Research and Practice on GNSS Education Capacity Building

13th Meeting of the International Committee on Global Navigation Satellite Systems

WENG Jingnong, JING Guifei
Beihang University, Beijing, China

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1 Introduction

2 GNSS Education Capacity Building

3 Practics of BeiDou/GNSS Education
What is “Capacity Building”?

• **Capacity Building** (or capacity development) is the process by which individuals and organizations obtain, improve, and retain the *skills, knowledge, tools, equipment and other resources* needed to do their jobs competently or to a greater capacity (larger scale, larger audience, larger impact, etc).

(From Wikipedia)
Why is Capacity Building Needed?

• The issue of capacity is critical and the scale of need is enormous, but appreciation of the problem is low.
• The link between needs and supply is weak.
• There is a lack of realistic funding.
• Training institutions are isolated - communications are poor.
• Development of teaching materials is inefficient.
• Alternative ways of capacity building are not adequately recognized.
The Proposal of GNSS Education Capacity Building

• In 2008 of ICG-3 meeting, the Working Group C was renamed from “Information Dissemination” to “Information Dissemination and Capacity Building”. Its scope of work includes:

1) maintaining the ICG Information Portal;

2) providing support for education and training on GNSS for capacity building in developing countries;

3) organizing workshops and special sessions on the use of GNSS technologies as tools for scientific applications.
The Proposal of GNSS Education Capacity Building

• In 2015 of ICG-10 meeting, the Working Group C considered the possibility of changing the Working Group’s title and proposed the following title “Global Navigation Satellite Systems (GNSS) Capacity Building, Education and Outreach”.

• In 2017 of ICG-12 meeting, the Working Group C recommended that further research on definition of capacity building and workforce index should be undertaken.
1 Introduction
2 GNSS Education Capacity Building
3 Practics of BeiDou/GNSS Education
GNSS Education Capacity

- **GNSS Education Capacity** is a set of capacities, which includes:

  1) **Education resources input**: Human, material and financial resources.

  2) **Output capacity**: Education and training activities and products.

  3) **Support capacity**: Policy, environment, organization and management.
GNSS Education Capacity

• **GNSS Education capacity** is composed of
  
  1) Educational resource mobilization capacity: Policy, resource mobilization and environmental support.

  2) Teaching outreach supply capacity: Creation, publication, information dissemination, and teaching activities.

  3) Service delivery capacity: Management, investment, organization and infrastructure.
GNSS Education Capacity Building

- **GNSS Education Capacity Building** is a systematic project

  1) under conditions of adequate educational funding, reasonable staffing and operational infrastructure;

  2) under conditions of continuous optimization of policy environment and organizational management;

  3) outputs and services such as activities and products that may be provided.
Elements of GNSS Education capacity building

1) Teacher team building: Qualified teachers, management team, invited international/domestic experts.

2) Teaching activities: Degree program (undergraduate education and postgraduate education), training courses (thematic training and series of training, popular science training and professional training, long-term training and short-term training), academic lectures, professional visits.
Elements of GNSS Education capacity building

3) **Infrastructure construction**: School buildings (classroom, office, laboratory, library, canteen, dormitory, sports ground), teaching and experimental equipment.

4) **Educational environment**: Educational platform, experimental teaching conditions and practical teaching base.

5) **Information dissemination**: Website, publications, textbook and teaching materials.
Elements of GNSS Education capacity building

6) Funding support: Government funding, social fund-raising, crowdfunding, and collaborative projects funding, for management, research and activities.
GNSS Education Capacity Building

**Evaluation indicators**

<table>
<thead>
<tr>
<th>Evaluation indicators (Level I)</th>
<th>Evaluation indicators (Level II)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teacher team building</td>
<td>Qualified teachers</td>
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<tr>
<td></td>
<td>Management team</td>
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<td></td>
<td>Invited experts</td>
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<tr>
<td>Teaching activities</td>
<td>Degree program</td>
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<tr>
<td></td>
<td>Training courses</td>
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<td></td>
<td>Academic lectures</td>
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<td></td>
<td>Professional visits</td>
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<tr>
<td>Infrastructure construction</td>
<td>School buildings</td>
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<tr>
<td></td>
<td>Teaching equipment</td>
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<tr>
<td></td>
<td>Experimental equipment</td>
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<tr>
<td>Educational environment</td>
<td>Educational platform</td>
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<tr>
<td></td>
<td>Experimental teaching conditions</td>
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<tr>
<td></td>
<td>Practical teaching base</td>
</tr>
<tr>
<td>Information dissemination</td>
<td>Website</td>
</tr>
<tr>
<td></td>
<td>Publications</td>
</tr>
<tr>
<td></td>
<td>Textbook &amp; teaching materials</td>
</tr>
<tr>
<td>Funding support</td>
<td>Government funding</td>
</tr>
<tr>
<td></td>
<td>Social fund-raising</td>
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<td></td>
<td>Crowdfunding</td>
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<td></td>
<td>Collaborative projects funding</td>
</tr>
</tbody>
</table>
1. Introduction

2. GNSS Education Capacity Building

3. Practics of BeiDou/GNSS Education
Our Practice

- **Teacher team building**

  - Domestic Universities 48
  - Domestic Industries 33
  - International Universities 26
  - **Domestic Research Institutes** 23
  - International Research Institutes & Government Ministries 12
  - Domestic Government Ministries 10

**Globalization of Faculty**
GNSS Education Capacity Building in China

International Professors/Experts

Ms. Mazian Otgma
Former Director of UNOOSA

Mr. Sergio Carnecho
Former Director of UNOOSA

Mr. Niklas Hedman
Doctor UNOOSA

Mr. Shirish Ravzan
UN-SPIDER Beijing Office

Mr. Christophe Macabiau
ENAC, France

Ms. Gabrynowicz
Professor, U.S.A.

Mr. Maarten Uijt de Haag
Ohio University, U.S.A.

Mr. Stephan
Hobe University of Cologne, Germany
GNSS Education Capacity Building in China

Domestic Professors/Experts
GNSS Education Capacity Building in China

Management team

Weng Jingnong
Executive Director of the Regional Centre (RCSSTEAP)

Jing Guifei
Dean of BeiDou Belt & Road School

Guo Yuanyuan
Director of the General Office of RCSSTEAP

Cui Yizhuo
Project manager of the General Office of RCSSTEAP

Wu Ke
Project manager of the General Office of RCSSTEAP

Yang Dongkai
Deputy Director of BeiDou International Exchange and Training Centre (BD-IETC)

Jin Tian
Deputy Director of BD-IETC

Xiu Chundi
Senior Expert on GNSS of RCSSTEAP

Gong Haoqin
Art Planning Director of RCSSTEAP

Wang Xin
Brand Design Director of RCSSTEAP
GNSS Education Capacity Building in China

- **Financial support**

Supported by Chinese Government, GNSS industry and University
GNSS Education Capacity Building in China

- **Infrastructure construction**
• **Educational environment**

  - International Exchange and Training Center of China Satellite Navigation Office
  - BD-IETC of CSNO
  - Asia-Pacific Space Cooperation Organization-Education and Training Center in China
  - APSCO-ETC in China
  - The Regional Centre for Space Science and Technology Education in Asia and the Pacific (China) (Affiliated to the United Nations)
  - RCSSTEAP (China)
  - BeiDou Belt & Road School

**GNSS Education Platforms**

- 2012: BD-IETC of CSNO
- 2013: APSCO-ETC in China
- 2014: RCSSTEAP (China)
- 2017: BeiDou Belt & Road School
GNSS Education Capacity Building in China

Experimental teaching conditions

BDS Exhibition Hall

Smart Classroom

Experiment equipment

Courseware/Tools
GNSS Education Capacity Building in China

- Experts/Lecturers
- Professional Visit
- Project

Practical teaching base

Map of Partners

The Centre, adhering to the tenet of "Openness, Innovation, and Indiscernibility", is continuously expanding cooperation with innovative development.
GNSS Education Capacity Building in China

- Information Dissemination
  - RCSSTEAP Website
  - BeiDou Education and Research Network
  - Distance Education
  - Research Services
  - Communication Community
GNSS Education Capacity Building in China

Publications
GNSS Education Capacity Building in China

Publications

Research and Practice on GNSS Education Capacity Building-ICG 13
GNSS Education Capacity Building in China

GNSS Textbook & training Materials
GNSS Education Capacity Building in China

**Teaching activities**

<table>
<thead>
<tr>
<th>GNSS Core Course</th>
<th>Class Hrs</th>
</tr>
</thead>
<tbody>
<tr>
<td>GNSS Reference System</td>
<td>18</td>
</tr>
<tr>
<td>Principle of Global Navigation Satellite Systems</td>
<td>32</td>
</tr>
<tr>
<td>GNSS Navigation Signal</td>
<td>18</td>
</tr>
<tr>
<td>GNSS Receiver Principles and Design</td>
<td>32</td>
</tr>
<tr>
<td>GNSS/INS Integration Navigation</td>
<td>32</td>
</tr>
<tr>
<td>Global Satellite Navigation System Applications</td>
<td>18</td>
</tr>
<tr>
<td>Satellite Navigation Data Processing</td>
<td>32</td>
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<tr>
<td>GNSS Experiment</td>
<td>18</td>
</tr>
<tr>
<td>GNSS New Technologies</td>
<td>18</td>
</tr>
</tbody>
</table>

**Enrolment**

<table>
<thead>
<tr>
<th>Year</th>
<th>Number</th>
<th>Countries of Participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016</td>
<td>11</td>
<td>Algeria, Bolivia, Brazil, Croatia, Iran, Nigeria, Peru, Thailand, Ukraine, Venezuela</td>
</tr>
<tr>
<td>2017</td>
<td>11</td>
<td>Bangladesh, Bolivia, Mongolia, Pakistan, Peru, Thailand, Turkey</td>
</tr>
<tr>
<td>2018</td>
<td>6</td>
<td>Ethiopia, Peru, Turkey, Iran, Pakistan</td>
</tr>
</tbody>
</table>

**Degree Award**

![2012-2018 Student Number Graph]

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## GNSS Education Capacity Building in China

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of training</th>
<th>Number of trainee</th>
<th>Number of countries</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015</td>
<td>2</td>
<td>111</td>
<td>15</td>
</tr>
<tr>
<td>2016</td>
<td>4</td>
<td>182</td>
<td>36</td>
</tr>
<tr>
<td>2017</td>
<td>3</td>
<td>114</td>
<td>21</td>
</tr>
<tr>
<td>2018</td>
<td>4</td>
<td>269</td>
<td>13</td>
</tr>
</tbody>
</table>

**GNSS Short Term Training (Totally 13, 2015-2018)**
GNSS Education Capacity Building in China

Academic Lectures & Professional Visits
GNSS Education Capacity Building in China

UGII — *New Mode for GNSS Education Capacity Building*

**U** — Hosted by University

**G** — Supported by Chinese Government

**I** — Work with Related International Organizations

(UNOOSA, APSCO, etc.)

**I** — Industry/Enterprise Participation
Besides Education, capacity building should include the other areas, such as:

- Research and development
- Manufacture of HW and SW
- Experiment facilities
- Management
- Quality guarantee
- Security and environment

Capacity Building index need to consider the weighty rate of different factors and give each factor a mark in order to put it into implementation.

Regional center could work together to prepare this index jointly and test its applications to facilitate GNSS development in respective region.
Thank you for your attention

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