Hydrography and Cartography education: New challenges, new standards

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Plan

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The International Board for Standards of Competences

- 10 members from parents organisations (4 FIG, 4 IHO and 2 ICA), from governmental, educational and civil sector;
- Experienced professionals in education, hydrography and cartography, from various areas of the world (Australia, France, Caribbean, Germany, Greece, India, Malaysia, New-Zealand, UK, USA)
The role of the Board

- **Review** syllabi of programmes and individual recognition schemes from education and training organizations (50 recognized programs, 18-20 submissions in Dec 2013);
- **Maintain IBSC publications**
- **Provide guidance** to education and training institutions;
- **Supports the IHB** for the establishment of new hydrographic programs where regional training capacity does not exist.
Hydrography and Cartography context (1)

• New use of the seas has shifted hydrographic products from safety of navigation purposes to a wide variety of applications:
  – Renewable energy;
  – Marine environment issues (habitat mapping, coastal erosion, ...);
  – Remote bathymetry (Unmanned Vehicles, Satellite);
  – Wide variety of scales (subsea infrastructure mapping, regional satellite bathymetry);

• Increased complexity of field operations and of survey systems components.
Environmental Acoustics, LiDAR
Geodesy and Inertial measurements
Positioning (surface, subsea)
Acquisition devices and software
Data processing and visualization tools

Hydrographic /cartographic data

Processing

Analysis

Sounding selection, generalization

Physics

Applied mathematics

Information Technologies

Cat. A/B level

Reactivity
Autonomy
Independent thinking

Hydrography/Cartography Education and Training

Hydrographic Services
Hydro/Carto systems and processing tools
Industry

Mobile mapping systems

Digital Hydrography on the Maritime Web
Hydrography and Cartography context (2)

• Advanced positioning methods, advanced ranging devices, more and more complex and integrated survey systems

• Increasing amount of hydrographic data (multibeam, water column, LiDAR, Satellite imagery) requires advanced data processing and management systems:
  – Data cleaning, quality control, modelling;
  – Sounding selection, chart generalization, dynamic ENCs;
  – Data management and diffusion.
Stakeholders needs and students expectation

- Most of the jobs opportunities comes from the industry;
- The hydrography and cartography community needs:
  - more personnel (source: IFHS, Industry, HS);
  - more qualifications.
- There is a demand for modular type of learning (CB, industry):
  - Life Long learning;
  - hydrographic personnel cannot be removed from their working environment for too long periods.

Conflict?
Education versus Training (1)

- Training courses = system use;
- Education:
  - Methodology and concept understanding;
  - Ability to make appropriate usage of a sensor, data processing technique, etc...
- Hydrography and Cartography requires practical skills, as well as competences;
  - Fieldwork without training is not possible;
  - Project work without hydrography education is not efficient.
The Standards need to reflect an up to date set of requirements as well offering a basis for a surveyor to make progress.

The Standards must maintain the balance for students expectations and employers needs whilst allowing for the new e-learning experience.
Two of the Port of London Authority vessels used by MSc students for practical work – the Galloper is generally used in near-shore surveys, while the Verifier is capable of operating in the Thames Estuary.

The launch from CCOM UNH

Field training

ENSTA Bretagne survey launch
Education versus Training (2)

• Minimum standards refers to H/C competences including hands-on and hydrographic projects;
• What is the optimum education/training rate for category A/B hydrographer and cartographer?
• The standards do not define what is a category A/B hydrographer or cartographer activity;
• How the industry defines the roles/interaction between category A and category B hydrographers?
Hydrography and Cartography education (1)

• Increasing demand for « qualified » hydrographers
  – Recognised qualifications and competences (category A and B);
  – Recognition of Individual by professional bodies (Hydrographic societies, ex: Australasian recognition scheme).

• Recognised programs are not accessible in many countries
  – Some Naval Academies are not opened to civilian students;
  – Some regions do not offer any course (6 countries offering university course in hydrography at category A level).

• Difficulties to maintain hydrographic courses
  – High cost, few applicants, moderate capacity;
  – Few academic staff.
In countries surrounding the Arctic there is NO recognised course (Russia, Canada, Norway, Greenland) except for 3 in USA.

The whole of Africa only has a Category B course in Tunisia.
Hydrography and Cartography education (2)

- H/C courses are delivered by limited staff groups, generally isolated and do not share resources;
- H/C groups are generally in minority in their own organisations;
- Limited networking (student and staff exchanges);
- Limited sharing of educational resources (equipment, staff);
- Difficulties to find the appropriate staff and equipment resources to cover the whole H/C field.
Modular/e-learning

• Modular learning:
  – Intensive courses modules, delivered on limited periods of time;
  – May facilitate international cooperation between institutes;
  – Effective for applied subjects, but not for basics subjects.

• New technologies and e-Learning:
  – Possible implementation of modular learning;
  – Possibly partial distance learning via intl. Cooperation between institutes (may replace and/or complement staff exchanges);
  – Very high development costs => Collaborative development might be an option
Distance learning

• Particular implementation of e-learning methods:
  – Hydrography/Cartography DL schemes requires practicals, and therefore residential modules;
  – Adapted for modular learning (CB, Industry);
  – But, this delivery mode in hydrography largely still needs to be proven.

• Tutoring:
  – Requires specific tutor training;
  – Is a key factor for success of DL type of delivery;
  – Virtual classes (forums).

• New standards will require DL specific information and will provide guidance.
The S-5 11th edition and S-8 3rd edition

- New guidelines for submission of courses;
- Establishment of procedures Internal assessment;
- Reduction of period of submission (6 years);
- Establishment of funding scheme/cost recovery allowing on-site visits;
- Individual recognition through recognition of national/regional schemes.

Digital Hydrography on the Maritime Web
Individual Competency Schemes offer to ensure and demonstrate that a surveyor maintains appropriate standards of practice.
Recognition of Individuals

• The Board recognises courses, not individuals;
• Individual Recognition Schemes objective:

To maintain the level of competence and field proficiency of hydrographers/cartographers;

• Individual recognition should be sought at national or regional level:
  – Recognition of individuals should not be left to HS, but preferably to Hydrographic Societies;
  – Should ideally involve both HS, Academia and the Industry.
• Life-long learning, refreshment and modular courses;
IBSC work program (2013-2017)

“IBSC to develop a new Standards framework to separate competency requirements for Cat A and Cat B hydrographers and nautical cartographers by

• developing **two discrete parts** in the standards S-5 and S-8;
• updating their content to comply with the scientific and technological developments in the fields of Hydrography and Nautical Cartography.”

The IBSC acknowledges the:

• various ways to deliver cat A or cat B through **e-learning and/or distance learning**;
• need for **modular learning** through limited periods of time to accumulate a full cat A and cat B curriculum;
• role played by the **private sector** in educational activities.
Rationale for category A and category B separation (1)

Cat A:

- Project leader: design, plan, choose appropriate technology, select and supervise a survey team
- Should be familiar with underlying physics and mathematics of survey or cartographic works
- Able to evaluate survey of cartographic product against initial expectations
- In the navy: hydrographer in charge of a major survey unit
- In the industry: lead hydrographer or chief surveyor of a major project
Rationale for category A and category B separation(2)

Cat A standards will be aimed at *theoretical educational and foundational background* necessary for Hydrographers/Nautical Cartographers-In-Charge and hydrographic/cartographic managers who will

- Develop specifications for surveys and charts;
- establish quality control and quality assurance systems;
- respond to the specific requirements of a full range of hydrographic/cartographic projects.
Rationale for category A and category B separation (3)

Category B:

• Watch-leader: reports to a category A project leader
• Should be familiar with fundamentals and practical aspects of hydrographic surveying and/or cartographic works
• In the Navy: junior officer in charge of a survey launch
• In the Industry: team leader in charge of localized surveys

Standards will be aimed at the *Basic educational level and training of survey technicians*
Rationale for category A and category B separation (4)

For both categories, the ability:

• to conduct or operate hydrographic surveys in the field;
• to utilize hydrographic/cartographic databases to compile and produce charts,

remains an fundamental competence, and thus an important part of education and training through **practicals** (field exercises and/or projects).
Synthesis of answers to IBSC white paper on new standards developments, following IHO CL 14/2013

- Technical, legal and economic aspects should be considered, as well as the compliance with IHO resolution 2/2007;
- Safety of navigation needs to be kept as the cornerstone and other usage of the sea to be built around. Options should not be fully integrated to the core essentials (would then require longer course duration);
- Support to use e-learning and modular type of delivery;
- Some MSc consider cat B as a pre-requisite for cat A, others have an opposing view, that cat B and cat A development should be done independently;
- Some MSs would like cat A and cat B linked to academic degrees (BSc, MSc);
- Improve the description of the role of cat A and cat B personnel.
New category A and category B standards

• Present standards are not fully written in terms learning outcomes;
• **S-5 and S-8 standards are not syllabi**;
• New standards will be written in terms of learning outcomes (i.e. constructive alignment);
• Category B is not a stepping stone toward category A
• Options will not be systematically included in the core of the essential subjects;
• Category A and B do not refer to a particular academic level;
• Will include e-learning and distance learning specific requirements
New category B standards

Integration of multi-platform (vessels, underwater vehicles, airborne, satellite) and multi-sensors surveys. Data management to access, store, maintain and distribute extremely large data sets.

• Same S-5 Essential Subjects (Bathymetry, Water levels and flow, Positioning, Hydrographic practice, Hydrographic data management, Environmental Science, Law of the Sea);
• More emphasis on learning outcomes;
• Options to be revisited, some options contents may be moved to « essential » subjects;
• Basics to be defined accordingly to new essentials contents.
New category A standards

• Standards essentials will be modified in three blocks of subjects:
  – General surveying subjects
  – Hydrography specific subjects
  – Data processing and management subjects

• Options

• Complex multidisciplinary project including hydrographic practice
New category A and category B standards development plan

Milestones:
3. Cartography category A and B standards: 2017
   (Application of new editions to be defined)

Three working groups (Americas, Europe, Asia) having specific assignments;
New category A and category B standards: Interaction with stakeholders

- IBSC Stakeholder seminars to be held in 2014, 2015, 2016:
  - Industry;
  - Academia;
  - IHO, IFHS.

- Communication of new standards draft versions:
  - Conferences;
  - Papers;
  - Stakeholder seminars.