



中國工程院  
Chinese Academy of Engineering



# *China's Engineering Education: Situation & Outlook*

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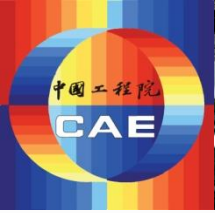
Former Executive Vice President of CAE

6/27/2013



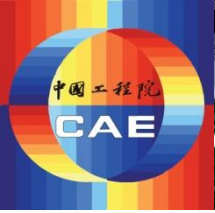


- **The level of engineering technologies**
  - —a country's core competence
- ***“Building up indigenous innovation capabilities and becoming an innovative country”***
  - —*“core of our national development strategies”*
  - —the key to improvement of China's overall national strength.
- Exchange and share thoughts:
  - —Survey & research by CAE(*Chinese Academy of Engineering*) in the reform of China's engineering education.



# Outline

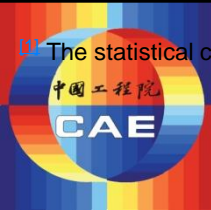
- I. Achievements.**
- II. Problems and weakness points.**
- III. Outlooks.**



## I. Achievements

### 1. Rapid expanding of scale

- —demand for engineering talents in China.
- —the enrollment of students expand very fast in the decade from 2000 to 2011.
- —see table 1 for details.



The statistical calibers of the figures in this row changed a little after 2012.

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Table 1: Number of students pursuing associate and bachelor's degrees and new enrollment in 2000 and 2011

	Number of students pursuing associate and bachelor's degrees			Number of students newly enrolled		
		Number of students attending engineering programs	Percentage		Number of students attending engineering programs	Percentage
<i>2000</i>	5.561 million	2.148 million	38.6%	2.206 million	832,000	37.7%
<i>2011</i>	22.318 million	8.689 million	38.9%	6.618 million	2.635 million	39.8%
<i>Average annual growth</i>	13.5%	13.6%	-	10.5%	11%	-
<i>Average annual growth in the first five years</i>	23%	20%	-	18%	17%	-



# I. Achievements

## 2. Positive change in educational structure

- History
  - —after 1949, attaching equal importance to higher and vocational education
  - —in the 1990s, vocational education was disregarded for many reasons.
  - —Now, pays renewed attention to vocational education.
- In 2011, China's universities
  - —recruited 6.815 million students.(higher vocational schools 2.579 million, 37.8 %. And engineering degrees 1.423 million, 55.2% of the total enrollment of higher vocational schools. )
- recognition and great momentum
  - —Application and practice-oriented master programs, especially those in engineering



## I. Achievements

### 3. More education investment

- Average annual growth: 18% over the last 11 years.
- In 2012, reached 4% of the GDP in China.



## I. Achievements

### 4. Improved teaching quality

- began to offer some new and interdisciplinary programs
  - —*molecular biology, function materials, resources recycling, engineering of Internet of Things, biomedical engineering.*
- traditional programs included new courses into their curriculum
  - —clean utilization of coal, extreme manufacturing, automatic process control, information technology, etc.
- Added *social science, humanities as economics, law, ethics and other courses*. Combination of theory and practice is being discussed and enhanced.





# I. Achievements

## 5. Educational reform

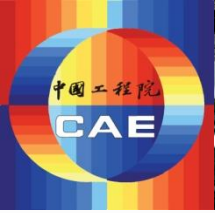
- The new teaching mode emphasizes:
  - — *student & demand orientation, comprehensive engineering training and holistic transformation of the curriculum system.*
- ***The Outstanding Engineers Educating and Training Program (the outstanding Program for short)***
- CDIO and PBL
  - — *ex, Shantou University integrated professional ethics into CDIO as needed to make it more comprehensive.*



## I. Achievements

### 6. International cooperation

- established relation and cooperating with foreign counterparts in various ways
  - —irregular/regular visits, experience exchange, student/visiting scholar exchange to collaborative education, mutual recognition of degree and joint degree awarding.etc
- taking in more and more foreign students.
  - — At present over 120,000 overseas students are studying in China.



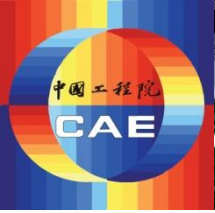
## II. Problems and weakness points

### 1. Imbalance between supply and demand

- — many college graduates find it difficult to get a job.
- — many businesses could not recruit the right persons they need.
- — The imbalance include two aspects: **totality and structure**.

### 2. Homogeneity of goals and patterns

- the institutions of higher learning are classified in many ways,
  - —vocational colleges, general universities and 211 universities and 985 universities, top and non-top universities (internationally, nationally and provincially).
  - —classification related to the administrative ranks of those institutions and their presidents as well as the fund and support they could get.
- in hot pursuit of theoretical scientization and ignore their own characteristics and philosophies.



## II. Problems and weakness points

### 3. Lack of practice

- —the experimental conditions insufficient.
- —the weak connection between schools and businesses.

### 4. Curriculum system not aligned with the characteristics of engineering



## II. Problems and weakness points

### 5. Insufficient importance attached to innovation and entrepreneurial education

- —only about 1% of college graduates (more among engineering graduates) started their own businesses
- —weak entrepreneurial education in universities
- —lack of innovation spirit in students.



## II. Problems and weakness points

### 6. Poor competence mix

- —Lack of *comprehensive thinking ability, interpersonal skills, raising questions independently and hands-on capability.*



### III. Outlooks

- *The National Outline for Medium and Long-term Education Reform and Development (2010-2020)*
  - —issued *by Chinese government*
  - —provides a roadmap for China's education till 2020.
  - —each part of it has impact on engineering education.
- In light of China's process of modernization and the Outline, we forecast that:



### III. Outlooks

1. **Competition between universities will intensify and the supply-demand imbalance will be alleviated**
2. **Differentiation depends on the reform of engineer system and administrative university classification**
  - i) complete engineer vocational qualification system
  - ii) the administrative of classification must be changed
3. **Quality of engineering education will be improved with a complete quality assurance system**
  - Over 350 programs have obtained such certificates by the end of 2011.





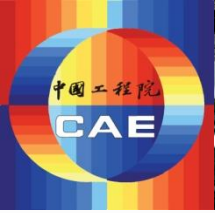
### III. Outlooks

4. **Industrial transformation will be conducive to joint talent development by universities and businesses**
5. **Instructors will be the mainstay of educational reform**
6. **Quality of students should be improved in many different ways**
  - Ethic education.
  - changing the long-existing exam-oriented education system in elementary and secondary schools. “everyone could become a talent” and “every sector is needed”.



## Conclusions :

- As China's modernization accelerates, the quality of its engineering education will be getting better and better.
- The foregoing contains both short and long-term tasks, as well as the problems exclusive for China and common in all countries.
- We expect to work closely with foreign colleagues to improve the quality to turn out engineering talents meeting the demand of national development.



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## Questions & Comments