Vanden Berghe E., M. Brown, M.J. Costello, C. Heip, S. Levitus and P. Pissierssens (Eds). 2004. p. 39-44
Proceedings of 'The Colour of Ocean Data' Symposium, Brussels, 25-27 November 2002
IOC Workshop Report 188 (UNESCO, Paris). x + 308 pp.
– also published as VLIZ Special Publication 16

OceanTeacher: building capacity in oceanographic data and information management

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Abstract

Within the framework of the International Oceanographic Data and Information Exchange (IODE) program, the IOC has developed a capacity building program to train data and information managers in developing countries with the objective of establishing and strengthening National Oceanographic Data and Information Centres. As part of these capacity building activities, IODE has developed OceanTeacher, a comprehensive self-training and resource tool for oceanographic data and information management.

OceanTeacher is a browser-driven system designed to provide training tools used primarily during IODE capacity building courses but also for self-training and continuous professional development. The OceanTeacher system comprises two components: the IODE Resource Kit and the Resource Kit Training Manual. The Resource Kit contains a range of marine data-management and information-management material, including software, quality control and analysis strategies, training manuals, and relevant IOC documents. The Resource Kit Manual is a collection of outlines, notes, examples, and miscellaneous class work documents used in conjunction with the Resource Kit to organize a training program in marine data and information management.

This paper details the OceanTeacher system and describes the approach being taken by IODE in providing capacity building to assist developing countries including regional group training courses and workshops to instruct data centre managers in the different aspects of oceanographic data and information management.

Keywords: Capacity building; Distance learning; Oceanographic data management.

Introduction

The International Oceanographic Data and Information Exchange (IODE) program of the IOC has developed the OceanTeacher system, a comprehensive training and self-study tool for ocean data and information management to support its capacity building strategy.

OceanTeacher contains a range of marine data management and information management material, including software, quality control and analysis strategies, training manuals, and relevant IOC documents. It is an extensive self-training and resource tool for newly established Oceanographic Data Centres, designed to assist managers and staff members to acquire the skills to set up and run new IODE centres. It provides a broad spectrum of background

information on global data and information archiving activities, specifications for data storage in standard formats, and the software tools needed to perform many quality control, sub-setting, and analyses techniques. In addition, datasets and information relevant to specific geographical regions are provided as a plug-in 'custom pack'. While aimed at developing countries, OceanTeacher is of significant value to developed countries and their marine science agencies.

IODE data and information management capacity building

Capacity building has always been an important component of the IODE program since its inception in 1961. Assisting member states to acquire and build the necessary resources for ocean data and information management is an essential and critical part of all IODE activities. Training courses, mostly hosted by National Oceanographic Data Centres, have been held annually with resource persons from the IODE community providing instruction.

Although these training courses have been successful in training data centre staff, the IODE program had never reached the stage where an agreement was made on a 'standard curriculum'. This meant that courses and their content could vary from course to course and that the course programs were not necessarily in line with the requirements of the participants. As these training courses were mostly one-off activities, the long-term impact was often disappointing, as the participating countries did not have the necessary infrastructure to implement the acquired knowledge. There was little or no follow-up to the courses, so the impact of the course on the participants' day-to-day work could not be monitored.

Regional networks as a structure for IODE capacity building

IOC activities in developing countries are mostly organised using a regional approach. The IOC regions include IOCINCWIO (North and Central Western Indian Ocean - 'Eastern Africa'), IOCEA (Central Eastern Atlantic - 'Western Africa'), IOCARIBE (Caribbean and adjacent region), IOCINDIO (Central Indian Ocean), WESTPAC (Western Pacific region), Black Sea and Southern Oceans regions. The IODE program has recognized the importance of building networks based on this regional structure. This approach has many advantages such as:

- Promotion of communication between members of the network;
- Promotion of south-south cooperation in training and institutional capacity building;
- Facilitating collaboration with other programs and projects;
- Facilitating follow-up for training activities;
- Facilitating exchange of data and information using compatible technologies and formats.

Ocean data and information networks

Since 1998 the IOC has been developing and enhancing the new ODIN (Ocean Data and Information Network) capacity building strategy that links training to infrastructure and operations. These networks promote regional cooperation, data exchange and creation of regional data products. The first project to be implemented under this new strategy was the ODINEA project for seven East African countries in the IOCINCWIO region. In order to support this new capacity building strategy, IODE began the development of a CD-ROM based 'NODC-In-A-Box' product. This product proved to be a useful capacity building tool and

provided both the tools and instruction on how to manage and manipulate oceanographic data as well as providing basic regional datasets. In 1998 it was decided to implement a Pilot Project for the development of a computer-based training tool based on the ODINEA CD-ROM, to be called the 'IODE Resource Kit'.

The success of the ODINEA project led to the development, and approval by a donor, of the ODINAFRICA II project involving 20 African member states. This project has a duration of three years and a budget of US$4 million. The objectives of the ODINAFRICA-II project are:

- Providing assistance in the development and operation of National Oceanographic Data (and Information) Centres and establish their networking in Africa;
- Providing training opportunities in marine data and information management applying standard formats and methodologies as defined by the IODE;
- Assist in the development and maintenance of national, regional and Pan-African marine metadata, information and data holding databases;
- Assist in the development and dissemination of marine and coastal data and information products responding to the needs of a wide variety of user groups using national and regional networks.

The first ODINAFRICA II capacity building workshop on ocean data management was held in April 2001 and the existing IODE Resource Kit was expanded to include a Training Manual and was renamed OceanTeacher.

Ocean teacher

OceanTeacher is a browser-based training and self-study tool for ocean data and information management. It is used in IODE capacity building programs and also for self-training and continuous professional development. OceanTeacher comprises two components: i) the IODE Resource Kit, and ii) the Resource Kit Training Manual. The Resource Kit contains a range of marine data-management and information-management material, including software, quality control and analysis strategies, training manuals, and relevant IOC documents. The Resource Kit Training Manual is a collection of outlines, notes, examples, and miscellaneous class work documents used in conjunction with the Resource Kit to organise a training program in marine data and information management. OceanTeacher can be viewed with a web browser either on-line or off-line. A CD-ROM version can be prepared at any time for use in capacity building workshops or for distribution to interested organisations or individuals. It is not essential that users have internet connection to use the system.

IODE Resource Kit

The IODE Resource Kit is a comprehensive self-training and resource tool for newly established Oceanographic Data Centres, designed to assist managers and staff members to acquire the skills to set up and run IODE data centres. It contains a range of marine data-management and information-management materials, including software, quality control and analysis strategies, training manuals, and relevant IOC documents. The Resource Kit provides a broad spectrum of background information on global data and information archiving activities, specifications for

data storage in standard formats, and the software tools to perform many quality-control, subsetting, and analyses techniques.

The Resource Kit is modular in design and contains three basic modules:

- Module 1. IODE Data Centre System
- Module 2. Data Management Systems
- Module 3: Data Analysis and Products

Module 1 discusses the roles and responsibilities of an oceanographic data centre and describes the IODE global network system of data centres. It further describes data and information management within a science program and how the data manager can provide valuable data and information sources to managers and project scientists during a science program. A comprehensive reference library containing relevant IOC manuals and guides, online tutorials and standard reference material is also included.

Module 2 describes some of the skills essential for an ocean data manager including computer systems, database technology, metadata and information management, data observation and collection instructions, data quality control, the use of the internet for data and information exchange, and an introduction to geographical information systems.

Module 3 describes in detail a number of data formats and the source of collateral data. It also includes a data classroom and software toolbox. The data classroom provides a training curriculum in the use of selected software to quality control and analyse ocean station data, using software tools such as the Ocean Data View program, and standard spreadsheet and relational database programs. The data classroom emphasises the connections between available software and global databases, based on the use of common formats. The software toolbox provides a number of useful software tools that can be immediately installed and run. Manuals and test datasets are included. These software packages are freeware and shareware applications.

The modular approach taken with the development of the Resource Kit enables i) selected experts to contribute and regularly update the content; and ii) course programs to be designed based on individual, national or regional priorities using material from each module.

Data management training manual

The Data Management Training Manual is a collection of outlines, notes, examples, and miscellaneous class work documents that can be used in combination with the IODE Resource Kit. The aim of OceanTeacher has been to organise the original source documents and reference materials into the Resource Kit itself, while saving the instructional materials that point to these documents for the Training Manual. The Manual and its inherent course outline have been developed over a number of years, principally during IODE training workshops for the ODINEA project. The long-term exercises, referred to as 'Intersessional Goals,' are those pioneered by the ODINEA participants. It was felt that the best way to learn the material in the Resource Kit was to undertake real-world projects to find, quality control, analyse, synthesise, and publish marine data and information.

A typical ocean data management workshop would cover:

- Basic computer skills
- The importance of marine data in general, and within the national and regional environment in particular
- How to set up an oceanographic data centre within the IODE System
- The infrastructure requirements, including hardware and software tools
- How to manipulate and analyse the principal types and formats of marine data
- How to produce ocean data products and to disseminate these products, both over the internet and by traditional methods

The topics covered are based on material from the Resource Kit, although not necessarily all during the same workshop session. Some topics are covered only once, while others are taught more than once, but at increasing levels of difficulty, during the 3-year training cycle.

Information management training manual

The Marine Information Management Training Manual provides a foundation for the professional education essential for the modern information worker. It is currently available in two volumes:

- Course 1. Basic introduction to marine information management, information concepts; information software and technology and the organisation of the collection using a defined integrated library management system (ILMS).
- Course 2. Building on Course 1. Advanced applications of ILMS; creation of research support services and information seeking and retrieval particularly in the electronic environment.

As well as specific information handling techniques, particularly in the electronic environment, students examine the political, economic and social context of the formation of an information centre. Teaching is underpinned by relevant research and utilises web-based learning modules as well as practical exercises. Topics covered include:

- Evaluate and assess the information requirements of the organisation
- Project manage the creation of an information centre in the organisation
- Understand the software and hardware required to underpin information management
- Apply efficient techniques to information seeking exercises
- Build, organise and document a library collection both paper and electronic
- Use the defined integrated library management system to support all management activities
- Set up and maintain research support services
- Identify the major electronic resources in marine science and organise access
- Oversee the production of internal publications and advise on e-publishing
- Introduce the concept of knowledge management to the organisation
- Network within the activities of marine science information associations
- Identify opportunities for continued professional education
- Provide information skills training on marine science resources to Information Centre users

Regional data collections

The Ocean Data Management Training Manual is supplemented by regional data collections containing marine and coastal data for use in environmental analyses. The underlying goal of the collections is to provide the user with data that can be synthesized, particularly in Geographic Information System (GIS).

Regional datasets have been prepared for various training courses, including:

- IOCINCWIO Regional Data Collection (coverage from 15o E to 80o E, 0o to 40o S)
- IOCEA Regional Data Collection (coverage from 50o W to 20o E, 0o to 40o N)
- Red Sea Data Collection (coverage from 10o N to 30o N, 30o E to 50o E)
- ODINCARSA Regional Data Collection (coverage from 33o N to 65o S, 120o W to 50o W)
- Africa Update (WOD01) Data Collection

Typically, these regional data collections contain the following specific data types:

- Base Mapping (Bathymetry, Coastlines)
- Chemistry and Hydrography (Chlorophyll, Nitrate, Nutrients, Phosphate, Ocean Station Data, Oxygen, Salinity, Sea Temperature)
- Geology and Soils (Geophysics, Soils)
- Meteorology (Air Temperature, Precipitation, Winds)
- Physical Oceanography (Currents, Waves)
- Terrestrial Biology (Land Cover, Vegetation)

All regional data collections are available on CD-ROM and on-line at the OceanTeacher site.

Conclusion

The Ocean Data and Information Network capacity building strategy, developed by IODE programme, links training to infrastructure and data centre operations. This model has proved to be successful within the African and South American framework and will be expanded to include other regions. The OceanTeacher system is an important component of this strategy – providing a training and self-study tool for ocean data and information management for use in IODE capacity building programs and also for self-training and continuous professional development. The aim of OceanTeacher is not just to train individual scientists, but also to build new training capacity in the participating institutions. Toward this end, OceanTeacher is designed to let former students become new local trainers.

The IODE program of IOC will continue to develop and maintain the OceanTeacher system as both an on-line and off-line resource to support its capacity building strategy. The on-line version of it is available at OceanTeacher.org. A CD-ROM version, for off-line viewing, can be ordered from IOC.