The 28th STAG Board Meeting

Session IV: Diverse Talents

Topic I：

Improving the Education Environment to Cultivate Interdisciplinary Talents in Taiwan

Director TK Tang

Advisory Office

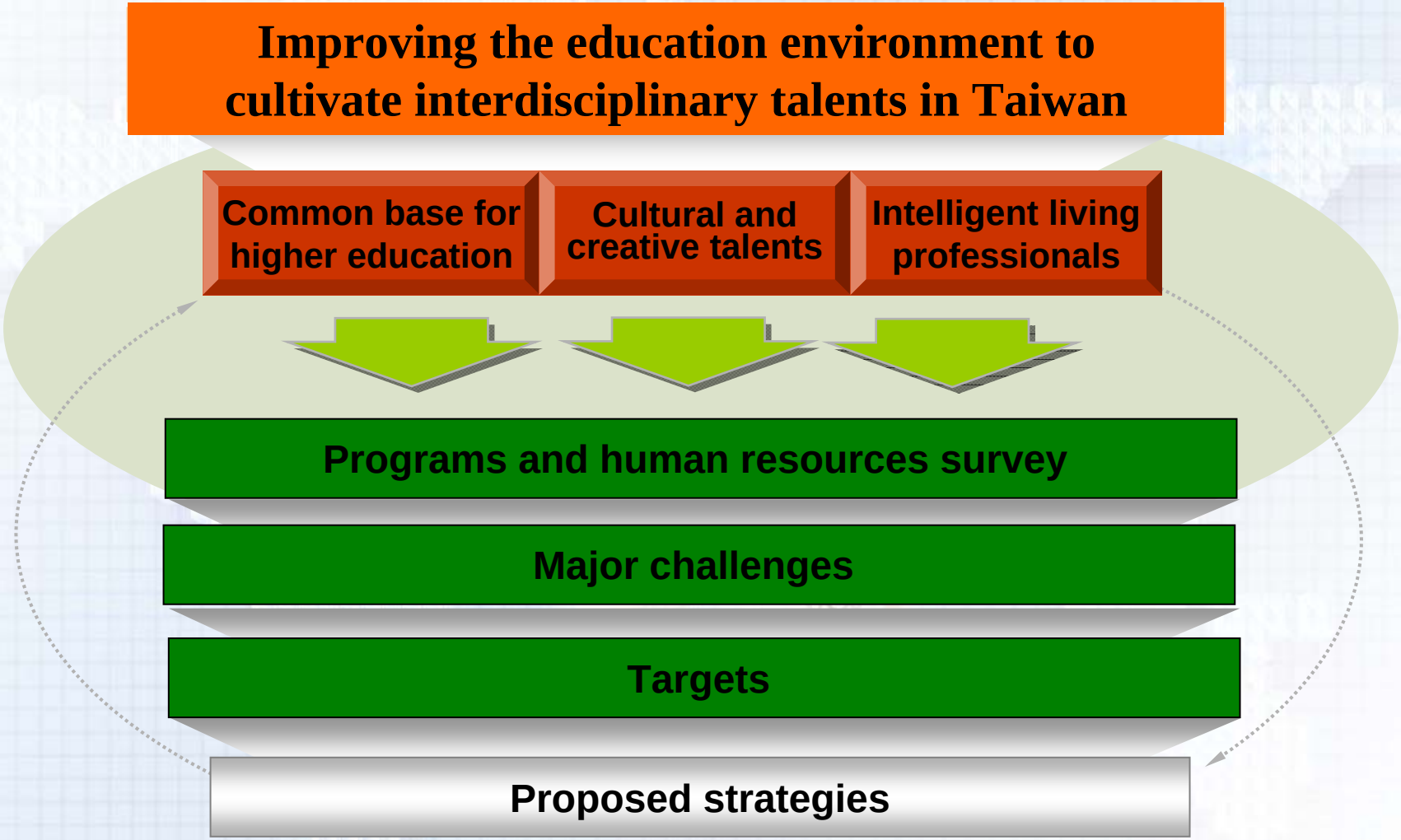
Ministry of Education

2008.11.19

Briefing Program

1. **Foreword**
2. **Current situation**
   - 2.1 Programs and human resources survey
   - 2.2. Major challenges
   - 2.3 Targets
3. **Strategies**
   - 3.1 Blueprint and timetable
   - 3.2 Strategies and action plans
4. **Conclusions**
   - 4.1 Brief conluding remarks
   - 4.2 Topics for discussion

❑Outline


Improving the education environment to cultivate interdisciplinary talents in Taiwan
Common base for higher education
Cultural and creative talents
Intelligent living professionals
Programs and human resources survey
Major challenges
Targets
Proposed strategies

1 Foreword

Taiwan IT Industry Competitiveness

1	Competitiveness	Taiwan is ranked second among 66 countries around the world in terms of the IT industry's competitiveness, moving up from the sixth place in 2007, second only to the US and is ranked first in Asia.
2	R&D Environment	Taiwan is ranked first in patent registrations, an indicator of the R&D Environment category, while it is ranked seventh in the Human Capital category, highlighting the significance of accumulation of human resources.
3	Infrastructure	In the Overall Business Environment, Legal Environment, IT Infrastructure and Support for IT Industry Development categories, Taiwan is ranked between 19th and 28th. Despite these facts, there is still room for improvement in areas of knowledge infrastructure and overall education environment.

Sources: Economist Intelligence Unit's (EIU) "IT Industry Competitiveness Index 2008"

2 Current situation

2.1 Programs and human resources survey(1/10)

The Ministry of Education (MOE) program to cultivate art and design talents in colleges and universities from 2003 to 2007:

Introduction

Intergrated cultivate art and design talents in colleges and universities and intercollegiate teaching resources. Establishing a communication channel between academia and industry.

Purpose

(1)Attracting world-class art and design educators/practitioners/researchers to Taiwan.

(2)Innovating programs, curricula and pedagogy.

(3)Establishing a communication channel between academia and industry to train individuals to possess the skills needed by industry and broaden students' horizons.

- The 5-year program has intergrated intercollegiate teaching resources to set up the Creative Resource Center for Traditional Arts, Taiwan Culture Luxury Design Teaching & Learning Resource Center, Digital Media Design Educational Center, Educational Resource Center for Life Trendy Goods Design, and Center for Digital Arts.

- The productive results are coming up with a total of 386 million dollars (US $ 12million) invested in it.

2 Current situation

2.1 Programs and human resources survey (2/10)

The Ministry of Education (MOE) program to cultivate art and design talents in colleges and universities from 2003 to 2007:

Summary

(1)421 world-class art and design educators/ practitioners/ researchers were recruited to lecture or offer workshops in Taiwan.

(2)20,261 students participated in a series of courses or programs.

(3)5,478 students taking courses or programs, work in the art and design related fields after graduation, or obtained certificates or diplomas.

(4)255 students and teachers carried out international collaborative projects, entered the finals or won prizes in exhibitions and competitions.

(5)238 academia-industry collaborative projects in art and design, both demestic and overseas.

To be continue

Successive programs between 2008 and 2011 include:

(1)Overseas Training Plan for Arts and Design Talents,

(2)IDC—a program to encourage students to participate in international arts and design competitions,

(3)Holding Taiwan International Design Competition in cooperation with the Ministry of Economic Affairs.

2 Current situation

2.1 Programs and human resources survey(3/10)

The MOE pilot programs to promote humanities and technology education as well as programs to train individuals to be professionals of various fields and disciplines in 2007:

Resources allocated to different types of schools in 2007

Program name – funds invested	Percentage			
	National Universities	Private Universities	National Vocational Schools	Private Vocational Schools
The Humanities *Education* Medium- Term Innovation Program (Sub-Program I. Digital *Humanities* Teaching Program) - $17.68 million (US $ 0.55 million)	**61%**	**16%**	**14%**	**9%**
Pilot Program to ICT professional cultivation (key areas including telematics and digital family) - $56.46 million (US $ 1.76million)	**39%**	**21%**	**19%**	**21%**
Pilot Program to Develop RFID Technology and Train RFID professionals - $60.28 million (US $ 1.88million)	**35%**	**14%**	**38%**	**13%**

Remark: The above three pilot programs are all four-year programs that began in 2007, with $134.42 million (US $ 4.2million) invested in it.

2 Current situation

2.1 Programs and human resources survey(4/10)

The MOE pilot programs to promote humanities and technology education as well as programs to train individuals to be professionals of various fields and disciplines in 2007:

Statistics on the training of professionals in 2007

Program	Classes	Teachers	Students
The Humanities Education Medium-Term Innovation Program (Sub-Program I. Digital Humanities Teaching Program)	55	91	2,115
Pilot Program to Train Telecommunication Professionals (key areas including telematics and digital family)	68	73	2,479
Pilot Program to Develop RFID Technology and Train RFID professionals	192	216	8,832
Total	315	380	13,426

Sub-Program I. Digital Humanities Teaching Program of The Humanities Education Medium-Term Innovation Program:

Introduction	The program aims to teach college students majoring in humanities and arts the knowledge and skills pertaining to digital archives and digital creation in order to facilitate their interdisciplinary studying, creation and research.
Executing	• For the first time draft almost to reach 200 documents in 2007. Integration between digital technologies and humanities culture, with progress being accumulated.

Pilot Program to ICT Professionals Cultivation:

Introduction	The program aims to develop six key industries – mobile, wireless, broadband, digital TV and broadcast, intelligent transport/Telematics, and digital family in an effort to enhance advanced technologies, application service and interdisciplinary integration.
Executing	• **To establish teaching alliance center, develop core curricula and teaching materials, to set up websites of teaching materials and activity of teaching.** • **Promotion of program to ICT curriculum cultivation, extending help to improvement teaching and application environment for universities.** • **Promotion of program of telematics and digital family in 2007, the initial stage of participate in 43 colleges and universities, gradually build up teaching and training professionals.**

2 Current situation

2.1 Programs and human resources survey (7/10)

Pilot Program to Develop RFID Technology and Train RFID Professionals:

Introduction	**The program aims to develop basic RFID application technology, RFID IT application and safety, RFID application to medical care, and RFID application to logistics and supply chain in an attempt to help colleges and universities to set up relevant teaching environment as well as cultivate students' RFID knowledge and skills.**
Executing	• **To establish educational resource center through cross-institutional collaborative to planning and popularize of teaching and investigate activities.** • **Promotion of program to develop RFID Technology and Train RFID curriculum , extending help to colleges and universities to set up relevant teaching environment as well as cultivate students' RFID knowledge and skills.** • **Promotion of program in 2007, the initial stage of participate in 27 colleges and universities, gradually build up teaching and training professionals.**

2 Current situation

2.1 Programs and human resources survey (8/10)

Education Program on Mobile Convergence Network, supported by the Industrial Development Bureau (IDB) from 2008 to 2011：

Purpose	The program aims to incubate professionals on mobile convergence networks.
Methods	• Modular training courses are provided to 500 system design and development engineers. • It is expected that the domestic industry can improve its capacity for product development, core technology development, design, system integration, as well as innovative services in the area of mobile convergence network.

Others Intelligent-Living Related Projects：

The Sponsor	Project
The National Science Council	Regional Centers of Intelligent Living Technology
	Technology for Quality Living Environment
	The Wireless Sensor Network Technology
	Conceptual Design of Future Products
	Interdisciplinary Research of Intelligent Living Technology
Ministry of the Interior	Industry Development of the Intelligent Living Space
	Promotion of Courses on Intelligent Living Space in Colleges and Universities

2 Current situation

2.1 Programs and human resources survey(10/10)

Examination of supply and demand for IT human resources from 2008 to 2010:

Information	Communications	Digital
Supply of information and communication professionals is sufficient. However, capable experienced engineers are in short supply. There are still shortfalls in the supply of professionals in certain fields.	The digital industry are crucially required for mid-, high-level professionals (e.g. directors, innovators and marketing agents), while the sufficient supply of basic-level manpower offsets the shortage.	Practical training offered by colleges doesn't live up to industry's expectation. Students lack practical experience and the teachers possessing practical experience is not enough.
		Hong Kong and Singapore are actively recruiting Taiwanese professionals. The competition for professionals has become internationalized.

Data sources: The Industrial Development Bureau, Ministry of Economic Affairs of The Conference on the Supply and Demand for Technological Professionals between 2008 and 2010

2 Current situation

2.2 Major Challenges(1/5)

	Points
Common base for higher education	1) Polarization of higher education creates another kind of digital divide in the knowledge economy era. 2) Promotion of digital learning in higher education alone is not sufficient for effectively raising college students' average quality.
Developing cultural and creative talents	1) "Quantity" vs. "quality" 2). Lack of qualified teaching faculty. 3) Uneven distribution of specialties of cultural and creative professionals and specialties that don't necessarily meet industry needs. 4). Lack of multidisciplinary professionals and professionals with the ability to participate in interdisciplinary collaboration. 5). Exposure of professionals to the international stage is beginning to show results and needs continued efforts.
Intelligent-Living Professionals	The intelligent-living professionals possessing knowledge and skills in a number of fields that include information and communications, construction and architecture, energy conservation, and health care are urgently needed. Currently no relevant courses or curricula exist to train this type of professionals.

Common base for higher education

Lack of quality courseware for digital learning

- Polarization of higher education creates another kind of digital divide in the knowledge economy era.
- Promotion of digital learning in higher education alone is not sufficient for effectively raising college students' average quality.

2 Current situation

2.2 Major Challenges (3/5)

Developing cultural and creative talents (Current Status)

Quantity" vs. "quality

A large number of students major in cultural and creative disciplines, but only few are well-prepared for the profession.

Lack of qualified teaching faculty

The rapid increase in the number of departments has created a shortage of qualified teachers and the hiring of faculty trained in other disciplines.

Talent doesn't live up to industry's expectation

Uneven distribution of specialties of cultural and creative professionals and specialties that don't necessarily meet industry needs.

Interdisciplinary ability and team work is not enough

Lack of multidisciplinary professionals and professionals with the ability to participate in interdisciplinary collaboration.

Strengthening professionals to the international stage

Exposure of professionals to the international stage is beginning to show results and needs continued efforts.

2 Current situation

2.2 Major Challenges(4/5)

Developing cultural and creative talents (Case studies from other countries)

Finland

- Enhancing education and creativity from childhood: The Finnish government emphasizes that imagination is more important than knowledge. Children are instilled with concepts of “cultural roots, international languages and global trends” as a move to build up creative thinking.
- The government provides job openings/ practical training opportunities for higher employment competitiveness

The United Kingdom

- Extending help to art creators into practitioners
- Bridging the link between creative industry and manpower supply
- Setting up creative industrial academic research centers

South Korea

- Training international affairs-savvy professionals
- Systematically developing talents in specific areas: Finding out the future demand through research conducted by the Korea Culture & Content Agency (KOCCA) and establishing training organizations.

Australia

- Setting up “The Creative Industries Precinct”
- Setting up “The Creative Industry & Creative Research Center”

2 Current situation

2.2 Major Challenges(5/5)

Intelligent-Living

Incubate creativity

The intelligent-living professionals possessing knowledge and skills in a number of fields that include information and communications, construction and architecture, energy conservation, and health care are urgently needed. Currently no relevant courses or curricula exist to train this type of professionals. It is worthwhile to develop professionals in the field of distant technology-based home care.

Enhancing academia-industry collaboration and division of labor in terms of research

Except for strengthening the basic knowledge and skills, the attention should be brought to the connection with industry in order to cultivate competitive human resource and create values of the intelligent-living industry. By enhancing future academia-industry collaboration with research efforts, it is expected to improve the synergy of human resource development in the near future.

To establish learning mechanism of the programs and courses

Since it's still at the beginning stage for educational systems in this field globally, it's important to enhance the teaching and research environment and innovative learning mechanism of the programs and courses. New promotion strategies other than current technology-oriented ones are highly suggested to achieve the goal of developing innovative interdisciplinary professionals.

2 Current situation — 2.3 Targets

Improving the education environment to cultivate interdisciplinary talents in Taiwan

To reduce the polarization phenomenon among colleges and universities by strengthening college students' overall core capabilities.	To improve the quality of students in higher education through the development of high-quality digital learning materials and innovation in teaching methodology.	To understand the supply and demand for cultural and creative professionals, and using the interdisciplinary model to encourage a balanced training of cultural and creative professionals.	To establish the cross-institutional collaborative system to incubates interdisciplinary professionals with creativity, well-rounded knowledge and skills.

3 Strategies(1/6)

3.1 Blueprint and timetable

Short-term → **Long-term**

1 – 4years

(1) Strengthening the core teaching and learning capabilities in higher education.

(2) Effectively narrowing the gap among colleges and universities, and the shortage between supply and demand for professionals.

(3) Demonstrating Taiwan's advantage in technology and humanities, and establishing an environment to train professionals of various fields.

5 -10years

Raise the quality of higher education and produce culturally and technologically sophisticated citizenry through investment in innovation of teaching/learning technology via the utilization of the know-how of Taiwan's R&D in technology and IT.

Improving the education environment to cultivate interdisciplinary talents in Taiwan

3 Strategies(2/6)

3.2.1 Common base of higher education

Strategies	Action plans
Select core courses in fundamental, interdisciplinary and application areas	Select core courses in fundamental, interdisciplinary and application areas. Develop high quality digital teaching/learning materials in the selected courses.
	Disseminate the developed courses to all universities and colleges as open courseware so that they can be used in places that do not have the capability to develop such courses on their own.
Establish new digital learning and teaching methodology.	Schools are provided free of charge with the redesigned course contents to carry out asynchronous web teaching. Teachers provide teaching support and learning services in classroom to answer students' questions in a timely fashion. Establishment of a new and effective digital learning and teaching model can maximize the benefits of quality contents.

3 Strategies(3/6)

3.2.2 Developing cultural and creative talents

Strategies	Action plans
Strengthening evaluation of departments and schools in cultural and creative disciplines	In addition to evaluating the number of teachers with doctoral degrees, it is important to evaluate whether the teachers' specialties and output match the department/ school's educational objectives.
	Encouraging departments/schools to recruit teachers with distinguished professional experience and having won awards in important international competitions.
Regulating supply of cultural and creative professionals	Identifying specialties with unmet demands and providing incentives to help existing departments/ schools to adjust their programs for training professionals in the under-supply specialties.

3 Strategies(4/6)

3.2.2 Developing cultural and creative talents

Strategies	Action plans
Promoting the training of interdisciplinary professionals	Offering incentives to encourage graduate schools to establish separate Master's programs for outstanding graduates from other disciplines, in order to create new channels for training interdisciplinary professionals.
Promoting interdisciplinary collaboration	Providing departments/schools incentives to offer interdisciplinary courses, particularly project-based courses, to allow students from different disciplines to form interdisciplinary teams to cultivate their ability to collaborate. The design of the contents of the interdisciplinary courses should encourage dialogue and integration between technologies and humanities.
Investing on training professionals with global views	Continuing to implement plans to send art and design talents to study abroad, plans to encourage students to participate in international art and design competitions, plans to encourage international exchanges in the training of professionals in the humanities, and plans to encourage international exchange of scholars in Taiwan literatures, histories, and arts. In addition, strengthening alliance and cooperation with top schools in the world to gradually establish Taiwan's reputation in the cultural and creative industries.

3 Strategies(5/6)

3.2.3 Intelligent-Living Professionals

Strategies	Action plans
The cross-university, interdisciplinary training model	In order to develop the professionals with creativity and vision, to set up a cross-institutional training model is important in terms of promoting collaboration synergy and flexibility. A multiple level of educational programs from general education, independent studies, coordinating lab researches to minor or degree programs could be considered for adoption.
The cross-university, interdisciplinary pedagogy	The utilize pedagogy that could help engage students into an innovative learning environment such as learner-centered, collaborative learning, project-based and problem-based learning methods. And new materials and innovative learning environment should be provided to promote this extensive model of application to faculties of educational institutions.
The college-diversity collaboration system	The synergetic training system that develop professional in multiple academic levels could be achieved by encouraging the collaboration among a variety of higher education institutions from vocational schools, technical colleges, to universities or graduate institutes. The characteristic competencies of these higher education institutions could be expected and exerted to improve the collaboration with industry in this vertical supply chain of research and development.
The international collaboration	A series of academia-industry collaboration activities could be extended to the international level. Approaches such as distance education, laboratory collaboration, exchanging students and visiting scholars programs, as well as enterprise internship could be implemented to deepen the level of the international exchange.

3 Strategies(6/6)

3.2.3 Intelligent-Living Professionals

Strategies	Action plans
The industry-engaged training system	Leveraging the industry involvement in academia-industry collaboration could be achieved and enhanced by introducing alternative training formats such as practical lecturers from industry, enterprise internship, and project researches. An industry-engaged training system guarantees more comprehensive collaboration between industries and schools, and develops students more competitive knowledge and skills for future works.
The extension education model for general publics	In order to improve public acceptance and acknowledge toward intelligent-living technology, the transformation of the originally professional knowledge into general information and applicable practices should be planned and implemented in various formats.
The distant home-care human resource development	Expertise includes medical care, information and communication technology, business and management, as well as jurisprudence should be introduced to design new training programs or educational curricula with the collaborative efforts between academia and industry. This model could be developed by enhancing academia-government collaboration with governmental supports such as offering certification to qualified professionals, and conduct faculty development programs. Also the final synergetic academia-industry-government collaboration model could be integrated and transformed into formal education programs in higher education system after its maturity.

4 Conclusions

4.1 Brief conluding remarks(1/3)

Train Professionals of Various Fields in Taiwan

Cultural and Creative community	Intelligent environment	Intelligent Living
Cultural and creative talents	Intelligent traffic、Telematics and broadband network talents	Energy-saving Building、digital family and distant home-care talents

4 Conclusions

4.1 Brief conluding remarks(2/3)

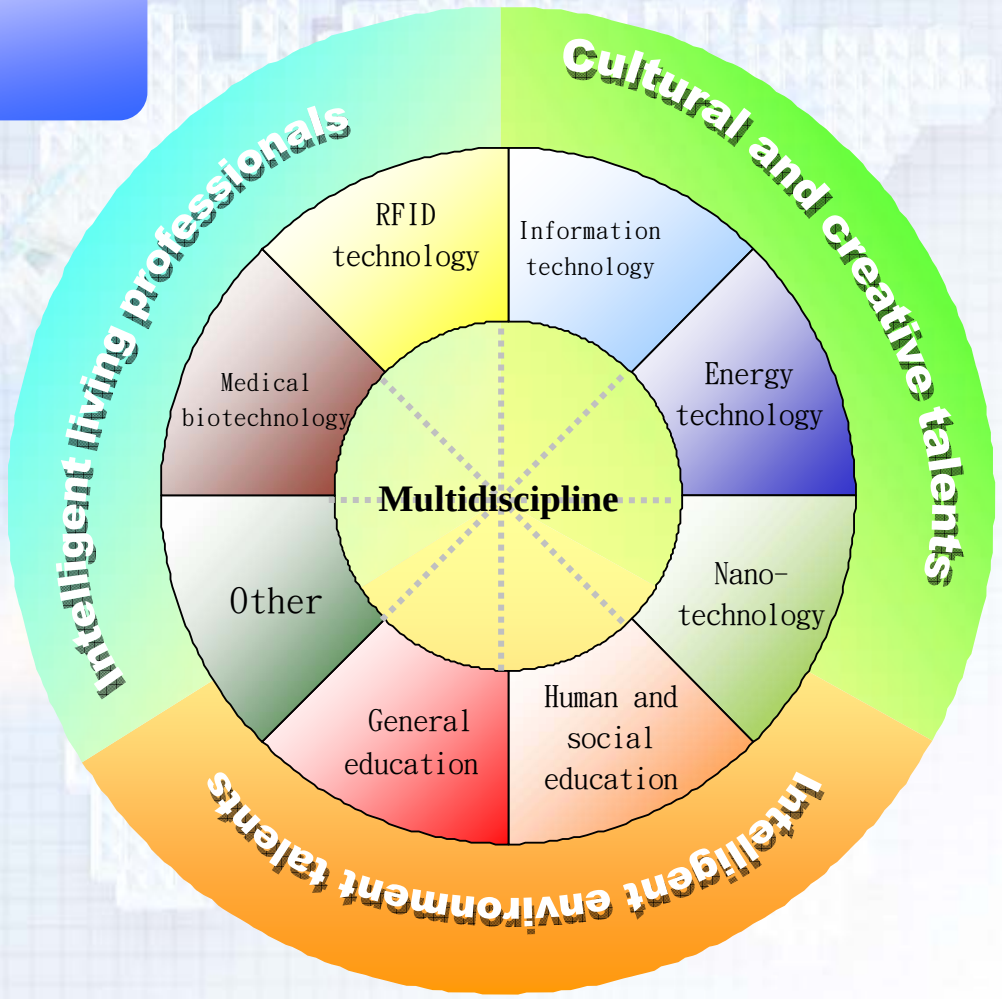
1. Developing creative, forward-looking, interschool, interdisciplinary educational models and designing professional teaching materials and methods that inspire creative learning.
2. Establishing new teaching methodology and diffusion mechanisms for digital learning so that quality courses can be promoted to various schools through the knowledge diffusion platform in order to effectively raise students' basic abilities.
3. Encouraging collaborative research between research-oriented universities and universities of technology, strengthening the contents of teaching materials and teaching standards of basic courses and hands-on training to facilitate vertical integration along the R&D supply chain.
4. Promoting mechanisms that encourage industry-academia collaborated professionals training (e.g. courses that combine practical training, classroom learning and hands-on experience in businesses)
5. Enhancing internationally collaborated professionals training mechanisms by working with first-tier universities and research institutions across the world.

4 Conclusions

4.1 Brief conluding remarks(3/3)

6 Establish teaching resource centers

- Provides professional teaching materials and methods
- Provides popular sciences teaching materials for multidisciplinary students
- Scientific ethics and research integrity
- Produces culturally and technologically citizenry



4 Conclusions

4.2 Topics for discussion

1. How to construct the fundamental environment to cultivate interdisciplinary talents in Taiwan? (such as to establish an “open courseware” sharing system in order to guide the quality of core curricula and teaching methodology so as to strengthen students’ capabilities.)

2. How to establish a collaboration system between higher education and technological/vocational education institutions? It is very important to encourage alliance across universities, colleges department, interdisciplinary, etc… to strengthen either the core curricula or teaching qualities.

3. How to develop international industry-academia alliance in an effort to cultivate integration professions in the fields of creativity, culture-base, and technology application abilities?

4. How to adjust education system to accelerative cultivate interdisciplinary talents to support the health care industry development?

Appreciation for

Zse-Hong Tsai, Professor, Department of Electrical Engineering,
National Taiwan University

Jieh Hsiang, Professor, Department of Computer Science,
National Taiwan University

Lin-Lin Chen, Dean, College of Design,
National Taiwan University of Science and Technology

Pei-Ling Liu, Director, Institute of Applied Mechanics,
Nationl Taiwan University

Show-Lin Wen, Associate professor , Department of Architecture and Urban Design Graduate Institute of Architecture and Urban Planning, Chinese Culture University

Hsiu-Ping Yueh, Department of Bio-Industry Communication and Development, National Taiwan University

Thank you

Reference

The Supply and Demand for Technological Professionals between 2008 and 2010 (1/2)

Digital content professionals

Year	2008		2009		2010	
Industry outlook	Additional demand	Additional supply	Additional demand	Additional supply	Additional demand	Additional supply
Optimistic	6,800	4,600	6,900	5,000	7,300	5,200
Fair	6,200		6,600		6,900	
Cautious	5,900		6,600		6,700	

The digital industry are crucially required for mid-, high-level professionals (e.g. directors, innovators and marketing agents), while the sufficient supply of basic-level manpower offsets the shortage.

Source: The Digital Education Institute, December 2007

Reference

The Supply and Demand for Technological Professionals between 2008 and 2010 (2/2)

Communications professionals

	Year	2008		2009		2010	
	Industry outlook	Additional demand	Additional supply	Additional demand	Additional supply	Additional demand	Additional supply
Communications equipment	Optimistic	2,700	2,000	2,400	2,100	1,900	2,200
	Fair	2,600		2,300		1,800	
	Cautious	2,400		2,200		1,700	
Communications service	Optimistic	400	900	400	900	600	1,000
	Fair	400		400		600	
	Cautious	400		400		600	

Source: IDB/Industrial Technology Research Institute, ICL April 2008

Information service professionals

Year	2008		2009		2010	
Industry outlook	Additional demand	Additional supply	Additional demand	Additional supply	Additional demand	Additional supply
Optimistic	8,420	6,620	9,000	7,000	9,610	7,460
Fair	8,080		8,630		9,220	
Cautious	7,740		8,260		8,830	

Source: The Digital Education Institute, December 2007

Reference

Transition Characteristics from age 18 to 20, According to Net Enrollment Rates

Unit:%

Continent	Country	18years-old	19years-old	20years-old
ASIA	**Taiwan**	**48**	**65**	**62**
	Japan	…	…	…
	Korea	63	72	65
North America	U.S.A	39	49	47
	Canada	…	…	…
Europe	The United Kingdom	23	31	33
	France	27	39	41
	Germany	2	10	18
	Holland	20	29	34
Oceania	Australia	27	35	37
	New Zealand	25	34	38
	Average	**17**	**29**	**34**

Source：Education at a Glance, OECD Indicators 2007, Tab. C2.3

Reference

Number of culture-, creativity-related programs added by colleges and universities in school years 2003 - 2007

Program	Bachelor's	Master's/ Master's for business executives	Doctoral
Regular universities (40 schools)	37	57	7
Universities of technology (35 schools)	60	13	1

Note:Bachelor's programs include undergraduate programs of 4-year colleges and universities, 2-, 4-year universities of technology, 2-year programs for business executives, and extension programs.