CloudClassRoom: The Next Generation

2nd International Conference on Educational Technologies (ICEduTech) 2014,
5th International Conference on Internet Technologies & Society (ITS) 2014,
3rd International Conference on Sustainability, Technology and Education (STE) 2014,

New Taipei City, Taiwan
December 10th – 12th, 2014

presented by
Chun-Yen Chang

NTNU Chair Professor and Professor of Graduate Institute of Science Education & Department of Earth Sciences, Director of Science Education Center, National Taiwan Normal University
Overview

Glory, yet...

CY Chang

Reflections

National Projects

CCR & related studies
## Taiwanese students’ TIMSS performance

<table>
<thead>
<tr>
<th></th>
<th>Subjects</th>
<th>Grade 4</th>
<th>Grade 8</th>
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<tbody>
<tr>
<td>TIMSS 1999</td>
<td>Math</td>
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<td>3&lt;sup&gt;rd&lt;/sup&gt;</td>
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<td>6&lt;sup&gt;th&lt;/sup&gt;</td>
<td>2&lt;sup&gt;nd&lt;/sup&gt;</td>
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Trends in International Mathematics and Science Study by IEA
Taiwanese students’ PISA performance

<table>
<thead>
<tr>
<th>Year</th>
<th>Subjects</th>
<th>15 years old</th>
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<td>Reading</td>
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<td>PISA 2009</td>
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<td>Math</td>
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<td></td>
<td>Reading</td>
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<td>PISA 2012</td>
<td>Science</td>
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<tr>
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<td>4th</td>
</tr>
<tr>
<td></td>
<td>Reading</td>
<td>8th</td>
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The Programme for International Student Assessment by OECD
Cognitive ability values for countries

### Index of cognitive skills and educational attainment

<table>
<thead>
<tr>
<th>Country</th>
<th>Overall Index rank and score</th>
<th>Cognitive Skills rank and score</th>
<th>Educational Attainment rank and score</th>
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<tr>
<td>SOUTH KOREA</td>
<td>[Rank 1] 1.30</td>
<td>[Rank 2] 1.35</td>
<td>[Rank 1] 1.19</td>
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<td>JAPAN</td>
<td>[Rank 2] 1.03</td>
<td>[Rank 4] 1.20</td>
<td>[Rank 6] 0.70</td>
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<tr>
<td>SINGAPORE</td>
<td>[Rank 3] 0.99</td>
<td>[Rank 1] 1.65</td>
<td>[Rank 33] -0.33*</td>
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<tr>
<td>HONG KONG-CHINA</td>
<td>[Rank 4] 0.96</td>
<td>[Rank 3] 1.34</td>
<td>[Rank 18] 0.20*</td>
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<td>FINLAND</td>
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<td>[Rank 5] 0.99</td>
<td>[Rank 4] 0.79</td>
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<td>UNITED KINGDOM</td>
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<td>[Rank 8] 0.52</td>
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<td>[Rank 7] 0.60</td>
<td>[Rank 6] 0.77</td>
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<td>NETHERLANDS</td>
<td>[Rank 8] 0.58</td>
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<td>[Rank 7] 0.58</td>
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<td>IRELAND</td>
<td>[Rank 9] 0.51</td>
<td>[Rank 10] 0.49</td>
<td>[Rank 10] 0.55</td>
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<td>POLAND</td>
<td>[Rank 10] 0.50</td>
<td>[Rank 16] 0.33</td>
<td>[Rank 3] 0.85</td>
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<td>DENMARK</td>
<td>[Rank 11] 0.46</td>
<td>[Rank 17] 0.32</td>
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<td>GERMANY</td>
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<td>[Rank 12] 0.48</td>
<td>[Rank 14] 0.28</td>
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<td>RUSSIA</td>
<td>[Rank 13] 0.40</td>
<td>[Rank 9] 0.50</td>
<td>[Rank 21] 0.19*</td>
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<td>UNITED STATES</td>
<td>[Rank 14] 0.39</td>
<td>[Rank 11] 0.49</td>
<td>[Rank 20] 0.19</td>
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<tr>
<td>AUSTRALIA</td>
<td>[Rank 15] 0.38</td>
<td>[Rank 13] 0.43</td>
<td>[Rank 13] 0.29</td>
</tr>
</tbody>
</table>
The contradiction of Taiwan students: Excellent performance in science and math, but lowest self-concept!
National Projects in Taiwan

• NSC and MoE initiated
  – Normal University Transformation Project (since 2005)
  – Plan to Develop First-class Universities and Top-level Research Centers (since 2005)

• Aims
  – to reform higher education
  – to promote the international visibility and global competitiveness of Taiwan in scientific research

• Large budgets were involved
  – their effectiveness in each related field or subfield is a critical concern for future strategic planning and to the continuation of similar national projects.
SMART classroom 2.0.a

No 1. Automatic face recognition
No 2. Automatic voice recognition
No 3. Dual/multiple screen projection
No 4. 3D virtual reality projection
SMART classroom 2.0.b

No 5. Instant message deliverer

No 6. Interactive whiteboard system

No 7. Automatic online assessment

No 8. Digital archive of course content

Click here to view the concept SMART classroom
http://www.youtube.com/watch?v=ekSaFKvEDYk
Speech-Driven PPT (SD_PPT) Teaching

- Desired slides can be shown based on the voice prompt & the instructor can be free from the teaching platform
Technology Enhanced Interaction System (TEIS)

- Students’ video images are captured, analyzed and transmitted real-time to the instructor’s laptop.
- Students’ names and seating are displayed at the instructor’s laptop so he can be informed of who is in the class without taking the attendance.
## Results

<table>
<thead>
<tr>
<th>Scales</th>
<th>Pre-test Mean (SD)</th>
<th>Post-test Mean (SD)</th>
<th>t</th>
<th>p</th>
<th>d</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall Attitudes on ICT-Supported Learning (ICT-SL)</td>
<td>3.66(0.48)</td>
<td>4.05(0.53)</td>
<td>-2.71</td>
<td>0.017**</td>
<td>0.70</td>
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<tr>
<td>Speech-Driven PPT (SD_PPT)</td>
<td>4.03(0.47)</td>
<td>4.23(0.50)</td>
<td>-1.47</td>
<td>0.164</td>
<td>0.38</td>
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<tr>
<td>Technology Enabled Interaction System (TEIS)</td>
<td>3.97(0.42)</td>
<td>4.12(0.52)</td>
<td>-1.09</td>
<td>0.294</td>
<td>0.28</td>
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<tr>
<td>Learning Motivation with ICT (LM_ICT)</td>
<td>3.24(1.30)</td>
<td>3.98(0.69)</td>
<td>-2.16</td>
<td>0.049**</td>
<td>0.56</td>
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<tr>
<td>Learning Effectiveness with ICT (LE_ICT)</td>
<td>3.63(0.49)</td>
<td>3.93(0.75)</td>
<td>-2.08</td>
<td>0.056*</td>
<td>0.54</td>
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</tbody>
</table>

Note: *p<0.1; **p<0.05;
Incorporating a Smart Classroom 2.0 Speech-Driven PowerPoint System (SDPPT) into University Teaching (an invited paper, minor revision)
A scientometric analysis of the effectiveness of Taiwan’s educational research projects

Yuen-Hsien Tseng · Chun-Yen Chang · M. Shane Tutwiler · Ming-Chao Lin · James P. Barufaldi

Received: 30 July 2012 / Published online: 13 February 2013
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Abstract The seeking of evidence for revealing the research performance of Education in Taiwan, in response to the stimulus by the national research projects, is presented and interpreted. More than 70,000 publication records over the years 1990–2011 from Web of Science were downloaded and analyzed. The overview analysis by data aggregation and country ranking shows that Taiwan has significantly improved its publication productivity and citation impact over the last decade. The drill-down analysis based on journal bibliographic coupling, information visualization, and diversity and trend indexes, reveals that e-Learning and Science Education are two fast growing subfields that attract global

Y.-H. Tseng (✉)
Information Technology Center, National Taiwan Normal University, Taipei, 106, Taiwan, Republic of China
e-mail: samtseng@ntnu.edu.tw

C.-Y. Chang
Department of Earth Sciences, National Taiwan Normal University, Taipei, 116, Taiwan, Republic of China
e-mail: changcy@ntnu.edu.tw

C.-Y. Chang
Graduate Institute of Science Education, National Taiwan Normal University, Taipei, 116, Taiwan, Republic of China
Ten most productive countries in Education from 1990-2012

(Ranks are based on 35 countries each contributing at least 100 publications)

<table>
<thead>
<tr>
<th>Y</th>
<th>C</th>
<th>USA</th>
<th>UK</th>
<th>AUS TRALIA</th>
<th>CANADA</th>
<th>GER MANY</th>
<th>NETHER LANDS</th>
<th>TURKEY</th>
<th>TAIWAN</th>
<th>CHINA</th>
<th>SOUTH AFRICA</th>
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<tbody>
<tr>
<td></td>
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<tr>
<td></td>
<td>90-94</td>
<td>2497</td>
<td>235</td>
<td>144</td>
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<td>904</td>
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<td>2039</td>
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<td>9922</td>
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<td>1306</td>
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<td>726</td>
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<td>1141</td>
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<td>1089</td>
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</table>

There are five non-English speaking countries in the top ten countries.
Turkey, Taiwan, and China published few papers during the early 1990s, but increased their productivity dramatically and ranked at 3, 7, and 9, respectively, in recent two-years span.
Ten most productive countries and their average citations per paper in Education from 1990-2011. (Ranks are based on 35 countries each contributing at least 100 publications.)

<table>
<thead>
<tr>
<th>Year</th>
<th>Cntry</th>
<th>USA</th>
<th>UK</th>
<th>AUS TRALIA</th>
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<th>CHINA</th>
<th>SOUTH AFRICA</th>
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<tbody>
<tr>
<td>90-94</td>
<td>USA</td>
<td>14.53</td>
<td>8.36</td>
<td>12.22</td>
<td>12.72</td>
<td>4.34</td>
<td>15.42</td>
<td>3.00</td>
<td>4.40</td>
<td>4.00</td>
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<tr>
<td>95-99</td>
<td>UK</td>
<td>12.23</td>
<td>11.56</td>
<td>14.15</td>
<td>13.42</td>
<td>4.22</td>
<td>15.80</td>
<td>5.56</td>
<td>15.15</td>
<td>5.50</td>
<td>8.90</td>
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<td>11.21</td>
<td>12.87</td>
<td>10.88</td>
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<td>16.05</td>
<td>9.34</td>
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<td>CANADA</td>
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<td>0.27</td>
<td>1.73</td>
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<td>Rank by CPP</td>
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<td>2</td>
<td>33</td>
<td>1</td>
<td>18</td>
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</table>
A new learning brain?
AND THEN THE TEACHER SAID

YOU MAY TAKE NOTES
Phubbing: looking at and typing your phone when other people are talking to you. Phubbing: the act of snubbing someone in a social setting by looking at your phone instead of paying attention. Phubbing is the new term coined to highlight the anti-social phone use. Phubbing is defined as the act of snubbing someone in a social setting by looking at your phone instead of paying attention. The term was coined by the international Stop Phubbing Campaign Group.
Phubbers are everywhere
Phubbers are everywhere
An average restaurant will see
36 cases
of phubbing per dinner session.
This is equal to spending 570 days
alone, while in the company of others.

87% of teens would rather
communicate via text
than face-to-face.
Posters for restaurants...

LIFE IS
WHAT HAPPENS TO YOU WHILE YOU'RE LOOKING AT YOUR SMARTPHONE
How about pushing the boat along with the current?
Incorporating all SMART classroom technologies into one mobile device?
CloudClassRoom (CCR)

- CCR works on every Internet-capable devices, such as PCs, laptops, PDAs, smartphones, or tablets, without further software or plug-ins installation.
- Chinese, English, French, Japanese, Korean, Arabic, Turkish versions are available.
- devx.ccr.tw (integrated with Mootel at NTNU)

<table>
<thead>
<tr>
<th>Teacher version</th>
<th>Student version</th>
</tr>
</thead>
</table>
CCR Group

Prof. Chun-Yen Chang
Director of CCR
NTNU Chair Professor

Yu-Ta Chien
CCR System R&D

Tsung-Yen Li
CCR System R&D
CloudClassRoom

Q1. .....
Test if students had listened to the instructor carefully?

- What is the cognitive ability ranking of Taiwan in the 2007 *European Journal of Personality* paper?

  a) 1  
  b) 2  
  c) 3  
  d) 4  
  e) 5
What is the most abundant greenhouse gas in the atmosphere?

a) Methane
b) Water vapor
c) Carbon dioxide
d) Nitrous oxide
e) Ozone
f) This is a boring question!
How giraffes get long necks?

a) Giraffes grow their necks to feed off high trees.

b) Female giraffes are attracted to long necks.

c) Male giraffes fight for females by “necking”. Having a long and powerful neck would be an advantage in these duels.

d) It’s complicated. No one can ever know.

e) It’s the phenotype results from the interaction of genes and environment

f) Another boring question again…
Vote for highly-controversial issues!

- Do you support gay marriage?
  a) Yes
  b) Neutral
  c) No
  d) What’s that?
  e) Define Gay (happy) marriage!
Can global warming be real if it’s cold in the U.S.? Um…?!

By Brad Plumer January 6 at 2:44 pm, 2014

Washington Post Wonkblog
What is global warming?

Global warming refers to the whole planet, not just the United States.
The global temperature

Annual Global Temperature Anomalies
1950 - 2012

Degrees Celsius
This graphic shows the ratio of record daily highs to record daily lows observed at about 1,800 weather stations in the 48 contiguous United States from January 1950 through September 2009. Each bar shows the proportion of record highs (red) to record lows (blue) for each decade. The 1960s and 1970s saw slightly more record daily lows than highs, but in the last 30 years record highs have increasingly predominated, with the ratio now about two-to-one for the 48 states as a whole. [ENLARGE] (©UCAR, graphic by Mike Shibao.)
Students’ immediate feedbacks to the instruction

◆ How well did you understand today's material?

a) Totally get it!

b) Pretty well.

c) Not very well.

d) Not at all, Need help.
CCR on the newsstands in Taiwan
日前得知師大老師 Chun-Yen Chang 張俊彥教授團隊發展的 GCR 雲端教學系統 (Cloud Class Room)，研究了一下，隨即設計了幾題小題目，馬上用在國中理化教學上。

學生們在上課時一邊很興奮的拿著行動裝置解著題目，但是心中一邊被制約著"上課不能玩手機ㄟ"，一直在我旁邊 MERMER，真是好笑 ^^

不過課堂中，很多同學在偷拍我><"
The best practice!
Research into the use of Clickers


- **Carl Wieman**
  - An American physicist and recipient of the Nobel Prize in Physics for the production, in 1995 with Eric Allin Cornell, of the first true Bose–Einstein condensate.
The results show that the two sections were indistinguishable (Table 1). This in itself is interesting, because the personalities of the two instructors are rather different, with instructor A (control section) being more animated and intense.
Fig. 1. Histogram of student scores for the two sections.
The common uses of clicker questions

1) **to increase or manage interaction, through questions that:**
   - start or focus **discussions** (Jackson and Trees, 2003)
   - require **interaction** with peers (Knight and Wood, 2005)
   - collect votes after a debate (Draper, 2002)

2) **to assess student preparation and ensure accountability, through:**
   - questions about **reading or homework** (Knight and Wood, 2005)
   - prelab questions
The common uses of clicker questions

3) **to find out more about students, by:**
   - surveying students’ thoughts about the pace, effectiveness, style, or topic of lecture
   - polling student opinions or attitudes
   - probing students’ pre-existing level of understanding
   - asking how students feel about clickers and/or active learning

4) **for formative (i.e., diagnostic) assessment, through questions that:**
   - assess students’ understanding of material in lecture
   - reveal student misunderstandings of lecture (e.g., Wood, 2004)
   - determine future direction of lecture, including the level of detail needed
   - test students’ understanding of previous lecture notes
   - assess students’ ability to apply lecture material to a new situation
   - determine whether students are ready to continue after working a problem (Poulis et al., 1998)
   - allow students to assess their own level of understanding at the end of a class (Halloran, 1995)
The common uses of clicker questions

5) for quizzes or tests (Draper, 2002) although reports of using clickers for summative high-stakes testing are relatively rare. Quiz questions typically check whether students are:

- paying attention
- taking good notes
- preparing for class or labs
- keeping up with homework
- actively thinking
- able to recall material from previous lectures

6) to do practice problems, especially in math, chemistry, engineering, or physics courses
The common uses of clicker questions

7) to guide **thinking, review, or teach**, including questions used to:
   - review at the end of lecture
   - give prelab tutorials (Draper, 2002)
   - review for a test (Jackson and Trees, 2003)
   - lead students through a multistep process by asking which step should come next (Wood, 2004)

8) to **conduct experiments on or illustrate human responses** (Draper et al., 2002; Simpson and Oliver, 2006)

9) to **make lecture fun!**
Our latest pilot study with CCR

◆ Participants
   65 undergraduates – two classes

◆ System
   ➢ CCR
      ✓ enable every student in the classroom to respond to the teacher’s questions instantly and anonymously by using a handheld device
      ✓ automatically form small groups based on student real-time responses
Procedure

- Class A

  ✓ Convenient Grouping
    - Discuss with Neighbors

Control section (A)

1. Argumentation Pre-Questionnaire
2. Interactive Lecture with CCR
3. Convenient Grouping - Discuss with Neighbors
4. Argumentation Post-Questionnaire
Procedure

- Class B

✓ Heterogeneous Grouping
  - Automatically formed by CCR based on students’ real-time responses (each group was composed of different position)

Experimental section (B)

1. Argumentation Pre-Questionnaire
2. Interactive Lecture with CCR
3. Heterogeneous grouping - Assigned by CCR
4. Argumentation Post-Questionnaire
The instructional method

◆ Interactive Lecture
  ✓ Biological Diversity

✓ Biological Migration

✓ CCR Question 1 (SHORT-ANSWER QUESTION): What factors are required for complex life?
Active and supply students’ background knowledge of the required factors for complex life?

Introduction to our own galaxy

CCR Question 2 (MULTIPLE-CHOICE QUESTION): How many Earth-size planets might exist in the galaxy?
Explain the possible relations between the planet size and the probability of life arising.

NASA’s Kepler program:
A paper published by Nature - The wheels come off Kepler (by Ron Cowen)
✓ Introduce two opposed positions

- The data obtained by the Kepler program can estimate the amount of Earth-like planets (William Borucki from NASA)
- No, it can not (Sara Seager from MIT)

✓ Report the cost of the Kepler program
CCR Question 3 (TRUE/FALSE QUESTION):
If you were a U.S. citizen, are you willing to keep paying money for the Kepler program?

Group discussion (2 to 3 students as a group)

- Class A: Convenient Grouping – with Neighbors
- Class B: Heterogeneous Grouping – with the peers assigned by CCR

Summary of group discussions for the whole class
Argumentation Pre- and Post-Questionnaires

- Do you agree with initiating some projects like the Kepler program in Taiwan? (Assessing students’ possible position change)
- If you want to convince your friend with your position, what arguments you will propose to convince him/her? (Assessing students’ ability to generate supportive arguments)
- If someone holds an opposite position with you on this issue, what arguments he/she may have? (Assessing students’ ability for counterargument construction)
- According to the arguments you have proposed in question 3, can you write down your opposing ideas to justify your position? (Assessing students’ ability for rebuttal construction)
The students in the heterogeneous groups tended to insist on their original positions ($p < .01$).

### Pre-questionnaire

<table>
<thead>
<tr>
<th>Group</th>
<th>Positive</th>
<th>Negative</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>11</td>
<td>23</td>
<td>34</td>
</tr>
<tr>
<td>B</td>
<td>15</td>
<td>16</td>
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<tr>
<td>Total</td>
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<td>39</td>
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### Post-questionnaire

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</thead>
<tbody>
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<td>A</td>
<td>18</td>
<td>16</td>
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</tr>
<tr>
<td>B</td>
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<tr>
<td>Total</td>
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### Position shift

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<th>Changed</th>
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<td>9</td>
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<tr>
<td>B</td>
<td>30</td>
<td>1</td>
<td>31</td>
</tr>
<tr>
<td>Total</td>
<td>55</td>
<td>10</td>
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</table>

Pearson Chi-Square: $p = .009$
The students in the heterogeneous groups tended to generate more rebuttals to defend their positions ($d = 0.45$)

<table>
<thead>
<tr>
<th></th>
<th>Group</th>
<th>Adj. M</th>
<th>SE</th>
<th>$p$</th>
<th>$d$</th>
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<tbody>
<tr>
<td><strong>Supportive argument</strong></td>
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<tr>
<td>A</td>
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<td>0.11</td>
<td>.392</td>
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<tr>
<td><strong>Counter argument</strong></td>
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<td>.614</td>
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<td>0.14</td>
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Summary

- We are optimistic about our innovative instructional strategy with the use of CCR – the preliminary results suggested a positive effect on rebuttal construction, which is deemed as a higher-order but hard-to-achieve ability in argumentation (e.g., Jonassen & Kim, 2010).

- The interesting thing emerged from the result is the negative relationship between position shift and rebuttal construction. Perhaps it can partially explain why heterogeneous grouping could facilitate rebuttal construction; try to defend your position, or just surrender. Heterogeneous grouping may easily generate the situation in which students have to secure their positions.

- Replicated studies with a larger sample size are certainly needed.
The good, attention, fun, no doze off, engenders better discussion

The bad, “stop messing around with technology and get back to good basic teaching” (d’Inverno et al., 2003).

And the ugly?
Important Indicators: Learning Embedded with Technologies

Teaching/Learning Goals & Technologies’ Adaptive Levels

Convenience and Efficiency of Technologies

Irreplaceability of Technologies

Focus on “Human” in “Human Technology”
Social Media is very powerful!

Join a SAGE Community Site

Social bookmarking with citeulike

Start blogging

Join academic social networking sites
A perfect match?

Facilitator