Culture and Innovation for Engineering Students: The PIPE©™ Model at City University of Hong Kong

3333 創造創新創業課©™

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Economic growth

創新

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Innovation
Schumpeter’s theory on economic growth (熊彼德的經濟增長理論)

- Schumpeterian innovations are the result of ‘entrepreneurial behavior’ — exploit some latent demand or to attack existing firms with radically new product or process.

- Which is the engine that drives economic growth

- 1995：400 entrepreneurship programs — (business/management schools)
Introducing Engineering & Science students to Entrepreneurship: Models and influential factors at Six American Universities

1. Carnegie Mellon University: The Donald H. Jones Center for Entrepreneurship
2. Stanford University: Stanford Technology Ventures Program (STVP)
3. University of Colorado at Boulder: The Center for Entrepreneurship
4. Rensselaer Polytechnic Institute: The Center for Technological Entrepreneurship,
5. University of California, LA, The Harold Price Center for Entrepreneurial Studies
6. University of Iowa, The John Pappajohn Entrepreneurial Center (JPEC)
2003 : Three international conferences

1. Three international conferences /colloquium American Society for Engineering Education (ASEE, www.asee.org) （美國工程教育學會）

2. European Society for Engineering Education (SEFI, www.ntb.ch/SEFI) 欧洲工程教育學會

3. REE: Roundtable Meeting for Entrepreneurship Education for Eng’g & Sci. students in Asia

Especially Creativity, Innovation and
The Engineer of 2020

<table>
<thead>
<tr>
<th>Skills</th>
<th>Chinese Translation</th>
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</thead>
<tbody>
<tr>
<td>Strong analytical skills</td>
<td>較強的分析能力</td>
</tr>
<tr>
<td>Practical ingenuity</td>
<td>實用的獨創性</td>
</tr>
<tr>
<td>Creativity</td>
<td>創造能力</td>
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<tr>
<td>High ethical standards and a strong sense of professionalism</td>
<td>較高的道德水準和專業態度</td>
</tr>
<tr>
<td>Dynamic/agile/resilient/flexible</td>
<td>活力，靈活，</td>
</tr>
<tr>
<td>Good communication skills</td>
<td>溝通能力</td>
</tr>
<tr>
<td>Business+management skills</td>
<td>管理能力</td>
</tr>
<tr>
<td>Leadership capabilities</td>
<td>領導能力</td>
</tr>
<tr>
<td>Lifelong learner</td>
<td>終生學習</td>
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</table>
The training of innovative eng’g & tech talents
关于中国创新型工程科技人才培养的研究
课题负责人：中国工程院常务副院长 潘云鹤

课题负责人：中國教育部部長 周济

June 2006 Shenzhen
CAE visits CityU (19 July 2007)
Awards

- 香港城市大学，全校通识课程，2012年度杰出教学奖。
- 2010年高教学会，创新创业分会，年度征文论文一等奖，题目：创新创业教育的四个基本问题。（2011年二等奖）
- 中国创造学会，二等奖，2010年。
- 国际Emerald 创业教育国际会议，最佳实践/政策论文奖 （The Best Practical/Policy paper, International Conference on Entrepreneurship Education by Emerald Publisher, Li Ka-Shing Education Foundation and Shantou University, September 2010, Shantou, China.）

创新，创造，创意，创业，创见，创富，创伤，发明，发现，发展，发疯，发财，研究，开发，科学，技术，科技，专利，商标，版权，侵权。
The Sun model of creative thinking:

- Ordinary thinking (常规思维)
- (Different)
- Creative thinking: (创新思维)
- think out ideas that other people normally do not think of.
  - Breakthrough the conventional frame of reference or pattern
  - 超越常规思维的束缚

Lateral thinking:
横向思维
Divergent thinking
发散思维
The function of a glass?
Flexibility while eating
Flexibility in cooking

Kitchen knife, cleaver
What culinary used in a Chinese Kitchen for preparing and serving meals
Chinese thinking style:

- Flexible, divergent

- Chinese thinking = creative thinking?
Which contains more innovation?
The Needham Question:

- why China had been overtaken by the West in science and technology, despite its earlier successes?

- 钱学森之问
Dr Sun’s Question

Why did not Chinese invent many new tools in their kitchens, despite their flexible thinking?
创新，创造，创意，创业，创见，创富，创伤，发明，发现，发展，发疯，发财，研究，开发，科学，技术，科技，专利，商标，版权，侵权。
Creativity or innovation?

创新：应用到商业环境里的创造力和想象力：

2006："Creativity and imagination applied in a business context is innovation." (Business Week: 100 top innovative companies)
Schumpeter’s theory on economic growth
（熊彼德的經濟增長理論）

- Schumpeterian innovations are the result of ‘entrepreneurial behavior’ — exploit some latent demand or to attack existing firms with radically new product or process. （以創新為基礎的創業）

- Which is the engine that drives economic growth

- 1995: 400 entrepreneurship programs
  (business/management schools)
The Process from Creativity, Innovation to Entrepreneurship

Psychology

Creativity

Idea (60)

Technology (invention)

Innovation

Product (10)

Business

Enterprise

Market (1)

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The Cross-disciplinary Syllabus (3-3-3 syllabus*)

Step-1: Creativity (Psychology)
- New Ideas (Originality)
  - Use your brain: Curious, critical and questioning

Step-2: Innovation (Technology)
- New Products (Feasibility)
  - Use your hands: Get hands dirty with a product

Step-3: Entrepreneurship (Business)
- New Businesses (Profitability)
  - Use your feet: Go out to do market research

If you can not describe what you are doing as a process, you do not know what you are doing.

如果你不能用一个过程来描述你做的事情，你就不知道你在做什么

Dr W. Edwards Deming 1900-1993, American CI management guru
Chinese Proverb/Confucius:

-Tell me and I will forget
-Show me and I will remember
-**Involve me** and I will understand
-Step back and I will act

-“不闻不若闻之，闻之不若见之；见之不若知之，知之不若行之；学至于行而止矣。” ---荀子《儒效篇》
-“夫耳闻之，不如目见之；目见之，不如足践之。” ----汉·刘向《说苑·政理》
-“学而时习之，不亦说乎” ----孔子 《论语》
-千学不如一看，千看不如一练。百闻不如一见，百见不如一干。
## The PIPE model for motivating student-centered learning*

<table>
<thead>
<tr>
<th>Project</th>
<th>Team-based project (Mock company, role play, teamwork, communication)</th>
<th>Performance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Process</td>
<td>Creativity (创造)</td>
<td>Innovation (创新)</td>
</tr>
<tr>
<td></td>
<td>3-steps</td>
<td></td>
</tr>
<tr>
<td>Practice</td>
<td>Ideas (新想法)</td>
<td>Product (新产品)</td>
</tr>
<tr>
<td></td>
<td>(PIPE)</td>
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</tr>
<tr>
<td></td>
<td>Use brain (动脑)</td>
<td>Hands-on (动手)</td>
</tr>
<tr>
<td></td>
<td>(Head to Feet)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Final report</td>
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</tbody>
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2012/40: 100 problems → 20 ideas → 6 new products
### 3333/PIPE framework

<table>
<thead>
<tr>
<th>3 Steps</th>
<th>Creativity</th>
<th>Innovation</th>
<th>Entrepreneurship</th>
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</thead>
<tbody>
<tr>
<td>3 New Problem</td>
<td>New Idea</td>
<td>New Product</td>
<td>New Enterprise</td>
</tr>
<tr>
<td>3 Trainings</td>
<td>Brain</td>
<td>Hand-on</td>
<td>Go to market</td>
</tr>
<tr>
<td>3 sets of capabilities</td>
<td>Questioning Discovery</td>
<td>Handson Active learning</td>
<td>Leadership Risk taking</td>
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2013香港城市大学“创新创业教育”研讨会暨师资培训班

时间：2013年12月1-6日 地点：香港城市大学

2013回顾和将来“创新创业教育3-3-3示范课暨师资培训班”的筹划和邀请

"2013年香港城市大学创新创业教育研讨会暨师资培训班"于2013年12月6日圆满完成。按报名顺序，来自华侨大学，河海大学，南京审计学院，华南理工大学，北京大学，湖北经济学院，清华大学，厦门理工学院。中山大学，湖北第二师范学院，大连理工大学，新华都商学院，汕头大学，长庚大学，国立台北大学，和中国科学技术大学的31老师参加了为期一周的研讨会和培训班。在此衷心感谢他们的支持。根据反馈，大部分老师都认为参加这次培训班收获良多，对将来开设创新创业课程会有很大帮助，尤其是提纲挚领的‘三创’理念和内容详实的创新教育3-3-3课程大纲，第一次把多年来反复议论的、看似既有区别但又有联系的、零零散散的内容系统地整合起来，而7P模式提供了可以操作的框架和具体实施的步骤。
The PIPE™© model for Teaching Creativity Innovation and Entrepreneurship

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