FIG/IHO/ICA S-5B Content

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FIG/IHO/ICA International Board for Standards of Competence (IBSC) for Nautical Hydrographers and Cartographers

From content to Intended Learning Outcomes (ILO's)

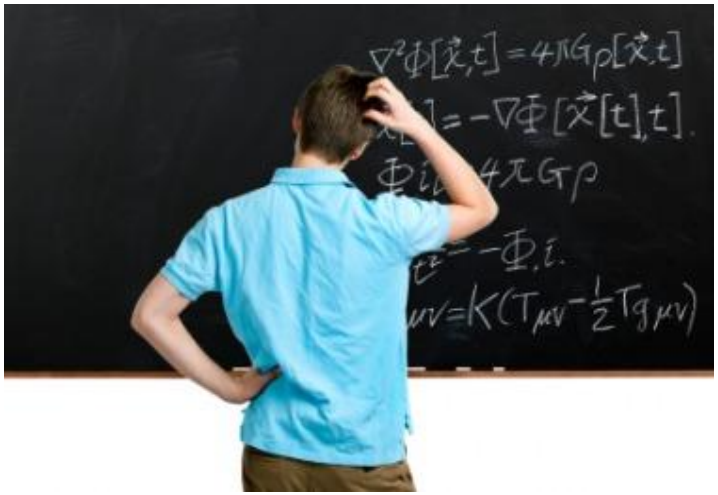
- Initially S-5 was written as content
- In the late 1990's Blooms taxonomy was used to add verbs
- Now we use more generic Intended Learning Outcomes (ILO's) and return to content

Content

"Geodesy, the geoid, Helmert, normal and orthometric heights ……."

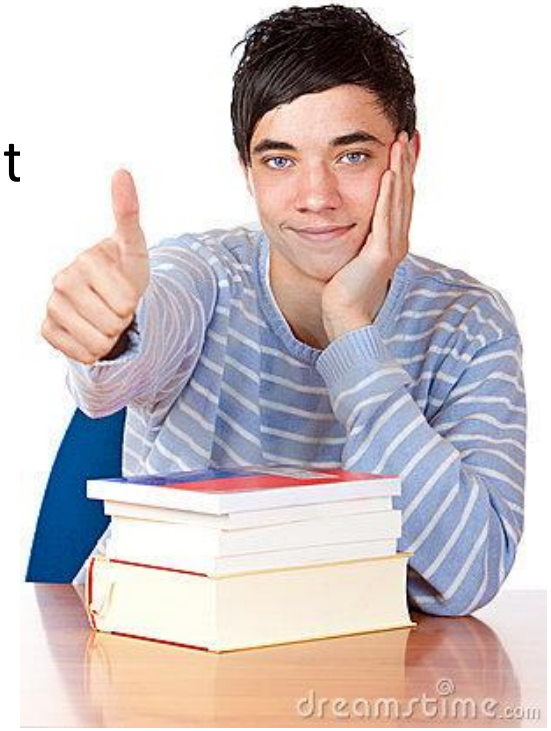
A list of topics that is meaningless to prospective course participants.

To the student who has not yet taken the course, it looks like this:



Course descriptions must be interesting

- In hydrography you will learn the principles of precise navigation from satellite systems and techniques in underwater positioning,
- You will spend lots of time doing practical work in boats using sophisticated sensors and devices that take measurements above and below the water without need for the operator to get wet.
- You will use hardware platforms and applications that make your ipad look like a Lego brick.



Typical teaching course offers

- Course description.
- Learning outcomes, just 5 or 6 for a one semester course.
- Lecture schedule – gives subject headings.
- Assessment schedule and outline of tasks

There is no content in the traditional sense

Competencies

- Are for instructors, to support preparation of programmes and courses.
  - Generic ILO's give expectations
  - Content places the learning outcomes into a set of essential topics that must be covered towards meeting an ILO.
- Minimum standards are much more difficult to define, for example from the draft S-5B an ILO is written:

  "*Using appropriate units, describe acoustic wave behaviour with reference to physical properties of the water column*"

  Would be covered differently by a student in acoustics or in physics.

  The specified content should place the ILO into context, but the material could still be covered at different levels.

  It is therefore important for the Board to receive information relating to time allocated and method of delivery.

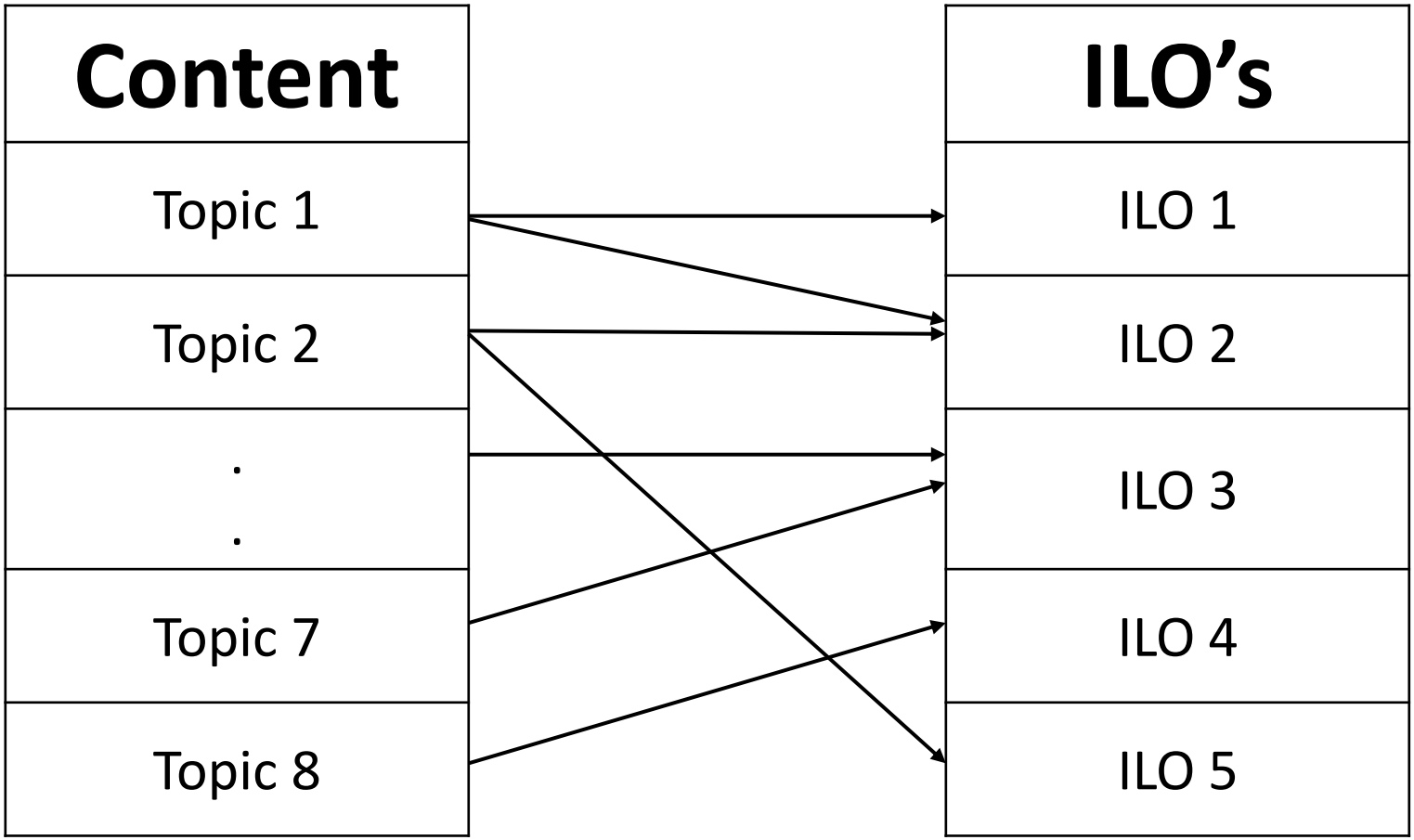
Flexibility in course design

- The proposed new format offers flexibility in the design of programmes (formation – in French, or formación – in Spanish).
- Content may not appear in institution course descriptions, but must be provided to the Board to show that S-5B requirements are satisfied.
- Assessment criteria must indicate that ILO's are met.
- Level of coverage as indicated by the content alone may not be implicit within the submission.

It is therefore important that course assignment and assessment details, specifications of practical work and past examination papers accompany submissions.

Mapping content to ILO's

(many to many relationship)



Assessment

Standard form

Subject	T/P/SG	Hours	Course and content	Content	Learning outcomes
S5B element	Are the competencies assessed through theory, in a practical context, or a combination ?	Hours devoted by the student towards the learning outcome; this should be broken down by lecture, practical, self-guided	Course module reference	Topics which the IBSC deems important to achieving the learning outcomes. These are spread across multiple subjects and outcomes	Students should be able to meet these outcomes at the completion of the program. They should be evaluated through written examinations, labs, practicals, or field project.
	To be filled by submitting organisations. A learning outcome should refer to the list of contents			Standards are cross references of learning outcomes and associated content.	

General example

Subject	T/P/ SG	Hours	Course and content	Content	Learning outcomes
1.2b. Single beam echo sounder data recording.	T P SG	5 3 10	HYD01 (i)(ii)(iv)(v) FW02 (iii)(iv)(v) (ii)(iv)(x)	(i) Split beam and dual beam echo sounders (ii) components of a single beam echo sounders. (iii) Operation of single beam echo sounders. (iv) Bottom detection principles.	Interpret echo sounder returns through differentiation between return signals.

Where and how is the learning outcome addressed?

Example 1 from draft S-5B

E1 UNDERWATER ACOUSTICS **E1.1 Acoustic Theory**					
1.1a Generation of acoustic waves				(i) Plane and spherical waves in terms of wavelength, amplitude and frequency. (ii) Speed of sound in relation to water properties and profile in the water column. (iii) Acoustic units, intensities and sound levels (iv) active Sonar Equation including sound source, causes of propagation loss in relation to water properties together with characteristics of the sea floor and targets, noise level and directivity (v) Refraction and the path of sound rays through the	Explain how transducer parameters impact upon beam characteristics.
1.1b Propagation of acoustic waves					Using appropriate units, describe acoustic wave behaviour with reference to physical properties of the water column.
1.1c Reflection, scattering and system performance.					Detail sources of noise and the impact of noise on operation of acoustic systems.

Example 2 from draft S-5B

				(vii) Sextant (viii) Total station (ix) Theodolite (x) Electromagnetic positioning devices	appropriate methods and use corresponding instruments for positioning. Establish azimuth using astronomic methods.
E4.2b Satellite positioning				(xi) Intersection, Resection, Polar and Traverse (xii) Astronomic methods for determination of orientation. (xiii) Expansion of traditional geodetic networks (xiv) Principle of GNSS positioning	Explain the GNSS concept and principles. Define pseudo ranging and carrier phase based modes of satellite positioning Differentiate between base station and permanent networks, real-time and post-processing.
E4.2c Positioning systems				(xv) GNSS services characteristics (single baseline, network, Precise Point Positioning) (xvi) Performance of code vs. carrier; differential vs. autonomous modes; multiple vs. single frequency; fixed vs. float ambiguity resolution (xvii) Control stations	Field test and use distance and angle measurement instruments. Apply field validation procedures Operate GNSS and DGNSS equipment, assess accuracy and precision, post-process GNSS data using appropriate software.
E4.2d Historical surveys				(xviii) Economic and logistical aspects of providing	Relate historical surveys to legacy positioning systems.

Contents of S-5B (slide 1)

- E1 UNDERWATER ACOUSTICS
  - E1.1 Acoustic Theory
  - E1.2 Single beam systems and side scan sonar
  - E1.3 Swath systems
- E2 REMOTE SENSING AND PHOTOGRAMMETRY
  - E2.1 LiDAR
  - E2.2 Remote Sensing and photogrammetry
- E3 WATER LEVELS AND FLOW
  - E3.1 Principles of Water Levels
  - E3.2 Water level measurement
  - E3.3 Currents

Contents of S-5B (slide 2)

- E4 POSITIONING
  - E4.1 Geodesy
  - E4.2 Principles of cartography
  - E4.3 Positioning Measurements, Methods and Techniques
  - E4.4 Vertical Positioning
  - E4.5 Acoustic Positioning
  - E4.5 Inertial Navigation
  - E4.6 Uncertainty in positioning
- E5 HYDROGRAPHIC PRACTICE
  - E5.1 Hydrographic survey projects
  - E5.2 Hydrographic survey operations
  - E5.3 Hydrographic survey documentation
- E6 HYDROGRAPHIC DATA MANAGEMENT
  - E6.1 Real-time data acquisition and control
  - E6.3 Data processing and analysis
  - E6.4 Data organisation and presentation

Contents of S-5B (slide 3)

- E7 ENVIRONMENT
  - E7.1 Oceanography
  - E7.2 Marine Geology and Geophysics
  - E7.3 Environmental impact

Basics will comprise:

- Mathematics
- Information and communication technology
- Physics
- Nautical Science

Options are not currently proposed.

Flexibility of the new format allows institutions to focus interests.