A Comparative Study of Teacher Preparation Strategies in Seven APEC Economies

Purpose: Information
Submitted by: United States
A Comparative Study of Teacher Preparation Strategies in Seven Asia Pacific Economic Cooperation (APEC) Economies

February 20, 2014
Presented to the APEC Education Network Meeting
Ningbo, China
Cheng Davis, Teachers College, Columbia University*
Alan Ginsburg, Consultant
Alister Jones, University of Waikato, New Zealand*
Rebecca Maynard, University of Pennsylvania

*Presenters

4 Broad Areas of Focus

1. Improving engagement and outcomes of students in mathematics & science
2. Strengthening equity of access & opportunity to learn mathematics & science
3. Strategies for creating a high-quality teacher workforce
4. Strategies for connecting teacher preparation programs to recruitment & in-service support systems
Collaboration of 7 APEC Nations: East & West

Steering Committee
Cheng Davis (Chair), Alister Jones (Co-Chair), Lee Sing Kang (Co-Chair), Alan Ginsburg (Co-Chair), Rebecca Maynard, Ding Gang, and Alexey Semenov

Western Economies
Australia
New Zealand
United States

Eastern Economies
China
Russia
Singapore
Thailand

Exemplary Features of Teacher Preparation Systems in the Participating Economies

**Australia:** Strategies for promoting teachers as self-learners.

**New Zealand:** Strategies to prepare teachers to work effectively with students from different cultural backgrounds.

**United States:** Strategies that blend teaching of pedagogy and content necessary for effective mathematics or science instruction.

**China:** Strategies for promoting in-depth understanding of mathematics and science content at the teacher-preparation institution.

**Russia:** Programs that prepare teachers to develop the talents of the most mathematically and science able students.

**Singapore:** An integrated system of teacher recruitment, preparation, placement, and advancement.

**Thailand:** Use of lesson study for guiding instruction in mathematics problem-solving.
Project History

<table>
<thead>
<tr>
<th>When</th>
<th>Activity</th>
<th>Host</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan. 2008</td>
<td>Proposal to APEC: Xi’an Symposium, China</td>
<td>MOE, P.R. China; MOE, Peru; DOE, US</td>
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<tr>
<td>June 2008</td>
<td>Planning Meeting: Comparative Research to Identify Best Practices</td>
<td>University of Pennsylvania, Philadelphia, PA</td>
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<tr>
<td>April 2009</td>
<td>Working Group Meeting</td>
<td>East China Normal University</td>
</tr>
<tr>
<td>Nov. 2010</td>
<td>Working Group Meeting</td>
<td>University of Waikato</td>
</tr>
<tr>
<td>Oct. 2011</td>
<td>Working Group Meeting</td>
<td>NIE, Singapore</td>
</tr>
<tr>
<td>Feb. 2012</td>
<td>Working Group Meeting</td>
<td>Moscow Institute of Open Education</td>
</tr>
<tr>
<td>Feb. 2014</td>
<td>Report to APEC</td>
<td>Ningbo, China</td>
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</table>

Challenges and Solutions

Challenges
- Funding
- Staff time and support
- Comparability of data sources

Facilitating Factors
- Committed team leads across the APEC economies
- Access to and cooperation by policy-makers
Study Methods

• Analysis of Extant Data
  Descriptors of secondary mathematics content and teacher preparation standards
  Teacher characteristics and performance indicators
  Student performance

• Surveys of Teacher Preparation Institutions
  Approaches to recruiting prospective teachers, curricula, and practica experiences

• Case studies
  Promising teacher preparation practices

• Reviews of induction policies and practices

• Develop & Test CK and PCK Assessment
  Pilot in 5 economies
  Teacher content knowledge
  Pedagogical content knowledge

Planned Products

• Report to APEC
  – Issues addressed
  – Methods
  – Findings

• Investigator initiated derivative research products
  – Country-specific policy briefs
  – Comparative topical reports
  – Follow-on research (e.g., using the math assessments or expanding the case studies)
Overview of Study Methods & Findings

• Project Overall (Alister Jones)
• In-depth Comparative Assessment of Teacher Preparation Practices (Stella Zhuang)
• Russia’s Strategy for Serving Gifted Math Students (Ivan Yashchenko)

Study Overview

1. Contextual data
   • System performance, curriculum, tertiary system
2. Teacher Preparation Policies & Practices
3. Teacher Induction & Support Practices
4. Assessments of Pre-service Teachers
5. Findings from Economy-focused Case Studies
Methods for Comparative Studies of Teacher Preparation & of Induction & Support

- Reviews of literature on the topics
- Surveys of participating economies
- Economy-specific case studies

Recruitment and standards

<table>
<thead>
<tr>
<th>Economy</th>
<th>Interview</th>
<th>Criteria</th>
<th>Sc/Math Prior degree</th>
<th>GPA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia</td>
<td>Depends</td>
<td></td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>China</td>
<td>Yes and Testing</td>
<td>Ability, health</td>
<td>Concurrent</td>
<td>No</td>
</tr>
<tr>
<td>New Zealand</td>
<td>Yes</td>
<td>Disposition to teach</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Singapore</td>
<td>Yes</td>
<td>Academic achievement and potential</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>United States</td>
<td>No</td>
<td>Content knowledge and reasons</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

Note: Information is not available for Thailand.
Preparation of teachers

- Graduate or concurrent
- Content
- Pedagogy
- Diversity
- Real World Problem solving
- Practicum experiences
- National standards

INDUCTION SUPPORT FOR BEGINNING TEACHERS

AIM: Survey current induction practices in a range of economies in an effort to identify promising and transferrable strategies. This is especially important in light of the high and increasing share of the teaching workforce who are novices in their profession.
Variety of Induction Policies & Practices

<table>
<thead>
<tr>
<th>Economy</th>
<th>Program type</th>
<th>Required for Full teacher Registration</th>
<th>Formal or informal</th>
<th>Time Allowance</th>
<th>In-school mentor</th>
<th>Portfolios Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia</td>
<td>State &amp; school based</td>
<td>Yes</td>
<td>Both; Formal (1-2 yrs.)</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>China</td>
<td>Regional &amp; school based</td>
<td>Yes</td>
<td>Both; Formal (4yrs)</td>
<td></td>
<td></td>
<td>No</td>
</tr>
<tr>
<td>New Zealand</td>
<td>School based</td>
<td>Yes</td>
<td>Both; Formal (2 yrs.)</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Russia</td>
<td>School-based</td>
<td>No</td>
<td>Both; Formal (4 yrs.)</td>
<td>Yes</td>
<td></td>
<td>No</td>
</tr>
<tr>
<td>Singapore</td>
<td>National (Compulsory) &amp; school-based</td>
<td>No</td>
<td>Both; Formal (2 yrs.)</td>
<td>School-dependent</td>
<td>No (school dependent)</td>
<td>No</td>
</tr>
<tr>
<td>United States</td>
<td>Variable</td>
<td>No</td>
<td>Formal in some districts</td>
<td>No</td>
<td>No (school dependent)</td>
<td>No</td>
</tr>
</tbody>
</table>

Findings on Induction Programs & Policies

- **Programs and policies are variable** in focus, quality and outcomes
- **Mentoring by experienced teachers** is a key element of most programs
  - Improve beginning teacher retention, job satisfaction & practice
- **Beginning teachers benefit from informal & formal mentoring**
  - Informal mentors may cause less tension between assistance & evaluation
- Subject specific mentoring is recommended to build **pedagogical content knowledge** is essential
- **ICT can be useful in mentoring and beyond**
CASE STUDIES: A SEARCH FOR PROMISING PRACTICES

Aim: Encourage key stakeholders to consider alternative policies and practices to improve teacher preparation programs within their own economy by learning from diverse promising practices from the other economies where evidences of impacts are available for reflection.

Case Methods

• Economy Discretion on Topic
  – Math, science (chemistry or physics) or both
  – Level (pre-service, induction, in-service)
  – Focus (innovative or otherwise high profile practices)

• Common Template for Case Reports
  – Theme, issues, & goals
  – Practices, artifacts & evidence
  – Implications, conclusions, & references

• Data & Analysis
  – Literature, published documents, interviews

• Thematic Synthesis
Cross-cutting Theme 1

- **Strengthen collaboration between teacher education institutes and schools**
  - Example: In China, teachers remain connected with their teacher education institutions through a combination of integrated distance learning and face-to-face training
  - Example: In New Zealand, teacher education includes the first two years of teaching

Cross-cutting Theme 2

- **Develop Content and Pedagogy Knowledge**
  - Example: In Russia, “pedagogy of discoveries” provides mathematics undergraduates opportunities to deepen mathematics knowledge while learning the psychology of learning by working with gifted high school students.
  - Example: The US has a UTeach model, which links secondary and tertiary math and science and provides supported teaching opportunities
Cross-cutting Theme 3

• Include research in training
  – Example: In Australia, Chemistry education course introduce pre-service teachers to a variety of research methodologies that can be applied in chemistry education
  – Example: Teachers in China’s MED program must complete a thesis of at least 20,000 words and defend it to a panel

Cross-cutting Theme 4

• Use Information and Communication Technologies (ICT) in Training
  – Example: Thailand specifically focuses on technological pedagogical and content knowledge (TPACK), which prepares teachers to conduct inquiry based science lessons
  – Example: In New Zealand, provisionally registered teachers have access to web resources such as past examinations and assessment
Applications of Case Study Findings

• Encourage collaboration between teacher educators and subject specialists
• Build awareness and support for promising practices with educators and policy makers
• Within the APEC network, support further studies and dissemination of information
  – E.g., using dissemination channels such as EDNET

ASSESSING KNOWLEDGE THAT SUPPORTS HIGH QUALITY MATHEMATICS INSTRUCTION
JON R. STAR AND EILEEN MURRAY, HARVARD UNIVERSITY (USA)

Aim: The math assessments were developed to support comparative measures of prospective mathematics teachers’ content knowledge and pedagogical content knowledge
Methods

• Assessment design
  – Collaborative & iterative
  – All economies contributed items
  – 45 minute PCK portion; 30 minute CK portion
  – Common scoring rubric

• Translation & administration
  – Economies translated from English
  – Administered to convenience samples of prospective teachers
  – Economies graded using common rubric

Pilot Assessment Results

<table>
<thead>
<tr>
<th>Economy/Institution</th>
<th>Number Responding**</th>
<th>Pedagogical Content Knowledge (PCK)- 8 Items (SD)</th>
<th>Content Knowledge (CK)- 7 Items (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>25</td>
<td>1.96 (1.02)</td>
<td>2.32 (1.89)</td>
</tr>
<tr>
<td>2</td>
<td>3</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>3</td>
<td>31</td>
<td>1.97 (1.43)</td>
<td>--</td>
</tr>
<tr>
<td>4</td>
<td>56</td>
<td>2.73 (1.24)</td>
<td>1.68 (1.51)</td>
</tr>
<tr>
<td>5</td>
<td>60</td>
<td>1.58 (1.48)</td>
<td>1.62 (1.42)</td>
</tr>
</tbody>
</table>

NOTES:
-- Indicates that too few students responded to report results.
** Respondents represent convenience samples of teacher trainees
Pilot Findings in Brief

• Performance was more similar than different across economies
• Respondents tended to struggle with the items on both assessments
• Cautions
  – Small, convenience samples
  – Small number of items on each assessment
• Next steps
  – Administer more broadly
  – Continue to validate
  – Compare results by program characteristics

ASSESSING KNOWLEDGE THAT SUPPORTS HIGH QUALITY SCIENCE INSTRUCTION

DEBORAH CORRIGAN, MONASH UNIVERSITY, AUSTRALIA
BEVERLEY COOPER AND BRONWEN COWIE, UNIVERSITY OF WAIKATO, NEW ZEALAND

Aim: The science assessments were developed to support comparative measures of prospective chemistry and physics teachers’ content knowledge and pedagogical content knowledge
Methods

• Assessment design
  – Part 1: CK-measures knowledge & skills in understanding, analyzing & comparing alternative viewpoints
  – Part 2: PCK- assesses how pre-service teachers think & judge students’ ability to grasp complex ideas
  – Scaled to be administered in 1 hour
  – High reading load

• Domains
  – Part 1: Understanding, analyzing & generalizing
  – Part 2: Content Representation (CoRe) - Understanding goals, importance, base knowledge, misconceptions, strategies

Pilot Assessment Results
Pre-service Teachers with One-year Postgraduate Diploma in Education (PGDE)

<table>
<thead>
<tr>
<th>Subject</th>
<th>Number Responding (Part I/ Part II)**</th>
<th>Part I- 6 Items (% Correct)</th>
<th>Part II- Small Group Work (% Correct)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemistry</td>
<td>19/9</td>
<td>--</td>
<td>69%</td>
</tr>
<tr>
<td>Physics</td>
<td>11/5</td>
<td>--</td>
<td>55%</td>
</tr>
<tr>
<td>Total</td>
<td>30/14</td>
<td>56%</td>
<td>66%</td>
</tr>
</tbody>
</table>

NOTES:
-- Not reported by subject
** Respondents represent convenience samples
Pilot Findings in Brief for the Science Assessments

- The results provide reason for optimism that we can create assessments that could work in different economies
- Performance was generally quite high
- Cautions
  - Small, convenience samples
  - Small number of items on each assessment
- Next steps
  - Administer more broadly
  - Continue to validate
  - Compare results by program characteristics

CONCLUDING THOUGHTS

- Importance of understanding the contextual influences in each economy
- Enhance quality of teacher education
- Teacher standards, professional values and engagement
- Importance of balancing content, pedagogical content knowledge
- Emerging practices
- Entry
- Course
- School-University relationship
- Mentoring
- Induction
- Increasing use of ICTs
- Development of tests on Pedagogical Content Knowledge
- Potential to build best practice models across economies