

ON THE TECHNOLOGICAL REQUIREMENTS OF MARINE EDUCATION

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An urgent need is felt to promote larger student involvement and provide adequate encouragement/equipment in marine educational programmes throughout the world. The paper underlines in a phased manner the systematic analysis required in marine education. Analytical approaches are proposed incorporating the experience gained by oceanographic operations using modern marine technology. On the job training, academic preparation and curriculum development have been highlighted.

1. INTRODUCTION

There appears a gap to exist between the marine scientists and oceanographers (making great advances in the understanding of the oceans). There is a need to fill this gap, to communicate the research findings of marine technology to educational institutions and users. We look at the sea for many of our basic needs, such as minerals, fresh water, drugs, recreation and indeed for living space itself. There is a need for an educational curriculum to disseminate knowledge, to promote marine education, to create an understanding, and co-relate this understanding of the oceans more closely to society by using the techniques developed on land based on our experience at sea [1].

Synoptic observations are very common to an oceanographer. Oceanography is progressing from boats, to ships, manned buoys to unmanned stations, on-board data storage to transmitting buoys, (may be) from floating factories to future ocean

cities. Engineering and technology can easily establish a link between science and society. To disseminate the knowledge widely, we have to promote seriously education about the oceans and seas around us, by finding out ways the sea touches people by providing physical, intellectual and cultural needs. In addition to the tremendous advances of technology on land and aviation, marine technology is also developing at a rapid pace.

2. METHODOLOGIES

An urgent need is being felt to promote larger student involvement and provide adequate encouragement/equipment in marine educational programmes throughout the world. The potential scientific educational benefits anticipated are enormous. However, the operational resources required to obtain these benefits are presented in the following paragraphs.

With the comprehensive combination of the needs of marine science education to marine technology : there is an immense amount of oceanographic data that is gathering attention on the need for a global automatic data acquisition forum (from different sites at sea to the data centre).

With the advancement of knowledge in the field of oceanographic instrumentation, marine educational programmes have received a new direction. Marine educational courses in marine instrumentation under various categories such as

- Measurement of marine meteorological and physical oceanographic parameters;
- Wave measurements in the ocean;
- Methods of exploring the ocean floor;
- Marine geophysical measurements;
- Marine biological measurements;

- Oceanographic data buoys;
- Remote sensing of the oceans.

The main demands of marine measurements call for measurement skills in all phases of marine science. In particular the observations [2] include

- *physical
 - temperature (air, sea)
 - barometric pressure
 - solar radiation
 - wind speed and direction
 - current speed and direction
 - tides
- *chemical
 - pH
 - dissolved oxygen
 - salinity (conductivity, temperature and depth)
 - density
 - nitrate, nitrite, silicate, phosphate
 - hydrocarbons.
- *biological-
 - chlorophyl
 - fish findels
- *ocean engineering
 - wave (period, height, direction).

In addition a need for international oceanographic data centre has come to stay due to the large amount of global marine data available today in various national marine laboratories and data centres.

As pointed out by Della M. McCaughan and Mary Landry [3], we cannot keep abreast of any technological field unless strong foundations in education and training exist for young people. They further emphasize that educators must meet a grave challenge to prepare young people to fulfill the increasingly complex career demands of all aspects of marine technology.

One thing that needs certain emphasis in the fact that marine educational programmes cannot have "holes" in technology acquisition plans.

One of the technological developments which will be highly useful in any marine educational program is to maintain the level of contact, particularly with the present day expanding horizons and geographically separated organisations : VIDEO CONFERENCING and TELECONFERENCING. Video conferencing can literally enable us to be

in two places at once and with most teleconferencing systems now being built to international CCITT communication standards, the two connecting places could be almost anywhere [4]. If we consider the ability to discuss a situation from an oceanographic platform/laboratory or a station in Antarctica, face to face, with a group of individuals on the other side of the world, without even leaving the classroom. Video conferencing makes it as simple as that. In fact, the OCEANS '88 participation and presentations could be thought of in these lines for greater participation and discussing facilities including marine scientists from their field laboratories.

Some lessons provide a better understanding of the technological impacts on marine education, viz;

- i) well-thought-of methods to identify and specify future needed marine educational outlook;
 - ii) to identify and incorporate/include a "leader"/"champion"/"pioneer" who spearheads the marine educational programme;
- and iii) to make technology transfer to educational organisations.

In general, the better idea of the scope of the marine studies could be illustrated in many ways:

- listing of broad technological needs desired by marine sciences,
- assigning priorities to the needs,
- specifying future needs with the desired performance boundaries (such as "marine-grade power sources", "satellite communications", etc.).
- projecting the desired subsystem improvements.

According to Ranson Baldwin [5] Scientific and technological inquiry are the activities that raise the level of technology and permit economic progress. Thus, the responsibility of educational planners is to make universally available the competencies involved in discovering new knowledge, while the responsibility of economic planners is to make universally available the opportunity to participate in applying new knowledge.

As technology advances, the amount of formal education necessary for its mastery has increased. The lesson highlighted by Baldwin Ranson is that the planning objective is not dictated by any occupational

structure, but rather by the nature of technological progress: the more one knows, the more he can learn. Transmitting the ability to adapt to evolving technological opportunities will maximise progress as well as educational excellence, by the growing potential for the better understanding of the oceans for the social well-being of the entire community.

3. CONCLUSION

The marine educational programme has greatly benefitted from the new technological achievements and capabilities which include

- i) the acquisition of near real-time marine data;
- ii) the capabilities of communication systems with low-power devices and computerisation at the front end;
- and iii) the fast response time of marine-grade Sensors.

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5. REFERENCES

- (1) UNESCO (1984). Ocean Science for the year 2000.
- (2) Desa E, Nayak M R. Marine Instrumentation-- Review. Proc. of Natl. Symp. on Professional Electronics 1984. 32-45.
- (3) Della M, McCaughan and Mary Landry (1980). Marine Technology 80s strengthened by Marine Education. Proc. Conf. MTS (Oct, 1980). 257-260.
- (4) Nayak M R. Information Management -- The Next Generation. Int. J. Systems Research & Info Science, Gordon Breach Sc. Pub. Inc (UK). (Accepted for publication, 1987).
- (5) Ranson Baldwin (1986). Planning Education for Economic Progress: Distinguishing Occupational Demands from Technological Possibilities. JEI Vol. XX, No. 4, Dec. 1986, 1053-1065.