

# Education for Graduate Students in KAIST

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November 8, 2006  
Tohoku University



◆ 1<sup>st</sup>, 2<sup>nd</sup> Steps of BK (Brain Korea) 21 program  
by Ministry of Education of Korea

- Institute of Mechanical Engineering of KAIST
- KAIST Valuefactory Institute of Mechanical Engineering

# 1<sup>st</sup> Step of BK-21 Program

- Research oriented graduate program
- Leading role in cultivation students of talent ability
- Higher international standards
- Open admission to other university
- Condition (term) of a contract of professor
- Integration of area - synthesis

# Background

## Economy

- Globalization on capital and labor (enterprise)

## Technology

- Market forces,
- Geopolitical factors
- Public acceptance

## R&D program

- Industry oriented
- Multinational and Multipartner
- Innovative
- Positive for the Environment
- Precompetitive

## Academic education

- Considerable efforts needed to produce to leading engineers

# Introduction of KAIST

## □ Timeline

- ▷ **Feb. 16, 1971** Establishment of Korea Advanced Institute of Science (KAIS) (Hongneung Campus, Seoul)
- ▷ **Mar. 05, 1973** First entrance ceremony for the master's program
- ▷ **Aug. 20, 1975** First graduation ceremony for the master's program
- ▷ **Sep. 12, 1975** First entrance ceremony for the doctoral program
- ▷ **Aug. 19, 1978** First graduation ceremony for the doctoral program
- ▷ **Dec. 31, 1980** Establishment of Korea Advanced Institute of Science and Technology (KAIST), in which KAIS is merged with KIST
- ▷ **Dec. 31, 1984** Establishment of Korea Institute of Technology, newly added bachelor degree course
- ▷ **Mar. 03, 1986** First entrance ceremony for Korea Institute of Technology
- ▷ **Jun. 12, 1989** Separation from KIS
- ▷ **Jul. 04, 1989** KAIST is merged with Korea Institute of Technology (relocation to Daedeok Campus)
- ▷ **Dec. 17, 1990** First graduation ceremony for bachelor's program
- ▷ **Oct. 01, 1996** Establishment of Korea Institute of Advanced Study

# Actual state and Performance

## □ Academic Programs

5 colleges, 13 departments and 7 divisions (excluding 5 MBA programs) and 10 interdisciplinary programs

colleges	Department, division	courses
College of natural sciences	Physics	Bachelor's, Master's and PhD
	Biological sciences	'
	Mathematics (Division of Mathematics)	'
	Mathematics (Division of Applied Mathematics)	'
	Chemistry	'
College of engineering	Civil and Environmental Engineering	'
	Mechanical Engineering (Division of Mechanical Engineering)	'
	Mechanical Engineering (Division of Aerospace Engineering)	'
	Industrial Engineering	'
	Industrial Design	'
	Chemical and Biomolecular Engineering	'
	Materials Science and Engineering	'
	Nuclear and Quantum Engineering	'
	Electrical Engineering and Computer Science (Division of Electrical Engineering)	'
	Electrical Engineering and Computer Science (Division of Computer and Science)	'
Graduate school of Management	Management Engineering Program	'
	MBA Programs (Techno-MBA, MIS-MBA, FE-MBA, Telecom-MBA, and Green-MBA, Executive-MBA)	Master's
School of Humanities and Social Sciences	-	-
College of Interdisciplinary Studies	Department of BioSystem	Master's/PhD

# Actual state and Performance

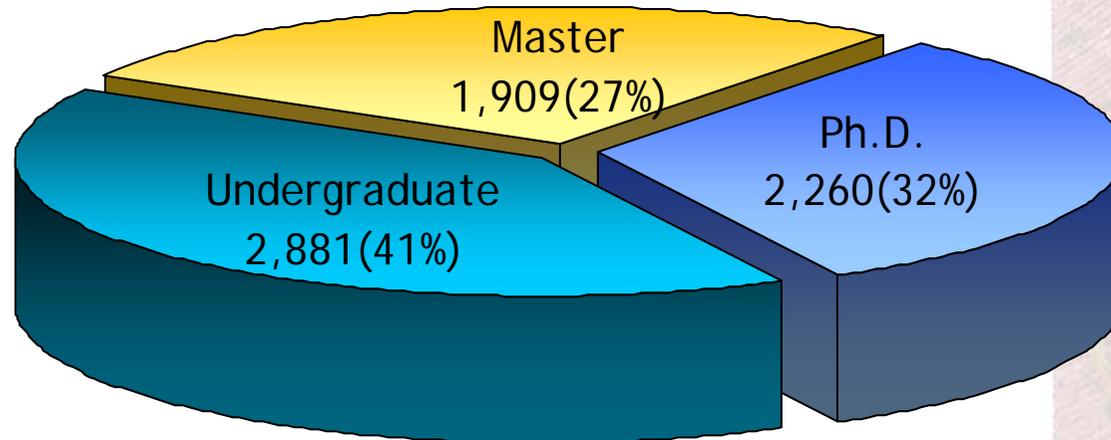
## □ Academic Programs

5 colleges, 13 departments and 7 divisions (excluding 5 MBA programs) and 10 interdisciplinary programs

<b>Interdisciplinary Program</b>	<b>Polymer Science and Engineering Program</b>	<b>Master's/PhD</b>
	<b>Science, Technology and Society Program</b>	<b>Master's/PhD</b>
	<b>Nano Science and Technology and Society</b>	<b>Master's/PhD</b>
	<b>The Robotics Program</b>	<b>Master's/PhD</b>
	<b>Culture Technology Program</b>	<b>Master's/PhD</b>
	<b>Professional Software Expert Program</b>	<b>Master's</b>
	<b>Biomedical Science and Engineering Program</b>	<b>Master's/PhD</b>
	<b>Telecommunication Engineering Program</b>	<b>Master's/PhD</b>
	<b>Environmental Energy Engineering Interdisciplinary Program</b>	<b>Master's/PhD</b>
	<b>E-Manufacturing Leadership Program</b>	<b>Master's/PhD</b>

# Enrollment 2004

Approximately 7,000 students enroll at KAIST in 2004.



Undergraduate: 2,881 (41%)  
Graduate: 4,169 (59%)

# Europe's skills fall behind Asia

**South Korea has especially high attainment levels in education Europe is falling behind Asia in terms of education and skills, according to a report by the Organisation for Economic Co-operation and Development (OECD).**

It blames France and Germany which are criticised for mediocre education systems and their inherent class bias.

China and India, on the other hand, are starting to deliver "high skills at low costs and at an ever increasing pace".

**South Korea and Finland are highlighted as positive examples where investment in education has taken priority.**

The report's author, Andreas Schleicher, says the solution is clear for countries falling behind, like France and Germany - investment in education and skills.

"Education and skills will be key for Europe to achieve its ambitious goals," he says.

"In short, if Europe wants to retain its competitive edge at the top of the global-value-added chain, the education system must be made more flexible, more effective and more easily accessible to a wider range of people."

He adds that France and Germany, "which make up 35% of the European Union's 11.6 trillion euro economy, are no longer among the world's leaders in developing knowledge and skills".

**Mr Schleicher praises the "miracle" of South Korea - a country which in the 1960s had a lower national income than Mexico and South American countries and sat near the bottom of the 30 OECD countries in terms of educational qualifications.**

## **Demand**

Today, 97% of South Korea's 25 to 34-year-olds have high school education - the highest rate among the main industrialised countries.

**He says South Korea was transformed by its positive response to a demand for education.**

"When demand for education began to outpace supply, students were not sent home," he said. "Instead, class size and schooling hours were extended."

Parents also invested in private tuition for their children.

"The incentives driving these reforms forward was a plethora of merit-based learning opportunities where progress depended on what children were able to do, not where they came from."

Mr Schleicher says this differs from France, Germany and Italy, where class distinction is a cause for concern.

"Europeans from difficult socio-economic backgrounds don't receive the same educational opportunities as children from rich and middle-class families," the study said.

"In many countries, the data suggest that European schools reinforce existing socio-economic inequities."

## **Class barrier**

In Germany, for example, children in white-collar families are four times more likely to go on to higher education.

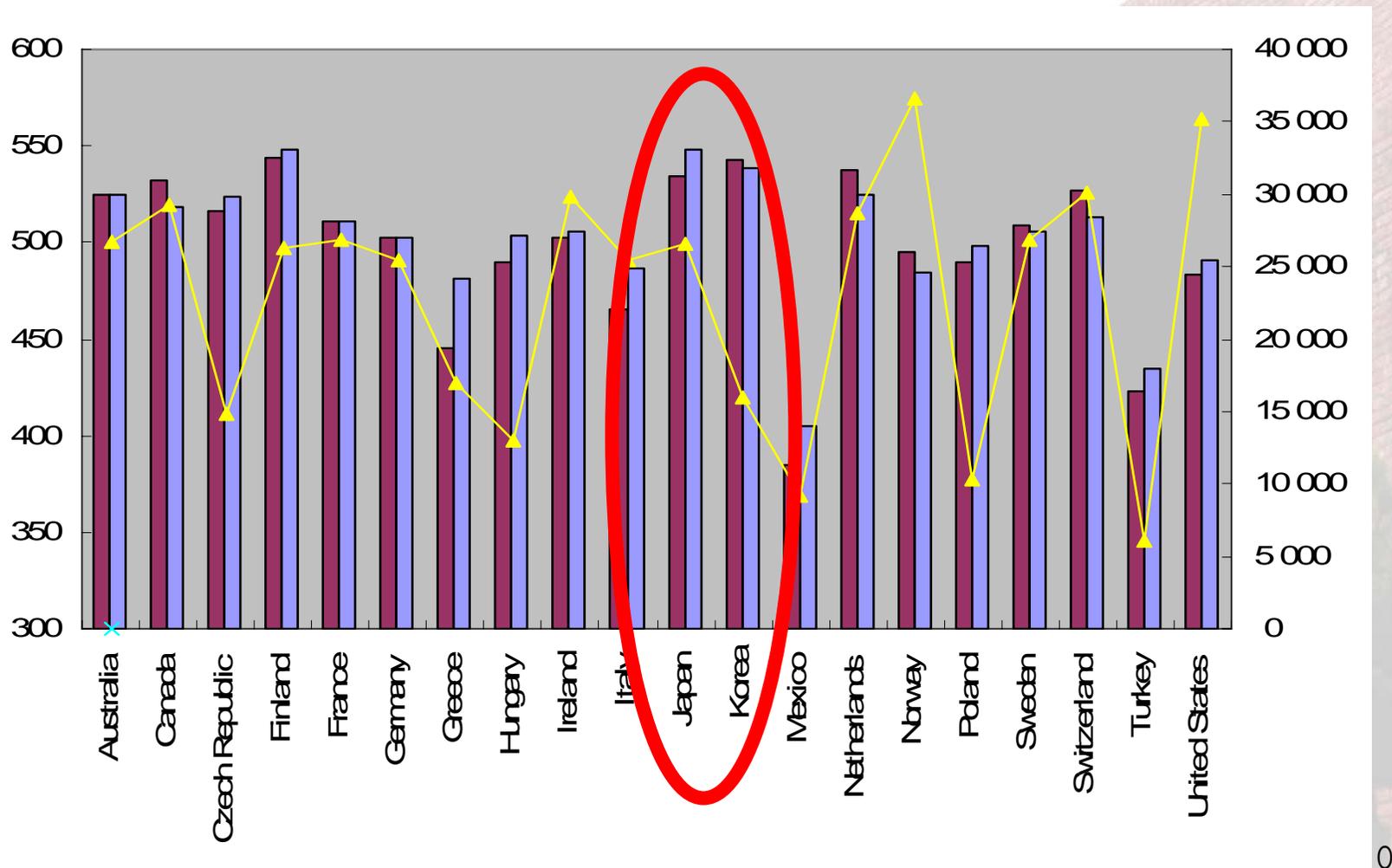
He says educators in Europe are also reluctant to change their ways, despite research.

"Education in Europe continues as a cottage industry, with practitioners working in isolation and building their practice on folk wisdom about what works," he says.

His recommendations to help turn Europe around include:

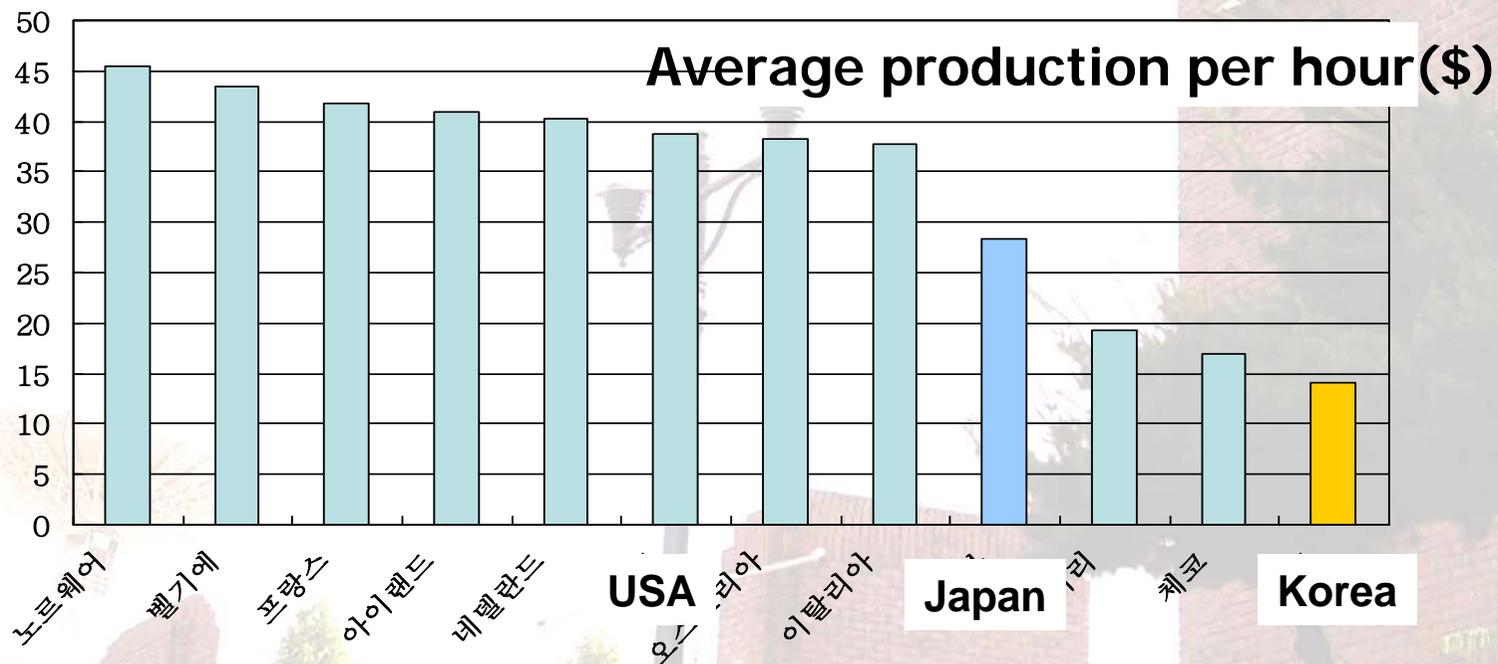
- \* creating a system of sustainable and high-quality educational institutions with the freedom to respond to demand
- \* developing higher education systems to improve access, quality and equality
- \* encouraging public and private funding
- \* ensuring universities are governed by a wider range of stakeholders than the academic community.

# OECD PISA 15 years old Math, Science score & GDP per capita



# Competitiveness of Manpower

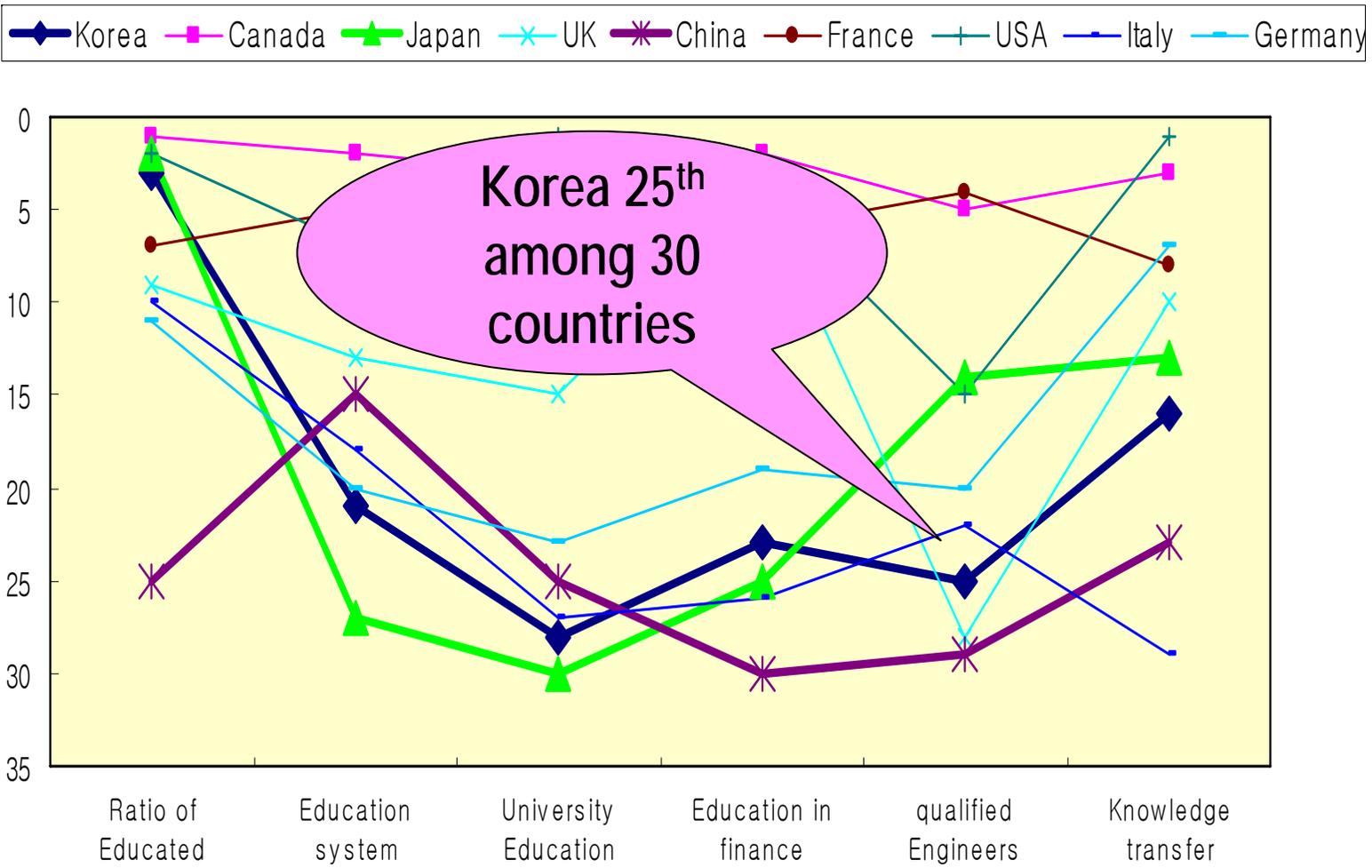
- “Korea’s competitiveness of manpower is 45% of global standard” (Korean CEO’s report)
- Productivity : 50% of USA, 60% of Singapore and Hong KONG, 66% of Japan( 2004/03/07  
<http://blog.naver.com/bluesky9828/40001185886>)



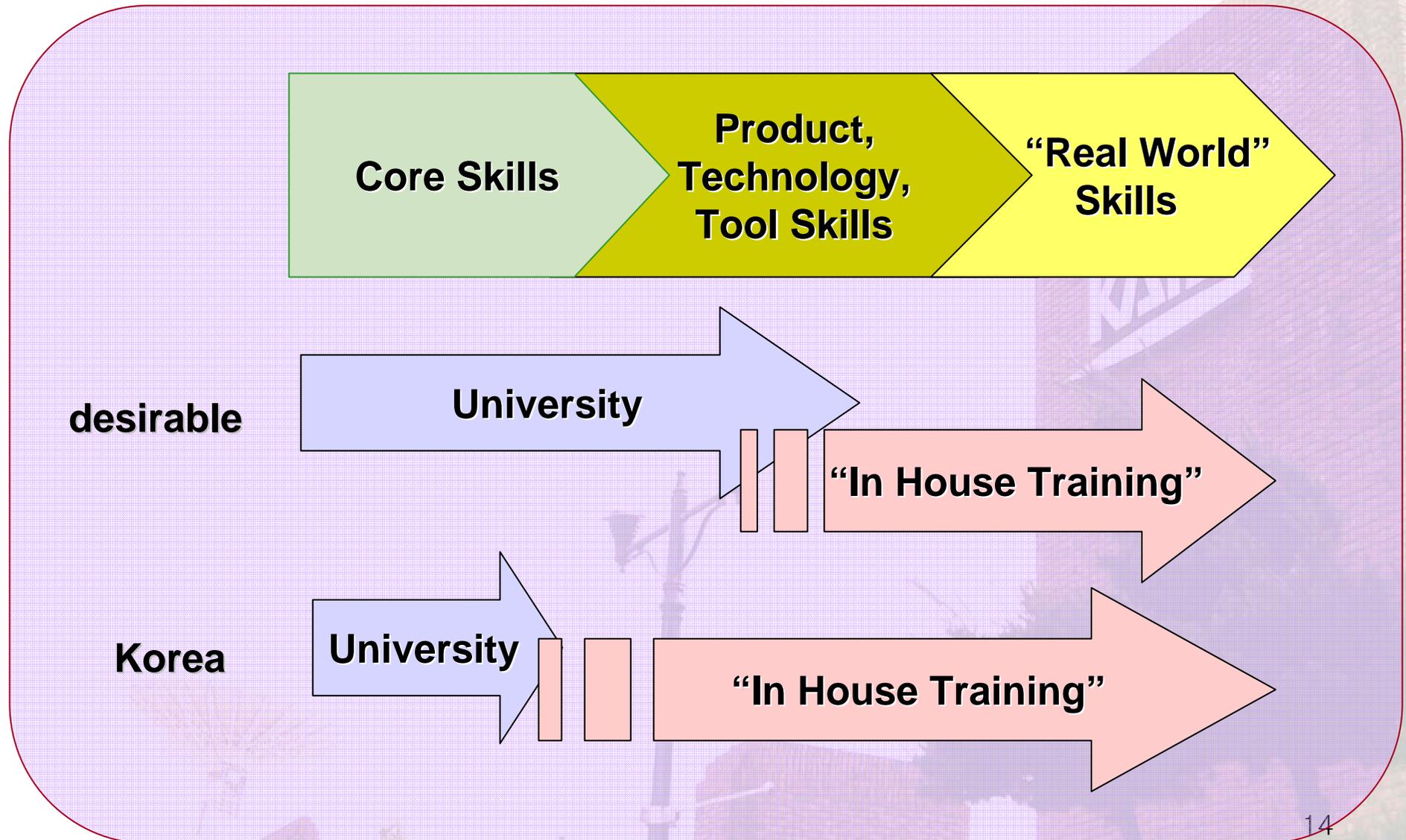
# Role of Higher Education for students

- Character building toward intellectual and moral maturity
- Professional training in science and technology
- Life-long education

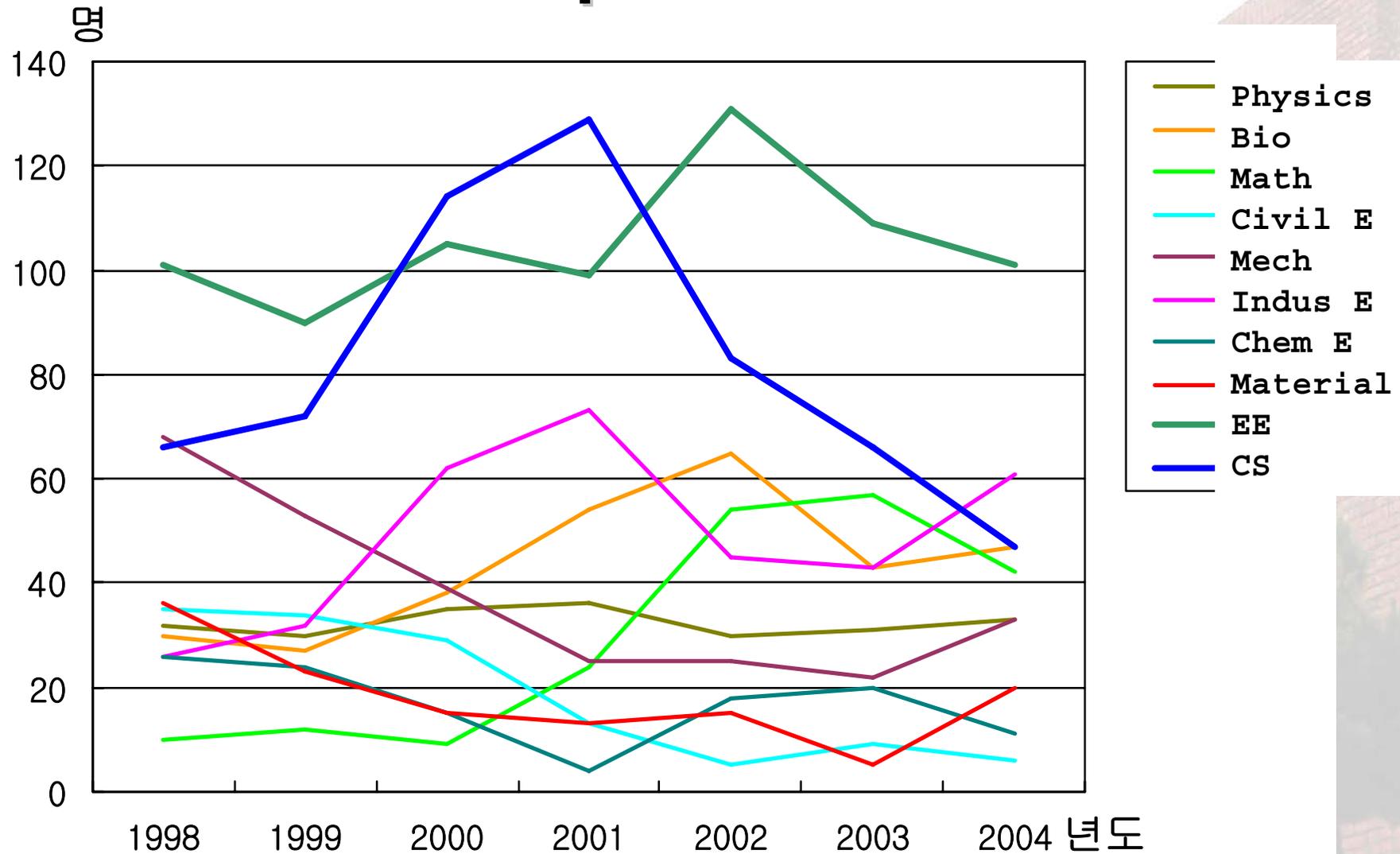
# Qualified Engineers in the Market



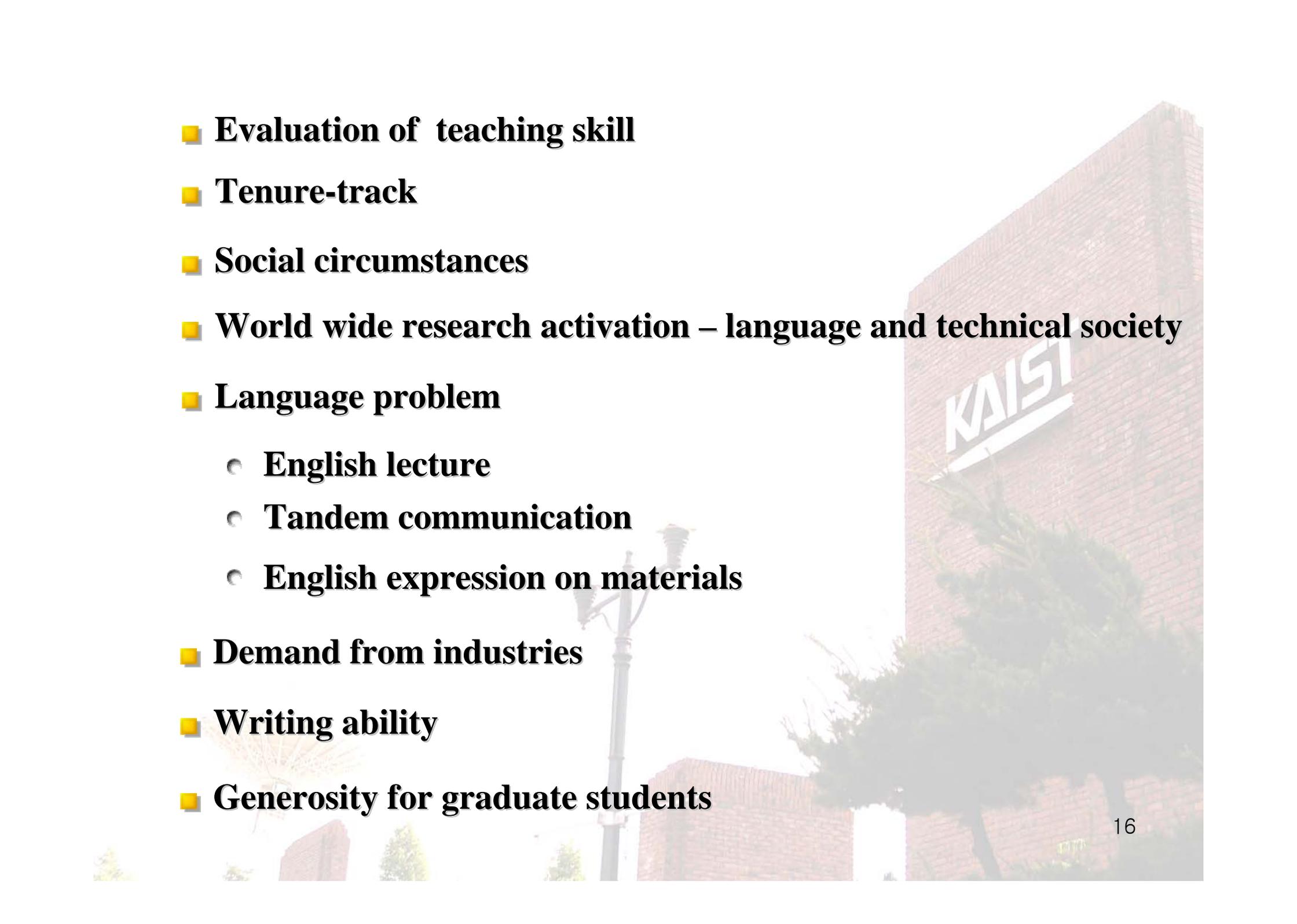
# Job Skill Phases



# Traditional Engineering field in desperate battle



Number of KAIST Undergraduates' Major Selection

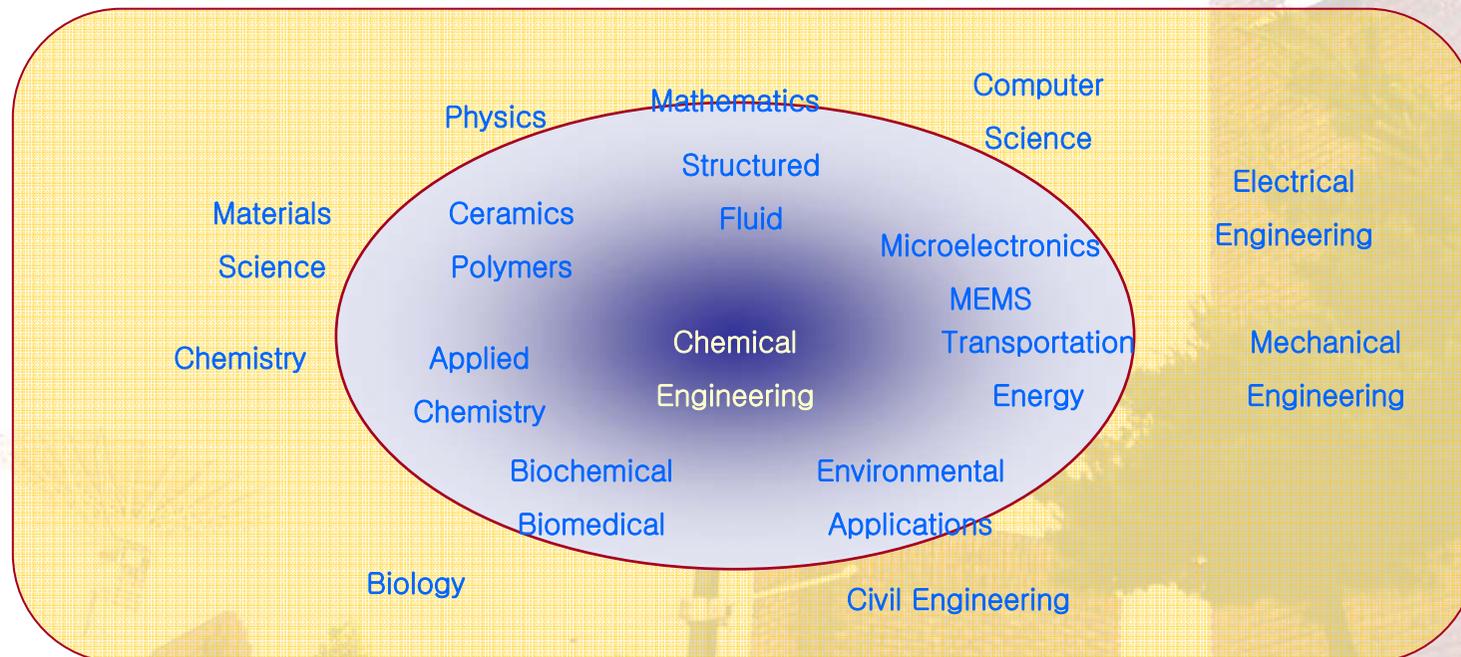
- 
- **Evaluation of teaching skill**
  - **Tenure-track**
  - **Social circumstances**
  - **World wide research activation – language and technical society**
  - **Language problem**
    - **English lecture**
    - **Tandem communication**
    - **English expression on materials**
  - **Demand from industries**
  - **Writing ability**
  - **Generosity for graduate students**

## □ Tandem Learning – University of Zurich

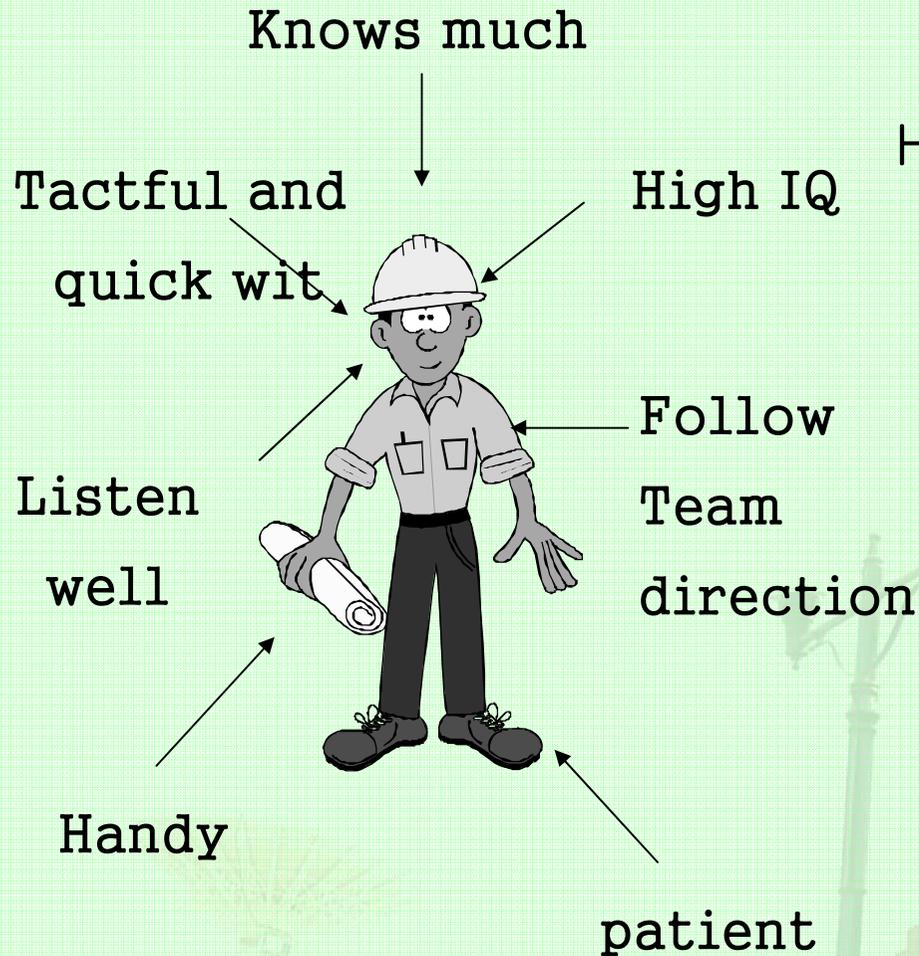
- Tandem learning takes place when two native speakers of different languages study each other's languages together. Tandem learning is also an opportunity to exchange information about each other's cultures.
- Tandem learning is an autonomous form of learning. Tandem partners take responsibility for the learning process, they choose their own targets, learning strategies and topics. They also agree on the time they wish to invest.
  - **Tandem learning is based on the principle of reciprocity:** Both partners should benefit equally from the learning partnership. You should dedicate the same amount of time to studying each language.
  - **Prepare your meetings:** Bring along materials, for instance textbooks, newspapers or pictures.

# Paradigm Shift in Science and Engineering

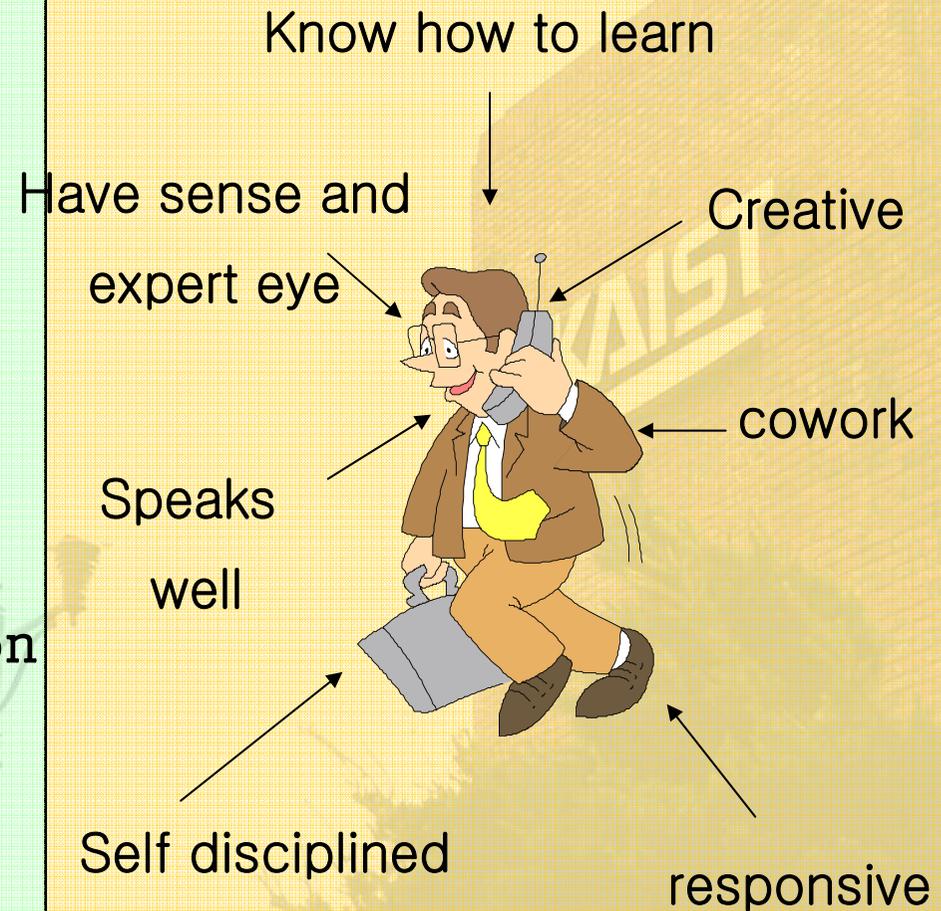
- Future society will be driven by advanced but **short life-cycle technologies**
- **Extremely interdisciplinary** nature of science and engineering



## Yesterday's Engineers



## Today's Engineer



# Why Korea's Engineering education is so poor ?

- **Objective of Engineering education is not clear**

- “Industry requires 10% of Research and 90% of Development. Therefore, university education should focus on the **engineering skills for product and technology development.**”

- Dr. Lim, Hyung Kyu, CEO of Samsung Electronics

- “Science and Engineering education in Korea, which aims **only for production of scientists**, should focus on the application of **scientific and engineering thinking** and skills not only to research but also works **in management, planning, production and marketing.**”

- Prof. Lee, C.H., Dean of School of Natural Science, WonKwang University

*2<sup>nd</sup> Stage of BK21*

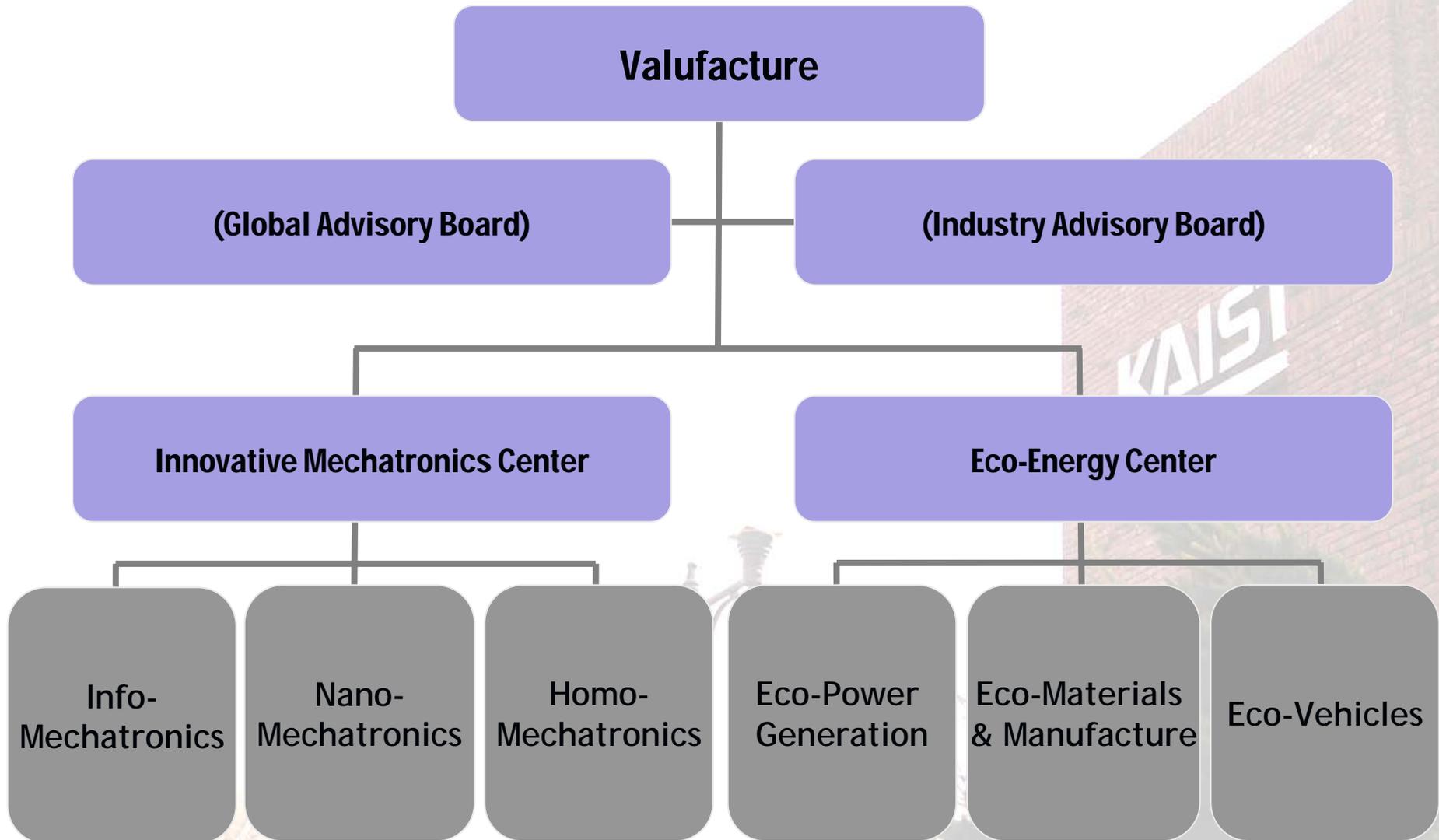
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	Professor	Graduate Student		
		Master	Doctor	Total
Total	64	288	433	721
Participation	63	251	283	534
	98.4%	87.1%	65.4%	74.1%

### ◆ Engagement

	Professor	Post-doc.	Total
Inside	1	13	14
Outside	5	11	16
Total	6	24	30

<b>Budget (2006)</b>	
<b>New Engagements</b>	<b>\$ 1,095,192</b>
<b>International Cooperation</b>	<b>\$ 544,943</b>
<b>Operational Expenses</b>	<b>\$ 539,637</b>
	<b>\$ 2,179,772</b>

## ◆ Students

	2003~2005 per year	MIT	Berkeley	Michigan	Goal (per year)
Master	103	105	69	95	120
Ph.D.	72	45	31	74	70
Total	175	150	100	169	190

## ◆ New Engagements

	2003	2004	2005	Goal
Post-doc.	20	30	47	30
Professor	9	10	8	16
Total	29	40	55	46

		2003	2004	2005	Goal
International Journal	Total	208	244	232	0.44
	Per Graduate student	0.32	0.37	0.36	
International Conference	Total	424	476	527	0.98
	Per Graduate student	1.32	1.45	1.64	

◆ International Cooperation

- Global Advisory Board(GAB)
- 80% English Lectures
- Attract Foreign Student - Japan and European Countries

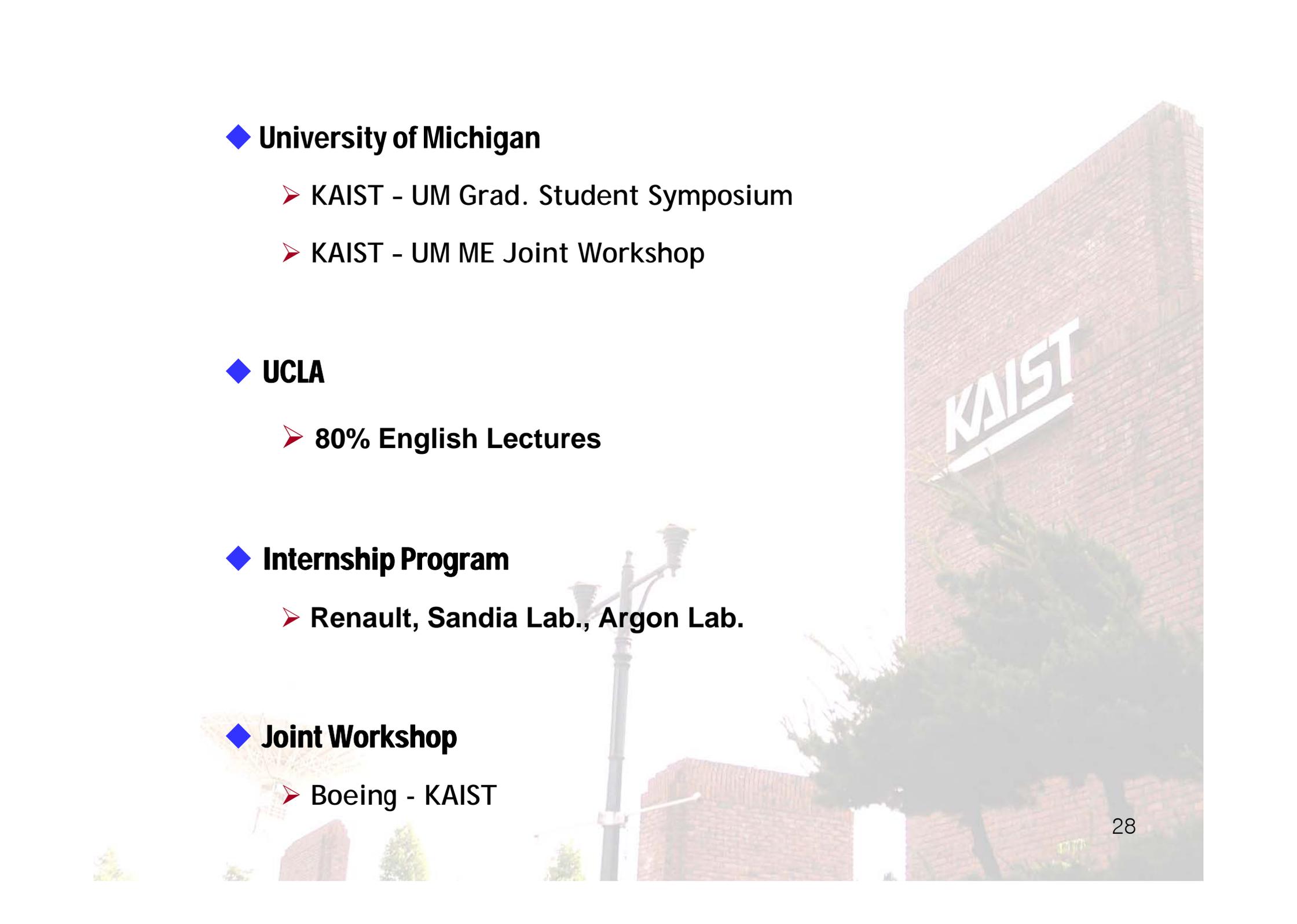
◆ Education of Graduate Student

- Overseas Training - Long Term

	2003	2004	2005	2006
Master	-	1	1	2
Ph.D.	14	15	17	8
Total	14	16	18	10

- Conference

2003	2004	2005	2006
163	181	221	73



◆ **University of Michigan**

- KAIST - UM Grad. Student Symposium
- KAIST - UM ME Joint Workshop

◆ **UCLA**

- **80% English Lectures**

◆ **Internship Program**

- **Renault, Sandia Lab., Argon Lab.**

◆ **Joint Workshop**

- **Boeing - KAIST**

◆ Mutual Benefits Cooperation with COEs in Japan

Univ. in Japan	Leader	in Charge
Tohoku Univ.	Shigenao Maruyama	Hyun Dong Shin
Tokyo Univ.	Nobuhide Kasagi	Hyung Jin Sung
Tokyo Inst. of Tech. Univ.	Shigeo Hirose	Jun Ho Oh
Nagoya Univ.	Yasunaga Mitsuya	Soo Hyun Kim
Kyushu Univ.	Keiye Muraue	JoongMyeon Bae
Tokyo Denki Univ.	Katsuhisa furuta	Dong Soo Kwon

Thank you !!

KAIST