



**Asia-Pacific
Economic Cooperation**

2013/SOM3/HRDWG/034

Agenda Item: EDNET 5.8

Identifying Best Practices in Mathematics and Science: Teacher Preparation in APEC Economies

Purpose: Information
Submitted by: United States



**35th Human Resources Development
Working Group Meeting
Medan, Indonesia
24-26 June 2013**

Project Progress Report:

Identifying Best Practices in Mathematics and Science Teacher Preparation in APEC Economies

Submitted by: United States



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Unique contribution

- This project fills an important knowledge gap in teacher preparation programs
- No major international study has:
 - Examined secondary mathematics and science teacher education programs
 - Identified promising practices in teacher preparation
 - Assessed the knowledge needed to effectively teach secondary mathematics and science
 - Developed a methodology for Economies and teacher preparation institutions to assess their own comparative effectiveness.



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2

Participating Economies

APEC Project Leadership: U.S ED & Columbia University

Lead Universities within Economies:

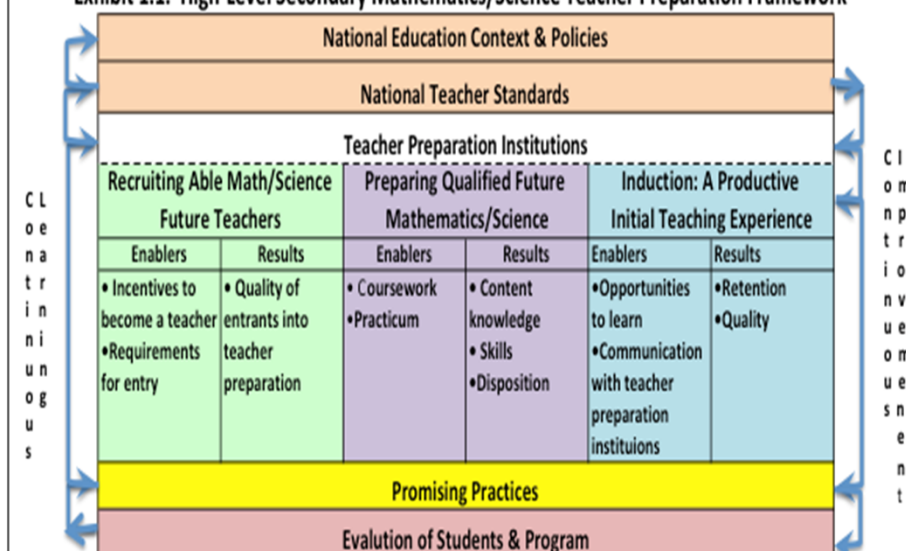
- Australia: Monash University
- China: East China Normal University
- New Zealand: Waikato University
- Russia: Moscow Institute of Open Education
- Singapore: National Institute of Education
- Thailand: Koen Kaen University
- USA: Harvard



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3

Exhibit 1.1. High-Level Secondary Mathematics/Science Teacher Preparation Framework



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4

Project Components

- **Economy Profiles:** Teacher Preparation Context
- **Recruiting and Preparing** Future Secondary Math/Science Teachers: Current Practice
- **Case Studies** of Exemplary Teacher Preparation Practices
- **Evaluation** of Future Secondary Teachers
- **Developing** New Math/Science Secondary Teachers in the Classroom (Induction)



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5

Economy Profiles: Teacher Preparation Context

Lead	USA
Objectives	Describes the economy context influencing math/science teacher preparation including identifying, student characteristics and performance, teacher preparation standards, policy & educational challenges
Research questions	<ol style="list-style-type: none"> 1. What is the composition and economic level of students? 2. How well do students perform on international math/science outcome measures? 3. What are the essential features of teacher quality standards that establish the aims of teacher preparation? 4. What are new math/science content policy and instructional emphases? 5. What are characteristics of secondary teacher working conditions?
Methodology	Using existing statistical data drawn from respected international sources of common data. Participating economies fill-in missing data and unique policy contexts (e.g. teacher preparation standards).
Progress	First draft completed

6

Recruiting and Preparing Future Teachers: Current Status	
Lead	China
Objectives	Describes 1) how institutions recruit good teacher candidates and 2) the nature of teacher preparation courses & practicum
Research questions	<p>Recruiting:</p> <ul style="list-style-type: none"> • Do institutions have difficulty finding candidates? Are incentives offered? • Are there special pathways into teaching? <p>Coursework:</p> <ul style="list-style-type: none"> • Do candidates take content courses inside or outside of their education department and how do their math rigor compare? • How much subject preparation in applied modern topics? • What is the quality and composition of pedagogical courses? • What is the approach and exposure to classroom experiences? • How do courses address teaching to diverse populations? • How do courses address teaching with technology?
Methodology	Institutions fill out surveys and submit information about recruiting.
Progress	Survey responses completed; need some additional information ⁷

Case Studies of Exemplary Practices: Lead Singapore	
Objectives	Identify promising practices in major areas of teacher preparation for other economies to consider adapting
Research questions	<p>What are promising practices with respect to teaching secondary mathematics/science content?</p> <ul style="list-style-type: none"> • teachers as learners • assessment literacy • meeting needs of a diverse population • connecting teacher preparation institutions with schools including induction and mentoring
Methodology	Economy representatives submit promising practice descriptions with artifacts, why it works, data on how well it works and develop implications for transferability.
Progress	First draft case studies nearing completion
<p><i>"The sharing of the case studies can stimulate fruitful exchanges of ideas and experiences leading to improvements and future joint research" Khoo Yoong Wong Singapore</i></p>	
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Evaluation of Future Secondary Teachers	
Lead	Math: USA; Science: Australia & New Zealand
Objectives	Provide direct assessment evidence about what prospective teachers know about math & science content and pedagogy
Research questions	<p>Mathematics: what knowledge do prospective teachers of mathematics have of 1) university advanced content and 2) pedagogical content knowledge</p> <p>Science: what knowledge do prospective teachers of science have of: 1) upper secondary content 2) pedagogical content knowledge using an innovative content representation model</p>
Methodology	Develop assessments and administer to future secondary math and science teachers nearing graduation
Progress	Assessments survey completed and administered to some but not all participating institutions



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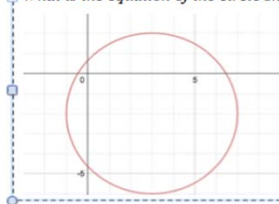
9

Sample Math Pedagogical Problem

APEC Promising Practices in Math/Science Teacher Preparation Project
Pedagogical Content Knowledge Items

1. Consider the following problem:


What is the equation of the circle shown below? (Note: Diagram is drawn to scale.)



The students in your geometry class are working on this problem. Describe two ways that students might approach this problem – one way that results in the correct answer and one way that emerges from a common student error.


“This prototype assessment can serve as a model for future assessments, as well as opening up additional lines of inquiry related to the types of university courses and the types of teacher professional development that may be instrumental in developing teachers' knowledge.”

Jon Star, Harvard


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10

Developing New Teachers in the Classroom	
Lead	New Zealand
Objectives	Identifies how teacher preparation institutions in coordination with school systems provide induction support to new graduates entering teaching
Research questions	<ol style="list-style-type: none"> 1. What research identifies as effective new teacher induction? 2. What are typical Economy induction policies? 3. How to sustain connections and development with new teachers and teacher preparation institutions?
Methodology	<ul style="list-style-type: none"> • Brief summary of research literature on effective practices in induction • Summary of Economies' typical induction policies and • Examples of Economies' effective practices
Progress	Literature review underway, Survey sent to economies about induction policies, effective practice examples from surveys

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Final Report	
<ul style="list-style-type: none"> • Completion: January 1, 2014 • Highlights of Economy similarities & differences in teacher preparation: East & West • What are key challenges confronting teacher preparation today and in the future? • What are lessons learned to overcome challenges? • What is a methodology for Economies and institutions to measure their own teacher preparation quality? • How to conduct international research to learn from diverse systems? 	

February 2012  Asia-Pacific Economic Cooperation Education Network 12