## 6. Strategic Curriculum Model for Standards Education

In this chapter 6, we introduce essential components of strategic curriculum model for standards and conformance. Based on the case studies of policy, education programs, and lessons learned explained in preceding chapters, we endeavor to build up useful framework to be employed by member economies whose cultural and economic environment is different.

6.1. Components

Good education is achievable through good curriculum. Good curriculum should contain various dimensions of education. These will be what (contents) and how (methods) based on who and why (students' need/objectives):

- ➢ Who/Why: the needs of students and objectives of education – e.g. understand the general importance of standardization; learn how to draft an ISO standard.

- ➢ How: the teaching methods including assessment tools – e.g. lecture, student presentation, group discussion, role-playing; mid-term exam, term paper, case study.

- ➢ What: the contents of education – e.g. history of standards, standards and IPR, conformance procedures.

- ➢ When (how long), depending on who and what, and where, program initiator and operator, should be considered as well as shown in <Figure 12>.

The subsequent chapters discuss who/why (learning objectives), what (content), and how (teaching and assessment methods) of standards education in detail.
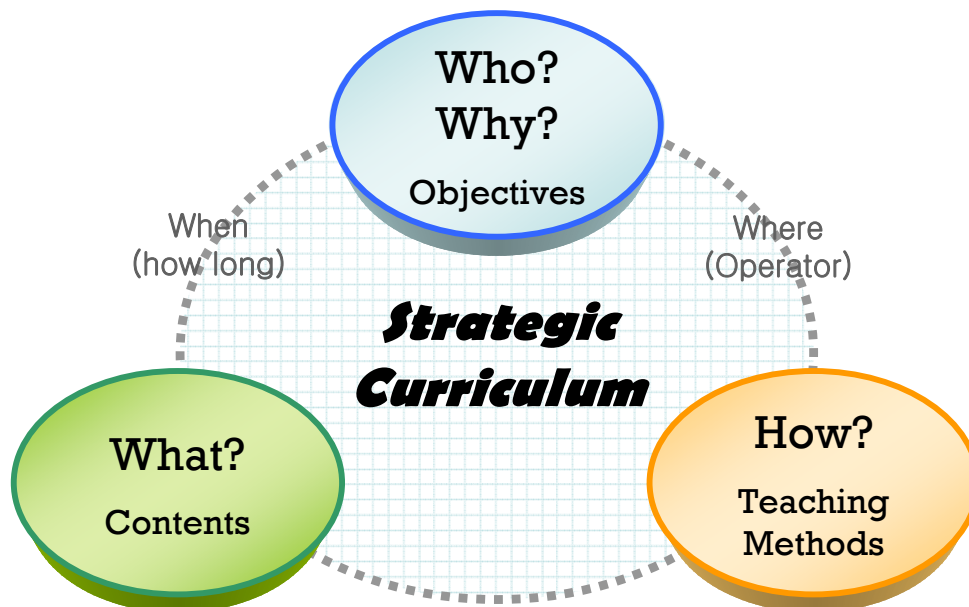
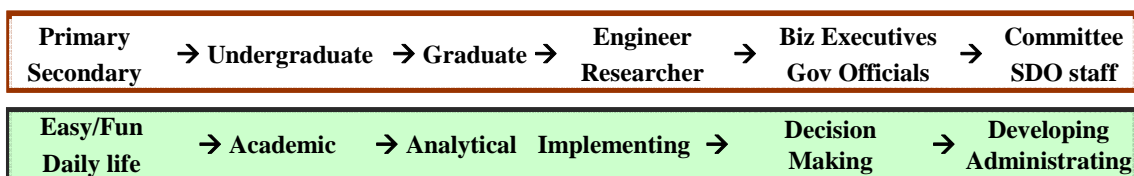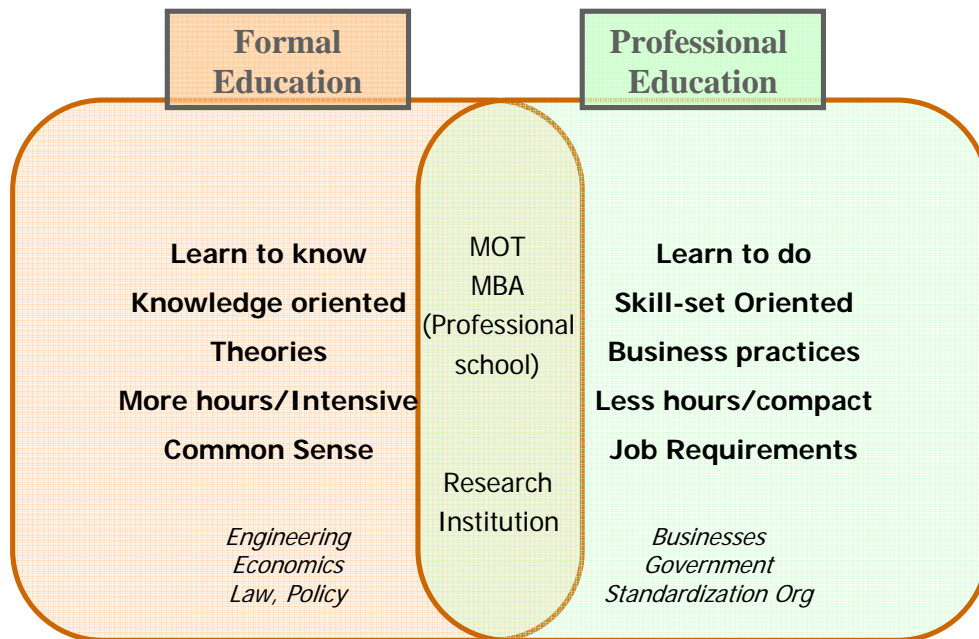**<Figure 12> Fundamentals of Strategic Curriculum Model**

6.2. Who and Why - Objectives Influencing Program Design

The question of why - learning/teaching objective is principally connected to the needs of 'who – students'. The why of the formal and professional education is pictured in <figure 14>.

In formal education, students need to learn what society expects them to know depending on the education level. Generally, the goal of formal education is to instruct cultural or intellectual common knowledge and additionally in higher education more academic knowledge. Comparing to higher education, primary/secondary education should be easy and fun and more learning by doing is preferred with less hours of class.

In professional education, learners need to learn what their career (work, supervisor, company, profession) calls for them to do. Normally, the objective of professional education is to train professional or specialized ability or skill. Comparing to courses for committee members, NSB staff, and the courses for biz executives or government official should be compact and present case studies within abridged format.

Of course, there are common areas between formal and professional areas or between their sub-categories of education. In those cases, the difference will be lying on level of depth, length of teaching hours, and teaching methods. Also, it would be not easy to distinguish the objectives professional schools like MBA or MOT, Also, you should take notice of the reality that majority of professional education has never been educated when they were in formal education .

Formal Education		**Professional Education**
Learn to know	MOT	**Learn to do**
Knowledge oriented	MBA	**Skill-set Oriented**
Theories	(Professional school)	**Business practices**
More hours/Intensive		**Less hours/compact**
Common Sense		**Job Requirements**
	Research Institution	
Engineering *Economics* *Law, Policy*		*Businesses* *Government* *Standardization Org*

Primary Secondary	→ Undergraduate	→ Graduate →	Engineer Researcher	→	Biz Executives Gov Officials	→	Committee SDO staff
Easy/Fun Daily life	→ Academic	→ Analytical	Implementing →		Decision Making	→	Developing Administrating

<Figure 13> Differences in Formal vs. Professional Education

6.3. What – Six Contents Modules in Brief

To identify the contents required for different objectives by target groups, we have reviewed all available information including course summary, table of contents in 88 detailed fact sheets of Annex D and some available textbooks. In the process we faced some notable obstacles related to contents of the education including:

- ➢ No standardized classifications
    - ■ same contents, but different title (found many times)
- ➢ Duplicative contents in even one textbook
    - ■ Mismatch of chapter title and contents
- ➢ Academic or theoretical contents are limited

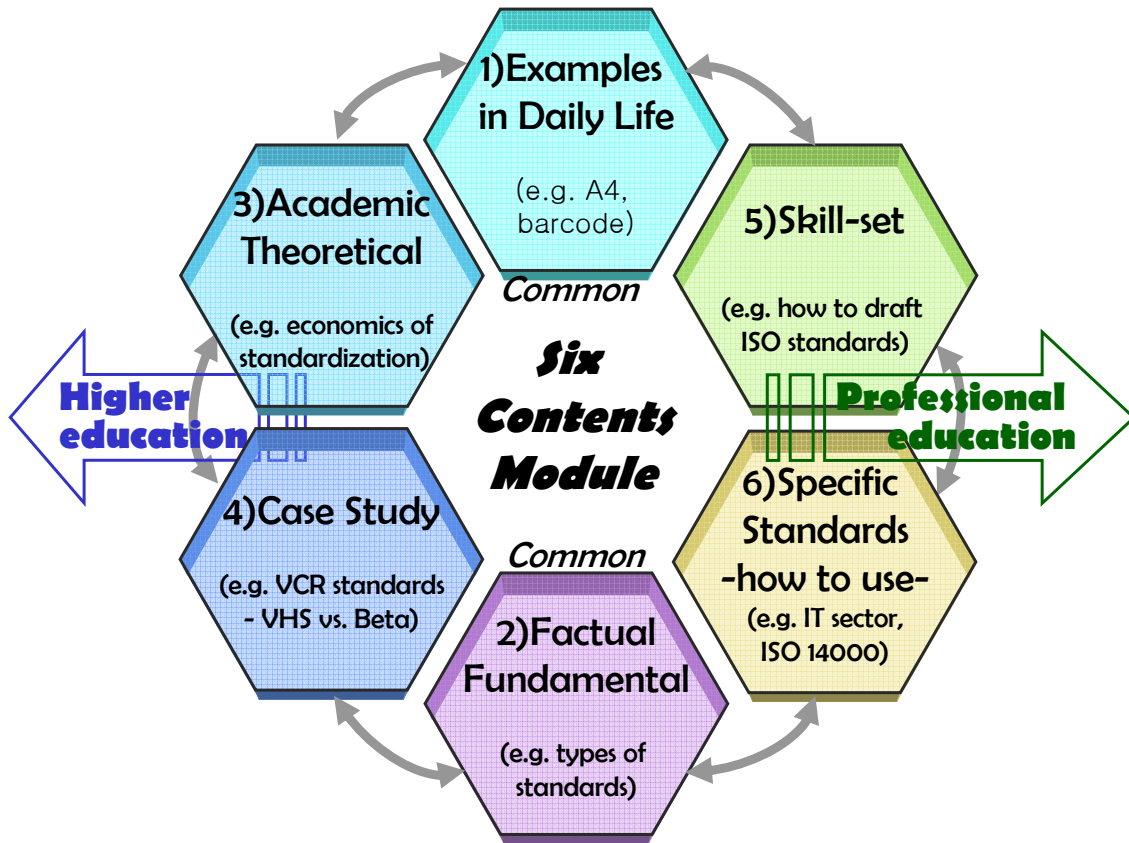**< Findings from Contents Analysis from 88 Practices>**

Having overcoming the above barriers, we analyzed and classified the overall contents and have discovered the following particulars:

- ➢ Daily examples and fundamentals of standardization are found in most courses: some topics are found in all types of education materials from contest for primary/secondary students to professional education course; these are examples from daily life examples explaining the importance of standards, and definition of standards, et al.
    - ■ around 40 cases are dealing with these contents
- ➢ Theoretical aspects of standardization chiefly found in higher education:
    - ■ economics of standardization, standardization and innovation, standards and IPR are commonly found in higher education
    - ■ Case #12, #17, #27, #28, #30
- ➢ Case Study chiefly found and expected to be dealt in higher education:
    - ■ Case study is usually dealt in higher education, commonly in graduate education. It requires students to have certain mathematical or analytical ability.
    - ■ Case #10, #12, #17, #19, #20, 21, #25, #27, #28, #29, #30
    - ■ Some professional education includes brief case studies as well.
- ➢ Skill-set mostly found in professional education:
    - ■ the education for skill-set is found mostly in professional education
    - ■ Case #45, #49, #52, #53, #57, #70, #78, #86, #99
    - ■ see <Table 5> in chapter 4.4 for details
- ➢ Industry/technology specific standards generally found in professional education:
    - ■ The education about how to use IT technology related standards, or how to apply ISO 14000 are generally found in professional education. However, some engineering departments in universities are also introducing industry related standards.
    - ■ Commonly as a few days of workshop or training course by standards organizations or trade associations

< Six Contents Modules Identified>

Consolidating all of the preceding discussions about who, why, what, and how, we are able to categorize the contents for standards and conformance into following six modules as illustrated the following conceptual model part 1 in <Figure 14>.

<Figure 14> Map of Six Contents Modules for Strategic Standards Education

First, Common Core Domain includes two centrally located modules: <Module 1> Example standards in daily life related contents and <Module 2> Factual or Fundamental information related contents. We place these two modules in central part of the map as they are common core contents and are considered part of any level of educations.

Second, Higher- Education Oriented Domain includes two left located modules: <Module 3> Academic/ Theoretical aspects of standards and conformance related contents, and <Module 4> Case Study of standardization related contents. We place these two modules in left part of the map, as they are commonly found in the courses in higher education, universities. However, you always have freedom to use these higher education oriented modules in professional education, either to meet specific objectives or to increase variety of an education program.

Third, Professional Education Oriented Domain includes two right located modules: <Module 5> Skill-set related contents, and <Module 6> (How to use) Specific Standards related contents. We place those two modules in right part of the map, as they are commonly found in the course in professional education. However, you always have freedom to use these professional education oriented modules in higher education, either to meet specific objectives or to increase variety of an education program.

6.4. What – Six Contents Modules in Detail

We are not challenging to list up all possible contents for the proposed six contents modules; but we are attempting to present all-inclusive list for <Module 2>, <Module 3> <Module 5> and example list for <Module 1>, <Module 4>, <Module 6>:

- ➢ All-inclusive List of contents:

    <Module 2> Factual or Fundamental information related contents.

    <Module 3> Academic/ Theoretical aspects related contents,

    <Module 5> Skill-set related contents

- ➢ Example List of contents:

    <Module 1> Example standards in daily life related contents

    <Module 4> Case Study of standardization related contents.

    <Module 6> (How to use) Specific Standards related contents

< All-inclusive List of Contents>

- ➢ **<Module 2> Factual or Fundamental information related contents**
    - ■ Definition: factual or fundamental information solely related to standards and conformance itself, and rarely found in other classes.
    - ■ Objective: to raise general awareness about importance and to learn factual/fundamental information in standards and conformance
    - ■ Target Group: for all – primary/secondary, higher, professional
    - ■ Projected Contents/Topics:

Major Classification	Sub-Classification
1.General	General - Introduction, orientation
2. Definitions	Concept and definition
3. Functions (Value)	Needs or objectives
	Functions and Effectiveness
4. History	General History, Evolution
5. Types/Classifications	General
	Who: national, regional, international
	How: De jure, De facto, Consortia/association
	What: Quality, Process, Interoperability, et al
6. National Standardization	History
	Policy, Strategy

Major Classification	Sub-Classification
	Procedures, Legal System
	Organizations including NSB, NMI, SDOs
	Impact and Challenges
	Major Current Issues
7. Regional Standardizatoin (internal)	History
	Policy, Strategy
	Procedures, Legal System
	Organizations
	Impact and Challenges
	Major Current Issues
8. Regional Standardization (external)	External regions – only where necessary
9.International Standardization	History
	Policy, Strategy
	Procedures, Legal System
	Organizations – formal
	Organizations – non-formal
	Impact and Challenges (Trade and TBT)
	Major Issues
10.Consortia Standarization	General
11.Company Standardization	Strategy
	Internal standardization
	External standardization
	Consumer needs
12.Conformity Assessment	General
	Types and Strategy
	Procedures, Legal System
	National System – Accreditation
	Other Nations – only where necessary
	International, Regional, Multi/Bi-lateral
	MRA – General
	MRA – Types and Effectiveness
13. Consumer	Users and Consumers
14. Government	Government and Standardization

* Based on analysis of #17(EU-Asia), #20(ZFIB), #23(DEVCO), #27(KSA-UEPS), #28(Erasmus), #108(ICES) and other professional education curriculum.

> **<Module 3> Academic/ Theoretical aspects related:**

- ■ Definition: Interdisciplinary academic contents related to standardization; standardization with traditional academic disciplines such as economics, business management, public administration, law, engineering, science

- ■ Objective: to learn and develop academic aspects of standardization

- ■ Target Group: primarily for higher education

- ■ Projected Contents/Topics:

Major Classification	Sub-Classification
General	Academic approach to standardization
History	History and Standardization (academic)
Library/Information Science	Library/Recording Management and Standardization
Human Life Science	Consumer Protection and Standardization
	Social Welfare and Standardization
Education	Education about Standardization
Sociology	Social System and Standardization (academic)
Public Administration	Regulatory Policy and standardization
	Industry/Science Policy and standardization
	R&D Policy and standardization
Political Science/ Diplomacy	International Trade and Standardization
Law	Law/Legislation and Standardization (academic)
Economics	Economics and Standardization
Natural Science	Natural Science and Standardization
	Natural Science and Measurement Standards
Medicine/Pharmacy	Medicine and Standardization
Business Management	Standardization as a Strategic Tool - Decision Making, Marketing
	Global Business and standardization
	Service Management and Standardization
	Innovation and Standardization
	IPR, Patent and Standardization (Academic)
	MBA - Business Case Analysis <Module4>
Engineering	Technology Management and Standardization
	Technology Transfer and Standardization
	Standardization in all Engineering Disciplines (Mechanical, Construction, ICT, et al) <Module 5>

* Based on analysis of current practices and potential needs.
* Some of the above topics are connected with other modules

- ➢ **<Module 6> Skill-set related:**
  - ■ Definition: Practical skills need in standardization practices in proposing, developing, disseminating, and administrating relevant procedures. Some of them are related to typical business skills like communication, others are solely related to standardization like writing standards
  - ■ Objective: to learn how to use and apply particular standard(s)
  - ■ Target Group: Primarily for professional education
  - ■ Projected Contents/Topics:

Classification/ Topics
Developing/Drafting standards – template
Communication skills – chairing/moderating a meeting
Communication - Working across cultures – cultural differences
Communication skills – language (English)
Communication skills – consensus, negotiation, discussion
Conformance Skills – test, assessment, and documentation
Administration of standardization activities
Standards Development Procedures – Practices <Module 2>
Standards for technical regulations or legislation (practices) <Module 3>
Specific industry/technology/products/issues standards - overview <Module 5>

* Based on analysis of current practices in professional education.
* Some of the above topics could be partly duplicative with other modules

< Example List of Contents>

- ➢ **<Module 1> Example Standards in Daily Life:**
  - ■ Definition: Examples we could in everyday life to show that standards are everywhere in our lives and it is vital for safe and efficient society
  - ■ Objective: raising general awareness level about the importance of standards
  - ■ Target Group: for all – primary, higher, professional education
  - ■ Possible contents (The followings are some examples):

Classification/ Topics	
Automotive – Lead Acid Battery	ISBN
Barcode to RFID	JPEG – pictures
Cellular Phone Charger	Measurement Standards
Color	Memory Card Standards
Compact Fluorescent Lamp	MP3 Player
DMB	Paper Size
Wine Glass	Car Airbag

- **<Module 4> Case Study related:**
  - ■ Definition: Business cases describing different aspects of standard and conformance.
  - ■ Objective: to learn and develop practical impacts of standardization in real business practices
  - ■ Target Group: Primarily for higher education
  - ■ Possible contents (The followings are some examples):

Classification/ Topics
Case Study of Agricultural Standards
Case Study of Container Standards
Case Study of Electronic Fee Collection Standards
Case Study of VCR (VHS and Beta)
Case Study of Cell Phone (CDMA vs. GSM)
Case Study of ISO 9000 or 14000

  * Simplified <Module 4> Case Study could be used as <Module 1>
  * Topics of case study involves specific standards, Industry, technology, or companies.
  * Some of the above topics could be partly duplicative with other modules

- **<Module 5> Sector specific standards related:**
  - ■ Definition: How to use or apply particular standards. Commonly the standards and its explanatory notes are teaching materials.
  - ■ Objective: to learn how to use and apply particular standard(s)
  - ■ Primarily for professional education (also found in engineering disciplines in higher education)
  - ■ Possible contents (Examples):

Classification/ Topics
Management Systems Standards – Quality Management and Application
Management Systems Standards – Environmental Management and Application
Chemical Engineering related Standards and Application
Mechanical Engineering related Standards and Application
Service Standards and Applications
Social Responsibility Standards and Application
RFID Standards and Application

  * Simplified overview of <Module 5> could be used in other modules
  * Topics can be chosen by Industry, technology, products.
  * Some of the above topics are connected with other modules

6.5. How – Teaching Methods

After identifying what to teach in education programs, it is moment to decide the modality of teaching and students' assessment.

Active teaching/learning shifts the focus from the teacher and delivery of course contents to the student and active engagement with the material. Through active learning practices and modeling by the teacher, students drop the traditional role as passive receptors and learn and practice how to capture knowledge and skills and use them.
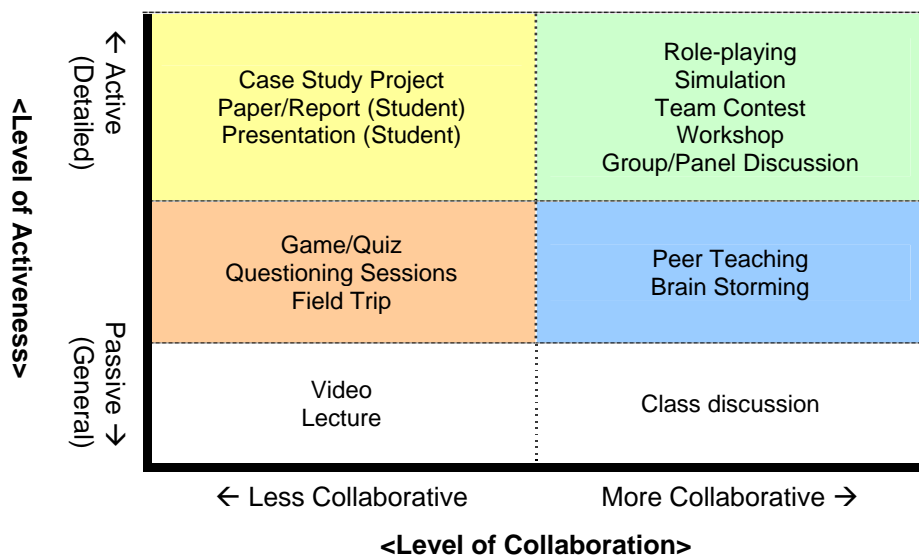
The practices of primary/secondary education, as partly summarized in Chapter 5.4, reveal that the contest type of group activities are widely adopted and used in the education for children. Also, in the practices of higher and professional education, case study and simulation are recommended modality to encourage students to participate and to develop required skills.

Assessment of student achievement is an important part of education program, and is associated with teaching methods. In addition to traditional test methods, the next alternative assessment devices enable you to provide measures of student performance, including:

> ➢ Essays, Term Papers

> ➢ Projects, Case studies; Portfolio

> ➢ Performances; Simulations; Peer evaluation

We already learned from lessons in chapter 5 that students prefer case studies, group activities, learning by doing. The <Figure 15> displays different types of teaching methods by the following two categories:

> ➢ Level of collaboration: Should a student learn alone or work together with others?

> ➢ Level of activeness: Should a student actively participate in classes?

<Figure 15> Various Methods in Teaching and Assessment

6.6. Strategic Curriculum Model Abridged

We endeavor, combining overall findings and suggestions in 6.1 to 6.5, to present the following **Strategic Curriculum Model (Abridged)** for Standards and Conformance Education. The abridged model is composed by the major factors who, why, where, what and how in planning and operating education programs.

< Table 7 > Strategic Curriculum Model Abridged

Who -students-	Why -objectives-	Where -operator-	What (Contents)		How -methods-	Good Practices (Annex C)
			-1st-	-2nd, 3rd-		
Pre-School	Awareness	Gov NSBs	Module 1 -examples (simplified!)		Game Quiz	N/A
Primary/ Secondary Education	Awareness	Gov NSBs	Module 1 -examples (simplified)	Module 2 (simplified)	Contest Camping Quiz Game	#7 Turkey #6 Thailand #3 Philippines #8-10 UK
Higher Education -Under- graduate	Awareness/ Specialized Knowledge	Gov NSBs SDOs Univ	Module 2 -fundamental Module 3 -academic Module 1 -example	Module 4 Module 5 Module 6	Team Project Presentation Field Trip	#12 CJLU #27 KSAUEPS #28 Erasmus
Higher Education -Graduate	Specialized Knowledge/ Theory	Univ Gov NSBs SDOs	Module 3 -academic Module 4 -case study	Module 6 Module 2 Module 5 Module 1	Case Study Term Paper Workshop	#25 Tokyo Un. #17 EU-Asia #18 PQI #19 Compienge #13 CJLU
Professional Education -Gov -Executive	Strategic Decision/ Policy Development	NSBs SDOs Gov	Module 2 -fundamental Module 3 -academic Module 4 -case study (Abridged!)	Module 1 Module 5 Module 6	Workshop Panel Discussion	#67 TISI(gov) #89 ANSI(gov)

Professional
Education
-Committee
  Members
-SDO staff
	Practical
	Skills or
	Ability
		NSBs
		SDOs
		Gov
			Module 5
			-skill-set
				Module 4
				Module 3
				Module 2
				Module 1
				Module 6
					Simulation
					Role Paying
					Workshop
						#48 ISO online
						#49 ISO training
						
						# many bust not
						  listed all here

Professional Education -Engineer -Researcher	How to use Specific Standards	Biz Univ R&D	Module6 -standards	Module 4 Module 3 Module 2 Module 1 Module 5	Experiments Practices	Not included in this Case Study, but many are operated by NSBs and SDOs