



**Asia-Pacific  
Economic Cooperation**

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**2014/SOM1/HRDWG/EDNET/033**

Agenda item: 5.5.1

## **A Comparative Study of Teacher Preparation Strategies in Seven APEC Economies**

Purpose: Information  
Submitted by: United States



**Human Resources Development Working Group  
Education Network Meeting  
Ningbo, China  
19-20 February 2014**

## 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

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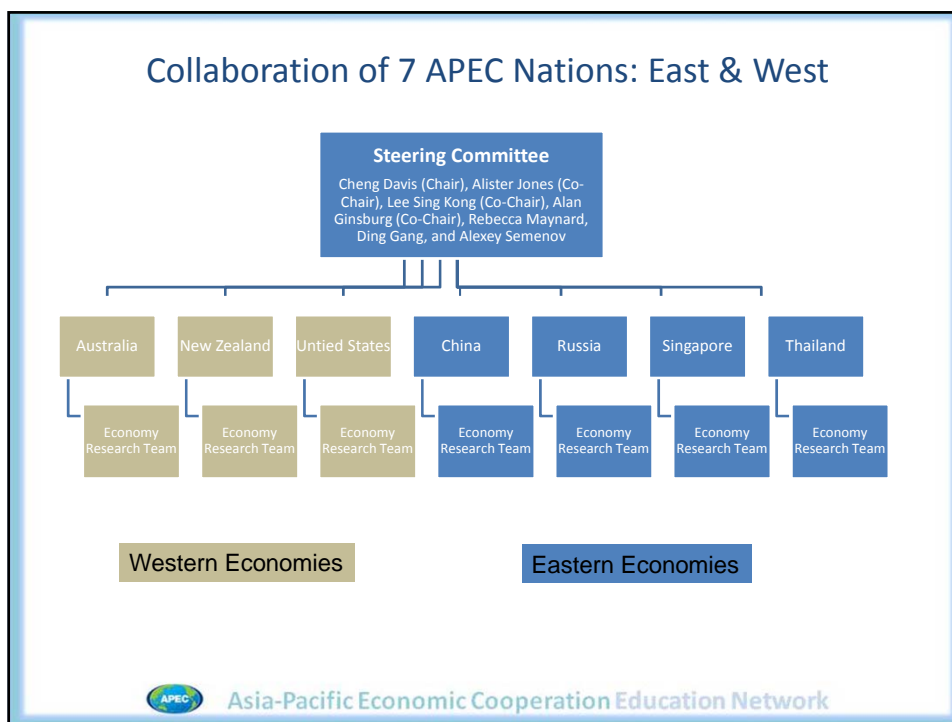
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### 4 Broad Areas of Focus

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



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### 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.



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## Project History

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



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## 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



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## Study Methods

- **Analysis of Extant Data**
  - Descriptores 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



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## 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)



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## 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)



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## 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



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## Methods for Comparative Studies of Teacher Preparation & of Induction & Support

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



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## Recruitment and standards

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

Note: Information is not available for Thailand.



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## Preparation of teachers

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



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## 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.



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## Variety of Induction Policies & Practices

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



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## 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



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## 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.



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## 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



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## 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



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## 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



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## 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



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## 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



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## 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



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## 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



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## 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



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## Pilot Assessment Results

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

NOTES:

-- Indicates that too few students responded to report results.

\*\* Respondents represent **convenience samples** of teacher trainees



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## 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



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## 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



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## 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



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## Pilot Assessment Results

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

Subject	Number Responding (Part I/ Part II)**	Part I- 6 Items (% Correct)	Part II- Small Group Work (% Correct)
Chemistry	19/9	--	69%
Physics	11/5	--	55%
Total	30/ 14	56%	66%

**NOTES:**

-- Not reported by subject

\*\* Respondents represent convenience samples



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## 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



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## 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



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