

EDUCATION IN HYDROGRAPHIC SURVEYING AND NAUTICAL CARTOGRAPHY

The International Board on Standards of Competence for Hydrographic Surveyors and Nautical Cartographers

By R. Furness, Chair

1. Introduction

The FIG/IHO/ICA International Board on Standards of Competence for Hydrographic Surveyors and Nautical Cartographers (IBSC) maintains standards in these disciplines and awards recognition to programs of education and certification schemes found to be compliant. Within recent years, the Standards have been fully revised and updated, both in terms of expectations of stakeholders and in nomenclature used in education. A previous paper published in this journal (November 2017)¹ explains in detail the rationale of the current Standards and offers information useful to institutions in development of programmes with the intention of gaining recognition.

This Note aims to refresh and update the reader on the work of the IBSC as it continues to operate under the impacts from the global pandemic of Covid-19.

The Standards for Hydrographic Surveyors (S-5A/B) and Nautical Cartographers (S-8A/B) are published on the IHO website² together with the important companion documents:

1. Guidelines for the Implementation of the Standards of Competence for Hydrographic Surveyors and Nautical Cartographers (Guidelines) (Edition 2.1.1, March 2020).
2. Frequently Asked Questions (FAQ) (Edition 1.0.0, March 2020).

The IBSC is further charged with maintaining the Standards and other relevant IHO documents and operates in accordance with its Terms of Reference, Code of Ethics, and established Rules of Procedure which, along with the Standards and other supporting documents, are published on the IHO website³.

2. The impact of Covid-19 on the IBSC's operations

The advent and impact of Covid-19 has been profound on the operations of the IBSC and for the continuation of training programmes throughout the world. There has been an increased and urgent transfer by some institutions to teaching using online methods with, anecdotally, varying levels of success. The high practical

¹ https://docs.iho.int/mtg_docs/com_wg/AB/AB_Misc/IHR-Nov-2017-Article-Standards.pdf

² <https://iho.int/en/standards-and-specifications>

³ <https://iho.int/uploads/user/Inter-Regional%20Coordination/IBSC/MISC/IBSC-ToR-RoP.pdf>

content of the Standards has presented challenges for all programmes. The impact of the pandemic on the operations of the IBSC saw it conduct its 44th Meeting online in April 2021. This was an extremely challenging meeting given the work-load and mode of operating adopted by the IBSC during more normal, non-Covid-19 impacted times. In summary, the IBSC considered twelve (12) courses and two (2) certification schemes.

A “normal” year for the IBSC sees continuous communication with educational institutions (typically Navy, government, academia, or industry) who provide or who intend to provide an educational programme in hydrographic surveying and/or nautical cartography and who wish to establish or continue IBSC recognition of that programme. The year commences on 1 January by which time all submissions for review at the subsequent Board meeting are received. There is increased interest in applications from proposed certification schemes. Preliminary reviews are made of each submission and the IBSC, meeting in plenary, finalises its decisions. It is usual that a period of iterative communication ensues with each institution as the IBSC communicates its considered views and the institution considers them for modification of their submission. The recognition process is concluded towards the end of the calendar year.

During its annual plenary meeting, the IBSC invites representatives from submitting organizations to attend, present their submissions to the IBSC directly and respond to queries from the IBSC Members. Covid-19 made this process impossible this year at IBSC44. Reviews are currently in process and it is possible that queries or clarifications by the IBSC will be conducted by correspondence and/or online discussions by arrangement. The time zone difference for IBSC Members is around fourteen (14) hours making it difficult for the IBSC to meet in plenary by online means. However, the Members are committed to the process and communications will be forthcoming as and when needed.

3. Guidance for submitting institutions

The IBSC has identified some common shortfalls in some submissions that frequently delay their recognition, and these might be summarised as being a lack of appreciation that the current Standards separate the Category A and B Standards, together with a lack of familiarity with the concept and principles of *constructive alignment*. It is not a simple task for established programmes to expect to readily map straight from their earlier recognised programme to fit into the current Standards. Some modification to established programmes should be expected. Also, there seems to be a tendency to confuse or conflate content with the expected learning outcomes.

The Standards should be taken as reflecting “minimum Standards”. Some submissions go further in their objectives and are so encouraged. However, some institutions choose to follow the Standards precisely. While this is acceptable, it is not acceptable for the review simply to present to the IBSC in the content column of the Module descriptions the content of the Standards *verbatim*. The cross-reference table is designed to relate the content of the Standards to the Modules adopted by the submitted programme. A moment’s thought will realise that only listing the content from the Standards becomes a circular process which provides no critical information to the reviewers. The IBSC expects to see some degree of elaboration of each activity, be it lecture, tutorial, practical or assignment. The Guidelines document at paragraph 7.3.2 provides an exam-

ple of the expected level of detail and should be considered by all submitting institutions. Another point is that each Module should cover around 6 – 8 Intended Learning Outcomes. It again provides no further information to the IBSC simply to list all the Learning Outcomes from the relevant Standard for a Module without appropriate reference. The testing of students should be directed at assessing their competencies to perform the Intended Learning Outcomes.

The IBSC believes that closer adherence to its Guidance will elevate the general education levels of those students who undertake courses recognized by the Board as the quality of education and training improves over time. It further believes that closer adherence by submitting institutions will simplify the task of preparing submissions and shorten the review period.

The IBSC has therefore developed the detailed Guidelines document together with the FAQ document, both referred to above, in its best efforts to explain and advise its expectations for each submission. Close reading of these companion documents is strongly advised before commencing the preparation of any submission. Rather than 'reinvent the wheel', it is worth repeating here, to emphasize, a section from the Preface of the Guidelines document which explains the underpinning philosophy of the Standards.

Separation of Category "A" and Category "B": It became evident to the IBSC that there were influencing factors that brought to the fore a number of imperatives for change in the way hydrographic surveyors and nautical cartographers are educated. To adapt to these new challenges, methodologies, equipment and software, the Board agreed on the separation of Category "A" and Category "B" requirements and a future separate path of development for each category. The motivation behind the separation of the Category "A" and Category "B" requirements and the intended outcome of Category "A" and Category "B" education/training is as follows:

A Category "A" programme will introduce subjects from the beginning at the underlying principles level. A Category "B" programme will introduce subjects from a practical level. According to the above framework the Category "B" Standard is aimed at the basic educational and training requirements for hydrographic technicians and hydrographic surveyors (S-5), and nautical cartographers (S-8). The Category "A" Standard is aimed at the theoretical educational and foundational background necessary for hydrographic surveyors/nautical cartographers in-charge and hydrographic/cartographic managers who will develop specifications for surveys and charts, establish quality control and quality assurance systems and respond to the specific requirements of a full range of hydrographic and/or cartographic projects.

For both Category "A" and Category "B" Standards, the ability to conduct or operate hydrographic surveys in the field or utilize hydrographic and/or cartographic databases to compile and produce charts are essential competencies, and thus a key part of education and training through the necessity of field and applied work (practical exercises and final project).

The educational process itself is in turn influenced by changing technological and methodological imperatives. Connectivity and the introduction of so-called e-learning methods and blended learning techniques have naturally attracted the attention of the professional community. Another relevant issue is the educational approach in the development of the standards relating to the principles of the style in which the requirements are presented. The IBSC adopted the concept and principles of constructive alignment⁴ that are used in most academ-

ic institutions and are documented in educational texts, for example Biggs and Tang, Teaching for Quality Learning at University, Open University Press (3rd Edition, 2007). The Standards describe Intended Learning Outcomes (ILO's) using verbs that are detailed under Bloom's taxonomy. In principle, an institution will evaluate students to ensure that they have achieved each learning outcome.

The separation of Category "A" and Category "B" Standards in addition to the adoption of constructive alignment approach was approved in 2012.

Options have been removed from the Standards. The philosophy of the Standards is to develop a hydrographer or nautical cartographer who can work with competence across the full spectrum of the profession. Therefore, the core content within the previous options is considered necessary for all hydrographers and nautical cartographers and can no longer be considered optional. In defining competencies in terms of ILO's, the opportunity exists for institutions to focus attention on specific issues while adhering to competencies and associated content as described in the Standards. Thus, while core competencies are retained, institutions can offer unique programmes within this framework, directed towards specific needs.

In fairness, it needs to be pointed out that the quality of submissions has been generally improving over time as institutions come better to understand the requirements for recognition and update their own teaching and educational processes.

4. Structure and membership of the IBSC

The IBSC membership comprises ten Members: four each from FIG and IHO, and two from ICA. The Secretary is provided by IHO. The list of the present Members of the IBSC is available on the IHO website⁵.

It is appropriate to acknowledge the dedication of all IBSC Members and their willingness to support the IBSC. This is despite the ongoing difficulties that started early last year and saw some Members remain 'at their posts' during March 2020 at IBSC43 as hourly changes to international travel occurred and national borders shut down with them all potentially stranded a long way from home in Cartagena de Indias, Colombia.

The impact from the loss to the IBSC of the Secretarial expertise, due to the recent retirement of long-time Secretary Alberto Costa Neves, whose experience, friendly disposition and competence has steered the IBSC through some intensely changing times with his familiarity with the profession and the IHO, was softened with the appointment by IHO of Assistant Director Leonel Manteigas who brings similar skills to the task of Secretary and, as a past Member, familiarity with the workings of the IBSC, as he capably fills the vacancy so created by Alberto's retirement.

Captain Leonel Manteigas is an Assistant Director of the IHO. He is an officer of the Portuguese Navy with a recognized Category A course in Hydrography. During most of his career he worked at the Portuguese Hydrographic Institute (IHPT) being Professor of Hydrography in the Portuguese Naval Academy and Professor of several modules in the IHPT School of Hydrography and Oceanography. He was the Head of the IHPT Hydrography Division for six years and the Director of the School of Hydrography and Oceanography. He was also the Commanding Officer of a

⁴ *Constructive Alignment means that content material is delivered constructively in a way that the learner thinks and to align the assessment accordingly through a set of learning outcomes. The concept of alignment hinges on assessment against the desired outcomes of a course with appropriate verbs used to indicate the expected level of learning.*

⁵ https://iho.int/uploads/user/Inter-Regional%20Coordination/IBSC/MISC/IBSC_Membership_20200815.pdf

Hydrographic Ship and has a Master of Engineering in Geomatics Engineering taken at the University of New Brunswick, in Canada. Before became the Secretary, he was an IBSC member for nearly two years.

The resignation of Dr. Keith Miller (FIG) and the appointment to Assistant Director IHO of Captain Leonel Manteigas (IHO) created two vacancies on the IBSC. The contribution of Dr. Miller to the revised Standards and his affable and professional support generally to the work of the IBSC is acknowledged. It was a pleasure recently to welcome two new Members to the IBSC.

Professor Harald Sternberg, a FIG representative, is a Surveying Engineer, Professor for Hydrography and Geodesy as well as additionally Vice President for Teaching and Digitalization at the HafenCity University Hamburg. He studied and worked at the Bundeswehr University in Munich and received there the Dr.-Ing. Mobile mapping systems on different carriers (cars, ships, and indoor trolleys) as well as the use of low-cost sensors for positioning, navigation and environmental data acquisition are part of his research area. He is also involved in the analysis of mass data using artificial intelligence. In the field of hydrography, he is working on autonomous underwater vehicles, automated analysis of underwater images and interpretation of backscatter data. From his Vice president's perspective, another focus is on the advancement of interdisciplinary teaching and new teaching formats.

Dr. Arata Sengoku, an IHO representative, is a consultant of hydrography and cartography of Aero Asahi Corporation, working for the hydrographic community in developing countries. He has a PhD in Satellite Geodesy. He was Chief Hydrographer of Japan and vice chairman of the East Asia Hydrographic Commission from 2016 to 2018. He worked in the Japan Hydrographic and Oceanographic Department for 34 years. His work background includes twenty (20) years in management of hydrography, oceanography, and cartography, and twelve (12) years in geodetic observation and analysis. He studied satellite geodesy and celestial mechanics in University of Texas at Austin and University of Tokyo.

It would be remiss of me not to acknowledge specifically by mention here the contributions of the remaining and long-serving eminent Members of the IBSC, all of whom bring to the work of the IBSC their wide-ranging expertise and many years of professional experience. When I add their total years of service it comes to over a hundred years! Representing the IHO are Captain Andrew Armstrong NOAA (USA), Captain Nickolás de A. Roscher (Brazil) and Commodore Rod Nairn (Australia). Representing the FIG are Gordon Johnston (UK), Adam Greenland (NZ) and Sobri Syawie (Indonesia). Representing ICA are Emeritus Professor Lysandros Tsoulos (Greece) and myself.

5. Summary

Despite the exigencies arising from Covid-19 and its seemingly ever-increasing workload, the IBSC continues to receive submissions, both of programmes and certification schemes. At the time of writing, the review process leading to an online IBSC44 in April 2021 has commenced. Close attention to the published Guidelines in preparing submissions will assist the IBSC review process and improve over time the quality of education for hydrographic surveyors and nautical cartographers. Membership of the IBSC has been refreshed recently with a new Secretary and

two new members. The continuing service of existing IBSC Members is acknowledged.