver around and through objects. The winning group was then highlighted in the MATE Newsletter.

Friday afternoon was spent listening to presentations from participant groups. They each gave a brief description of their mission and how they would implement the weeks activities in their classrooms. To end the institute, there was an evaluation handed out, a final barbecue, and the raffle. All participants were very excited about what they had accomplished during the week and continued talking during the barbecue about how they might collaborate with each other and with the MATE Center. After dinner, we raffled off five of the ROVs to people who had bought tickets during the week. The night ended on a very high note, with all participants being excited to go home and implement the information that they had learned.

B. Curriculum Products:

A curriculum module was produced by each of the ten groups, which were the same groups that built the ROV together. All of the modules were based on each group's individual mission. The modules are available from the MATE Center. The following is a list of the module titles:

- "ROVing Lake Ocatchoebe"
- "Remotely Piloted Vehicle"
- "ROV design and construction"

- "Stealth ROV"
- "Getting to the bottom of sediment"
- "Inland Seas ROV construction and skills module"
- Four modules have yet to be titled.

C. Overall evaluation of the institute:

According to the summary of the participant evaluations, the summer institute was a great success! Participants were able to gather valuable information and network with people from throughout the country to get new ideas for their classrooms. The institute could be strengthened in the following ways, to allow participants to absorb all of the information that they are given:

- allow participants more time to work together and talk about what they are doing at their institutions.
- shorter days, to allow participants to think about the day.
- shorter presentations, with more time scheduled for hands-on activities.
- present all of the curriculum building information in the beginning and then start to develop the ROV.
- allow more time to build the ROV.
- a pre-institute assessment would allow speakers to tailor their talks around the knowledge that the participants already have and where they may need to strengthen their knowledge.

The following topics were recommended for future institutes:

- build 1 person submersible
- Fisheries Technology: Past, Present, Future
- ROVs again
- Other Marine sampling techniques - sonar, nets, water samplings, temp. sensors/probes
- Intertidal exploration & scientific diving

III. Organization:

A. Introduction:

Saundra Butcher and Nicole Crane took the lead in planning the 2000 MATE Center Summer Institute with support, organization, and participation from all the MATE staff. Saundra Butcher directed the organization of the event, and provided the primary leadership during the Institute.

Harry Bohm, faculty and lab Director at Simon Frasier University in Canada, and Gary Scott, curriculum and faculty development coordinator in Los Angeles County, were co-instructors at the Institute. They directed the development of the ROV planning and building portions of the institute, and led the teachers through the completion of their ROV missions in the MPC pool.

B. Participant Selection Process:

The MATE Center staff (Nicole, Deidre, Jim, Jill, and Saundra) met in early June to select 30 participants from the applicant list. Every applicant but one was in the marine science or marine technology fields. The criteria that we based our selections on were the following:

- Community college instructors
- High school instructors
- University instructors
- Previous experience and interest in marine technology
- Serving student population that is traditionally underrepresented in sciences and technology.

C. Participant Information Packet:

Three weeks prior to the institute, all participants received an information packet containing the following items:

- A cover letter;
- A draft agenda;
- A list of participants;
- A brief description of the MATE Center with contact information;
- A MATE Newsletter;
- An example of how MBARI uses one of their ROVs;
- Useful website list for further information about ROVs;
- Information about how the University of Delaware has used ROVs;
- An example of how a high school instructor built an ROV in the classroom;
- Maps and background information about the Monterey Bay area and accommodations at CSUMB.

D. Collaboration with local organizations

The Monterey Bay Aquarium Research Institute was an important sponsor of the Institute. They provided a facility for talks, and a tour of the ROV and ship operations. Bill Kirkwood (engineering), Jim McFarlane (technical ops and ROVs), and George Matsumoto (uses of ROVs in science operations), Division directors at MBARI gave lectures on uses, fabrication and history of ROVs. Two MBARI interns gave a presentation on AUVs, and the future of ocean robotics. MBARI also made three sets of slides: : benthic sampling, mid-water sampling, and MBARI facilities, available to the teachers at cost.

The Monterey Bay Aquarium made their facility available for a live-link presentation to the teachers, and a tour of the aquarium. This is always a big hit.