A Quality Teacher in Every APEC Classroom

Purpose: Information
Submitted by: United States
A Quality Teacher in Every APEC Classroom

I. Background

School systems and teachers have to prepare future workers to meet the demands of the 21st century global, innovative and partnering workplace (Partnership for 21st Century Skills; National Institute of Education Singapore, 2009). In this effort, they need to build students’ skill set:

- **Content knowledge skills** form the core from which to build the other skills. *Eastern* education systems with an emphasis on direct instruction and intensive practice have been particularly strong delivery of content knowledge.

- **Learning and innovation skills** include critical thinking and problem solving, creativity and innovation and oral and written communications that enable students to apply content knowledge. *Western* education systems with a tradition of project-based learning, class discussion and composition tend to be perceived as strong in producing students with innovation skills.

- **Information, media and technology literacy skills** include readily accessing and evaluating information; understanding and constructing media messages; and interpreting information from different points of view. In the 21st Century workplace, this requires using ICT to research, organize, evaluate, and communicate information.

- **Student life, career, and citizenship skills** in the 21st Century involve global awareness, valuing diversity, and respecting the environment. Citizenship skills are important for maintaining positive and historical values to counterbalance the pressures of rapid societal change in the 21st Century.

Developing students with these 21st Century skills requires fundamental changes in instruction and hence teacher preparation. This priority area, teacher quality, identifies research-based strategies and suggestions for potential future APEC projects to strengthen teachers throughout the teacher pipeline, but with a focus on providing future teachers with sound preparation.

Research demonstrates that the quality of a student’s teacher is probably the most important

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1 Much of the information in this paper comes from the APEC Education Network project, *Quality of Teacher Preparation in Secondary Math and Science*, sponsored by the United States Department of Education with participation by leading universities from seven Economies: Monash University, Australia; East China Normal University, China; University of Waikato, New Zealand; Moscow Institute of Open Education, Russia; National Institute of Education, Singapore and the Ministry of Education, Singapore; Khon Kaen University, Thailand; Harvard University, USA; Columbia University, USA; University of Pennsylvania, USA. Columbia University’s Teachers College, NZ’s Waikato University and Singapore’s National Institute of Education are serving as co-directors for the project. The project is yielding rich in-depth information about current mathematics and science teacher preparation at the upper secondary level. The products include a comparison of teacher preparation curricula, best practices in teacher preparation, and strategies for assessing future teacher knowledge of content and pedagogy. See Appendix 1 for details.
school-based factor influencing learning (Goldhaber, et al., 1999; Hanushek, et al., 1998). In fact, rigorous U.S. research on data for over two million students has now linked the quality of a primary teacher as measured by the amount of student improvement on end-of-grade assessments to student earnings in later years (Exhibit 1). Indeed, if a low-value added teacher were replaced with a teacher of average value-added, the earnings over a lifetime of a typical class of students having a single year of a high-quality teacher would raise lifetime earnings of students in a typical U.S. classroom by over $50,000. Thus, providing a quality teacher in every classroom should be a fundamental goal of every APEC education system, as they prepare students with the knowledge, skills and values to succeed in meeting the rapid pace of change in the 21st Century workplace.

In Australia, the Australian Government has committed up to $550 million to states and territories over five years (2008-09 to 2012-13) to facilitate and reward domestically significant and sustainable reforms to address the issue of the quality of teachers and school leaders. Further reforms, underpinned by the implementation of the National Professional Standards for Teachers, are underway including domestic accreditation of initial teacher education programs, domestically consistent registration and certification, and the introduction of employment-based pathways into teaching aimed at attracting and retaining quality entrants in the profession. When these are combined with initiatives to support teachers through management of their performance and development and reward those that achieve certification at the higher levels, the Australian teaching profession is being prepared to effectively educate students in 21st century schools.

In the United States, President Obama has just called for $5 billion from the American Jobs Act to support a competitive program that would encourage states and districts to enact bold reforms at every stage of the teaching profession through the Recognizing Educational Success, Professional Excellence, and Collaborative Teaching (RESPECT) Project (http://www.ed.gov/blog/2012/02/launching-project-respect). The U.S. Department of Education’s request would help states and districts attract top-tier talent into the profession and prepare them for success; create career ladders with competitive compensation; evaluate and support the development of teachers and principals; and get the best educators to the students who need them most. In this effort, the United States hopes to learn from the successes of other Economies. Over the long term, the program will draw positive attention to and focus on improving all phases of teaching, from training and tenure to compensation and career opportunities. Reshaping how teachers are viewed by American society and ensuring that every state recruits, trains, supports, rewards, and retains the best teachers are critical because no other profession carries a greater burden for securing the economic future of an Economy.

Given the fluidity and uncertainty of the teacher preparation context and research, Economies’ education systems can benefit from cross-economy studies of promising practices in teacher recruitment, preparation, professional development and evaluation from different Economies that have evolved at different economic rates and in different governance ways.

II. Relation to the APEC Agenda: Preparing a Workforce With 21st Century Skills

For example, Goldhaber (1999) found that teachers accounted for over 40 percent of the variance in student achievement explained by in-school factors.
A core premise of the APEC priority on teacher quality is that changes in our world require changes in our teachers. The rapid pace of change in our world requires us to think deeply about what it means to be a teacher. What it means to be a teacher in today’s world is much different than it was 50, 20, or even 10 years ago both because of changes in the workplace.

The 2012 APEC education ministerial workforce-related goals exemplify the challenges education systems and their teachers face in meeting an Economy’s demand for 21st Century human resources in the workplace and the student skill sets these workplaces require for success (Exhibit 2, outer ring).

- *Trade & investment liberalization* requires preparing a workforce that can *compete globally*;
- *Fostering growth* requires preparing a workforce that is creative and adaptable to the rapid pace of *innovation*; and
- *Regional economic integration* requires preparing a workforce that can work in *partnership* both locally in the workplace and internationally in joint ventures.

With *globalization*, a competitive workforce that does not rely on low wages for its competitiveness must have high-productivity to support its higher wages. While worker productivity depends upon a number of factors, including market efficiency and physical capital availability (World Economic Forum, 2011), four decades of economic research confirm the central importance of human capital development through education for economic productivity and growth (Becker, 1964; Hanushek & Wößman, 2007). One of the most accurate international indicators of worker productivity is worker output per hour (Exhibit 3).

These results show that among the 11 APEC Economies for which worker productivity data are available, the U.S. worker has the highest level of worker output per hour. The high level of U.S. worker productivity may be surprising in view of the relatively low U.S. scores compared with a number of the high-scoring Asian APEC members on the OECD Program for International Student Assessment (PISA) of age 15 students.

One part of the explanation may be that because Asian education levels have improved rapidly over the last several decades, the effects of education improvements on average worker productivity show-up gradually overtime as younger workers enter the workforce. There is some support for this explanation in the productivity trends. Hong Kong China, Singapore, South Korea and Chinese Taipei are high-scoring Economies on PISA and each has among the highest worker productivity growth between 2000 and 2010 (Exhibit 3).³

A second possible explanation for the relative high U.S. worker productivity is that for some Economies average performance on international assessments, such as PISA, is an inadequate indicator of the ultimate performance of their education system in preparing their workforce.

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³ Japan is exception with productivity growth comparable to the U.S., but in Japan’s case, market forces of a stagnant economy may be operating. As noted education is only one factor determining labor productivity.
In the case of the U.S., the written test of PISA at age 15 may fail to reflect the U.S. having a widespread second-chance system, a high-quality college sector, and a stress on building students’ soft skills. According to U.S. surveys, employers rate high workforce preparation in the soft skills, which include professionalism or work ethic, oral and written communication, teamwork and collaboration, and critical thinking or problem-solving skills (The Conference Board, 2006).

The *innovation component* in the 21st Century Economy (Exhibit 1) for the purposes of this Ministerial Meeting is defined by how the Information Communication and Technology (ICT) revolution is altering the workplace by generating a wage premium to workers who are prepared to carry out non-routine functions in a digital economy. Examples of non-routine functions are workers’ ability to identify patterns in data, compose text and problem solving (Levy & Murnane, 2005).

As Singapore Education Minister Heng Swee Keat (Center for Strategic Information Studies, 2012) has observed, a challenge for any education system is to produce future members of the workforce who can carry out new job requirements when the pace of technology and innovation produces jobs that are radically changed from those commonly available when a worker attended school (Exhibit 4). Consequently, much of what future workers will need to know may not have been invented when they had their formal schooling, and 21st Century schools will have to prepare students with the *skills to learn how to learn beyond the classroom years*.

*Partnership*, a third component of the changing workplace (Exhibit 2), requires the 21st worker to be able to work collaboratively, often within international joint ventures. Just within the last decade, the exports of goods and services for APEC Economies grew as a percent of Gross Domestic Product from 18.2% in 2000 to 23.7% in 2010, a 30% increase (Stats APEC, 2012).

As an example of how international the workplace has become, the Cars.com (2012) 2009 list of the top American-made cars, judged by where the car’s parts come from and whether the car is assembled in the U.S., ranks the Japanese Toyota Camry as the top American-made car, not a car made by American owned GM or Ford. Truly, the 21st Century workforce will need to be comfortable in partnership environments that may involve communicating with workers worldwide.

### III. Key Research

#### IIIa. Key Research: Standards for a High-Quality Teacher in the 21st Century

At the front end of developing a quality teaching force are the teacher quality standards (Exhibit 2) that establish the desired attributes that drive a standards-driven systemic approach to teacher preparation (Lee, 2008). Three questions are addressed in examining the teacher standards:

- Do the teacher standards in different APEC education systems address common teacher-quality objectives or are their significant differences among the standards?
How well do the current teacher-standards address the challenges of developing students with 21st Century skills? Do the current teacher standards recognize and respond to how computers and the web are changing the role of the teacher in the classroom?

The first question concerns the commonality of the teacher standards across the different APEC Economies. The APEC Quality of Teacher Preparation in Secondary Math and Science project has initially collected and examined teacher standards for four English-speaking participants: Australia New Zealand and Singapore and the U.S. Those from Australia, New Zealand and Singapore represent domestic standards. The U.S. is represented by the teacher quality standards developed by the National Board for Professional Teacher Standards, a widely used set of standards for measuring an accomplished teacher (Exhibit 5).

Although these four Economies differ considerably in their respective size, centralization, and cultures, nonetheless, the four sets of standards frameworks can readily be organized around five common characteristics describing a quality teacher. These standards take a holistic view of a teacher’s responsibilities that cover knowledge, skills and values (National Institute of Education, Singapore, 2009).

- The learner-centered standard recognizes that preparing students for the modern workplace requires that teachers identify and address the multiple attributes and pathways students may take to success (Gardner, 1993; National Research Council, 2005).

- The teacher knowledge standard is consistent with the body of research that shows teachers with stronger content knowledge, especially in the upper grades, produce students who learn more on content assessments (Clotfelter et al., 2007; Sawchuk, 2011).

- The teacher skill standard recognizes that the content knowledge of a subject is important but not sufficient to produce high levels of student learning. A quality teacher must also develop the pedagogical content skills necessary to explain subjects for understanding and reach students with different abilities and different backgrounds (Hill et al., 2005, Shulman, 1987).

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4 Teacher standards for the non-English speaking Economies participating in the project are in the process of being translated.

5 Teacher standards for New Zealand and Singapore apply to their entire education system. The U.S. standards from the National Board for Professional Teacher Standards are voluntary economy-wide standards for teachers to demonstrate that they are Board certified. Students of teachers meeting these standards show above average learning gains in rigorous evaluations.
• The teacher on-going professional improvement standard recognizes that the development of teacher knowledge and skills is ongoing and needs to respond to ever-changing knowledge, new pedagogical research, and classroom environments. (Harris & Sass, 2007).

• The commitment to the profession and the community standard recognizes that teachers’ sphere of influence extends beyond classroom instruction. Teachers should be active professional participants in achieving school-wide quality through mentoring and professional collaboration. They also should be supportive of the larger school community of parents and sensitive to student and community culture.

However, the analyses of the three sets of standards suggest that the current standards would benefit from two additions. One, the notion of “Teacher values and identity” is not clear from the above 5 standards. A teacher’s work cannot be divorced from his/her “self” as a model for their students, especially important in the East. Second, the standards need to more explicitly recognize that for the 21st Century teacher, technology and globalization are likely to bring about a fundamental restructuring of how teaching occurs in the same way they have altered workplace processes.

For example, two technology innovations are pre-saging future changes in the fundamental delivery of instruction:

• Open Education Resources. “The confluence of the Web and a spirit of sharing intellectual property have fueled a worldwide movement to make knowledge and education materials open to all for use” (Smith, 2009). A prime example is the Khan Academy (http://www.khanacademy.org/), a nonprofit organization that has built a free, online collection of thousands of digital lessons (nearly 3,000 of them created by Mr. Khan himself) with more than 1 million viewers a day and exercises in subjects ranging from algebra to microeconomics. It seeks to create the “flipped classroom. As Salman Kahn states it:

“I'm not sure of the timeline, but the classic teacher in front of the room at a chalkboard lecturing while you have 20 to 35 students at their desks taking notes—I think that model will soon go away. I think that's going to be kind of blown away in favor of a model where every student is working at their own pace and the teacher now has a much higher-value role as someone who is diagnosing students' weaknesses, who is mentoring students both on the academic material, but also mentoring students on becoming good teachers of their peers.”

• E-book revolution. Accompanying the rapid growth of on-demand video tutorials, the e-textbook revolution is growing rapidly throughout the APEC region and especially in Korea, which is undertaking a major pilot program that may lead to universal adoption. The potential education advantages of e-books include they are interactive,
updatable, individualized, and in-depth content pathways. Apple announced iBooks and in just three days, one-third of a million e-books were sold. Major international textbooks publishers of Houghton Mifflin Harcourt, McGraw-Hill and Pearson will deliver education titles typically for under $15.00 U.S. dollars, far less than the cost of typical textbooks. iBooks “Author” is a free Apple application enabling educators from around the world to create and publish textbooks without specialized and expensive electronic publishing packages.

Although there has not been sufficient time for careful evaluations of online learning videos and e-textbooks at the primary and secondary level, the U.S. Department of Education recently completed a careful meta-analysis of college level of online learning (U.S. Department of Education, 2010). The study found that overall, “Students who took all or part of their class online performed better, on average, than those taking the same course through traditional face-to-face instruction. Instruction combining online and face-to-face elements had a larger advantage relative to purely face-to-face instruction than did purely online instruction.”

Within the APEC project area, the U.S.-China E-Language Project: A Study of a Gaming Approach to English Language Learning for Middle School Students (Green, et. al., 2011) found statistically significant positive results of using the intervention for the lower performing students along with the positive effects on student motivation.”

Despite its considerable potential benefits, care is necessary in introducing digital media including electronic textbooks to ensure that there are not unintended harmful effects from excessive technology. Korea, a leader among APEC Economies in the electronic learning revolution and the ICT/Innovation priority area leader for this Ministerial Meeting, is finding that students may have become excessively addicted to electronic media (The Washington Post, March 24, 2012).

Similarly, a concern in Singapore is the Pathological Video-Gaming among Singaporean Youth (Choo, et.al.,2010). For example, the socio-cognitive-psychological impacts of ICT-driven classrooms are still not clear; e.g., does playing with science simulated experiments have similar effects on scientific inquiry compared to carrying out real experiments? Hence, there should be a careful cost-benefit analysis of widespread use of IT, I believe that Thailand has abandoned the plan to give every pupil free computer?

Finally, it should be noted that at least in Australia, ICT standards are being developed to highlight the minimal ICT competence of graduating teachers in much the same way as literacy and numeracy high stakes testing and standards detail minimal achievement of students. In the case of ICT standards for graduating teachers, what can be expected of graduating teachers is also tempered by the fact that assessment practices throughout the world remain fairly traditional with pen and pencil examinations and tests still holding a prominent place in system-wide assessment practices. The ideal of integration of domesite teacher standards, with their emphasis on developing professional teaching expertise, and ICT standards at this stage appears to be still an ideal as long as such a disconnect remains.
IIIb. Key Research: Recruiting and Preparing Teachers to Meet the Challenges of a 21st Century Education

This section builds on preliminary findings from the APEC study on the Quality of Teacher Preparation in Secondary Math and Science for China, New Zealand, Russian Federation, Singapore and U.S. to:

- Describe essential characteristics of teacher preparation programs in APEC economies.
- Identify promising strategies for promoting high levels of content knowledge and pedagogical content knowledge for teachers of secondary math and science in particular economies contexts.

The teacher preparation data focus on mathematics, but they illustrate the general choices and characteristics of teacher preparation programs

**Essential Characteristics of Secondary Teacher Preparation Programs**

*Recruiting Entrants into Teaching.* Recruiting teachers from the top portion of each high school graduating class (Exhibit 1) is an accepted goal of high-performing education systems to achieve a quality teaching force (McKinsey, 2007). Selectivity will depend upon both the size and nature of the applicant pool and university entrance requirements.

APEC members vary considerably in the class rank of their teachers. Korea draws from the top 5 percent, Singapore and Hong Kong China the top 30 percent (McKinsey, 2007). U.S. data indicate that only about half those teaching were in the top 30 percent of their high school graduating class and about one-third were drawn from students in the bottom half of their high school class (Manski, 1987). Moreover, U.S. data also indicate

Different factors account for the greater selectivity of some education systems. Data from Korea, Singapore and Hong Kong China show that their teachers are paid considerably more relative to their per capita income than are U.S. teachers. However, research suggests that raising salaries even by 10 percent would cost the U.S. almost $30 billion, but could possibly raise teacher entrants to the average of all college graduates provided it was coupled with a commensurate raising of the entry-level bar for new teachers (Manski, 1987).

The research across APEC suggests several other strategies other than raising salaries and entry requirements to the profession for improving the quality of entrants into teaching preparation programs and classroom teaching.

- **Compensate teacher preparation entrants for tuition and living expenses.** All Singapore student teachers are employed and paid a salary while being enrolled in their pre-service program. East China Normal University (ECNU) did not offer such incentive payments to students. In contrast, students registered in pre-service program

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6 Digest of Education Statistics: 2010, Table 188.
are free of tuition fee during their undergraduate studying period, which is applicable for some universities, including ECNU.

- **Encourage substantive majors rather than majors in education program areas.** U.S. data on the widely used Scholastic Aptitude Test (SAT) college entrance exam (see Exhibit 5) show that SAT scores of prospective teachers who pass exams in science or mathematics considerably exceed the SAT score for all college graduates. In contrast, prospective teachers with elementary, special education, and physical education specialties have SAT scores considerable below the college average. This suggests seeking out more teachers of math and science who pass rigorous math and science specialty teacher exams.

- **Provide the support systems for success** as is done in the Boston Teacher Residency program that recruits high-performing students with undergraduate majors from prestigious Eastern colleges, has the recruits teach a full year in the Boston school system supervised by an experienced mentor, and provides tuition and living expenses while they are pursuing a master’s degree in education for certification (http://www.bostonteacherresidency.org/).

- **Encourage advanced coursetaking in teacher preparation programs.** Future teacher course-taking patterns during preparation (Exhibit 6) are characterized by a number of different types of courses including courses required for all majors in a discipline, additional discipline courses required of education majors in that discipline, teacher education courses, practicum, and general education courses.

- **Provide more career pathways.** Many teachers want to stay in the teaching profession but they would like options or areas of expertise. In many Economies, teacher pathways as a mentor teacher, research teacher, or master teacher are offered that allow individuals to contribute as teacher experts to the profession.

- **Raise the prestige of the profession.** In many of the Asian member Economies, teachers’ prestige (and salary) is commensurate with those of other professions like lawyers, engineers, and doctors.

Some clear differences emerge in patterns of secondary mathematics teacher preparation courses across the various Economy institutions participating in the quality teacher preparation project (Exhibit 7).

- East China Normal University (ECNU) students’ course-taking patterns resemble those of general majors in mathematics, as ECNU focuses on ensuring solid understanding of mathematics. Consequently, ECNU students receive less teacher
education and practicum exposure, as this training is provided once students start teaching.

- Waikato, a graduate program in New Zealand, *emphasizes teacher education courses and practicum*. Considerable teacher preparation time is spent in the practicum to expose students to actual classroom instruction. This program is consistent with a graduate teacher program, as students already have an undergraduate subject major.

- The U.S., Russian Federation and Singapore institutions participating in the project represent balanced approaches to content and pedagogy offerings. However, the Russian Institute, unlike Singapore and the U.S. institutions in the study, stresses only learning at the postsecondary institution and does not typically include practical field experience.

**Exemplary Practices in Learning How to Teach Math or Science Content**

APEC’s case study work through the *Quality of Teacher Preparation in Secondary Math and Science* project is designed to improve teacher preparation programs within each economy by learning from diverse “exemplary practices from the other economies.” The initial case study reports are completed by Australia, China, New Zealand, Russian Federation, Singapore, Thailand, and US, which cover three important areas: (1) teaching content and pedagogy, (2) teaching gifted students, and (3) strengthening collaboration between schools and teacher education institutes (Exhibit A-1 in the Appendix).

**Exemplary Area 1. Teaching Content and Pedagogy**: There is tremendous interest among teacher education institutes in learning how to design courses that combine content knowledge and pedagogy for two main reasons: to deepen the content knowledge of the future teachers in the specific domain and to link this knowledge with their future work as teachers. In other words, a quality teacher must know both subject area content and how to teach it.

The following four approaches recognize that mathematics teachers need a firm grounding in both content and pedagogy:

- *Three categories of Teacher Knowledge* (Thailand) explicitly recognizes that mathematics teachers need exposure to math content knowledge, mathematical pedagogical content knowledge, and general pedagogical knowledge through separate pre-service courses in each area. It has included lesson study, which includes collaboratively planning, doing and seeing within an open approach to help future teachers develop the skills to conduct problem-solving lessons on their own.

- “*Secondary Math for Teachers*” (U.S.) is relatively unique in offering prospective math teachers with courses integrating content and pedagogy, thus bridging the historical separation of secondary teachers learning content from courses in the mathematics departments and pedagogy from courses which are typically controlled by the education faculty. Future teachers in these courses simultaneously learn the content and strategies for teaching the content to others.

- *MED advance Math Education concepts* (China) exposes novice teachers during their first years of teaching to mainly mathematics education, education research, and thesis writing. This reinforces the mathematics content knowledge that has already
been well established at the bachelor degree level.

- *Teachers as Learners* (Australia) provides a theoretical framework and a set of tools (portfolio and learning logs) that future chemistry teachers can use to reflect on their own teaching problems and to challenge prior learning experiences. Through this process, they build knowledge bases and skills and examine their attitudes and values as chemistry teachers. Using the same framework, both the chemistry teacher educators and future teachers become co-learners.

These three case studies represent different routes to achieving rich understanding of content, pedagogical content, and pedagogy. Research on the relative effectiveness of the different approaches applied in different education settings would be informative.

**Exemplary Area 2. Supervising Gifted Students:** Gifted students can help prospective teacher’s development.

- *College math majors train secondary gifted students (Russian Federation).* Potential future teachers who are undergraduate students in the math department at Moscow State University develop pedagogy by supervising several gifted students in the schools, thus learning about the psychology of these students. The potential future teachers in turn are supervised by experienced math teachers and they have an opportunity to explore teaching and become teachers.

**Exemplary Area 3. Strengthening collaboration between schools and teacher education institutes:** When future teachers are able to spend a considerable time in schools under the joint supervision of school mentors and teacher education institutes, they are likely to see the relevance of their training, as well as to appreciate the theory-practice link. In addition to the Russian case above, several other exemplary cases recognize the need for continued learning and linkages between school and teacher education institutions.

- *Induction and mentoring as an essential component of teacher education (New Zealand).* The New Zealand Teacher Education System is unique in that teacher education includes the first two years of teaching. Every graduate from teacher education programs is provisionally registered and expected to complete a two-year educative induction and mentoring program supervised by experienced, registered teachers. Thus, the New Zealand approach is able to extensively valuate the quality of a future teacher in the classroom prior to approval for graduation and teaching.

- *The Math Education (MED, China)* mentioned above is distinctive among the case studies in that graduating teachers remain connected with their teacher education institutions through a combination of integrated distance learning and face-to-face training. These combined delivery modes enable access to teachers even in more geographically isolated rural China schools.

- *School-based mentoring of pre-service junior college/high school chemistry teachers on Paper-and-Pen Assessment (P&PA) competencies (Singapore).* This case employs just-in-time learning to enable future teachers to understand and apply the theory of assessment by preparing a test package for assessing Chemistry students at the end of their Year 1 at the JC (Grade 11 equivalent). Typically, future teachers have little real
opportunity to apply sound and practical assessment strategies through assessments that they have developed themselves.

Both the China and New Zealand cases stress the importance of novice teachers conducting research about their own practices in schools, and evidence from these two on-going programs will be of immense interest to other economies.

**III c. Key Research: Evaluating Student Teachers and Teacher Preparation**

Evaluation of the quality of student teachers and the quality teacher preparation programs are an essential component to systemically improve the quality of teacher preparation. This section examines two questions about the nature of evaluating the quality of teacher preparation across APEC members.

- What potential modes of assessment do teacher preparation institutions employ to evaluate the quality of individual future teachers’ knowledge, skills and values?
- What are different strategies for evaluating the quality of teacher preparation programs?

**Evaluating Future Teachers in Teacher Preparation Programs**

Assessing the quality of future teachers in teacher preparation programs is challenging because it is important to accurately assess what students know with respect to subject content and pedagogy as well as their ability to apply what they know in classroom settings. Exhibit 8 examines the modes of assessment of future secondary math teachers used by the teacher preparation institutions participating in APEC’s teacher preparation project, *The Quality of Teacher Preparation in Math and Science.*

The menu of potential modes for assessing future teachers in teacher preparation programs is quite extensive. They include traditional paper and pen exams, group work and participation, analyses of portfolios and journals, and observations. Interestingly, there is quite a difference in the emphasis among Economies in modes of assessment.

- The participating Russian institution takes a very traditional route to assess future teachers through written exams and thesis writing.
- The participating New Zealand University is at the other end of the assessment spectrum and uses only the authentic assessment of Lesson Plans and work samples.
- The modes of assessment employed by the participating institutions in China, Singapore and US are more varied. China’s institutions combine written exams with lesson analyses. Participating Singapore and the U.S. institutions use the full array of assessment approaches.

Future APEC work examining the relative advantages of these different assessment approaches would be useful information for teacher preparation institutions.

**Evaluating Teacher Preparation Programs**
Evaluation of a teacher preparation program requires a common evaluation instrument across students in that program. If the instrument is common across teacher preparation institutions then institutions can be compared with respect to the quality of their graduates. If the instrument is common internationally then evaluations can compare teacher preparation programs internationally across different education systems.

The APEC teacher quality project is developing a written assessment of the math/science content knowledge and pedagogical content knowledge of secondary future math/science teachers. This approach builds on the international Teacher Education Study in Mathematics (TEDS-M) conducted for primary and middle school teachers (Center for Research in Mathematics and Science Education, 2010).

Exhibit 9 illustrates some useful results from the TEDS-M assessment of future middle-school teachers’ content knowledge and pedagogical content knowledge. The teachers from the three top scoring Economies are the APEC Economies of Chinese Taipei, Russian Federation and Singapore. U.S. scores are statistically below the top-performing group on both math content knowledge and pedagogical content knowledge.

Looking to the possible future of teacher assessment, U.S. research and the U.S. Department of Education are supporting a new line of accountability that argues that the effectiveness of teacher preparation is best measured by taking into account the amount of student learning that takes place in classrooms taught by these teachers. Student learning is measured in the U.S. by using longitudinal data on student outcomes on state test scores (Exhibit 10).

Exhibit 10. Value-Added Approach

The value-added teacher calculations are based on the statistical model approach that compares the actual scores of a teacher’s students with the predicted scores based on initial scores, controlling for factors that can influence student achievement but that are outside of a teacher’s control. The value-added results for individual teachers who have completed teacher preparation are then aggregated and yield an institutional value-added rating. Exhibit 11 presents results of value-added calculations for mathematics by teacher preparation institution within the State of Washington in the U.S.

Although these value-added measures serve as measure for holding institutions accountable for student learning, they also can guide teacher development plans to support continuous
Moving To a Comprehensive Teacher Evaluation System

A comprehensive system could use evaluation evidence at three stages to: (1) encourage academically capable students to enter teacher preparation; (2) evaluate potential teachers while in education school prior to entering teaching; and (3) systematically evaluate the quality of current teachers tied to incentives and corrective professional development.

The Chilean teacher assessment system is an example within APEC of all three elements (Chamizo Álvarez, Eliana. 2012). First, to make the teaching profession attractive to the more academically able, an incentive payment is tied to a student’s test score for higher education entrance. Students entering teacher preparation who achieve a very high score receive a tuition scholarship plus a monthly stipend. Students who achieve a lower but still good score receive only the tuition scholarship and no bonus. Receipt of the incentive is tied to 3-years teaching.

Second, students who are graduates of teacher preparation schools take a test of knowledge and pedagogy, INICIA. This INICIA Test is an evaluation that assess graduate’s knowledge about education, pedagogy and didactics. Also, it evaluates basic competencies on written communication and the use of Information and Communication Technologies, ICTs. The results allow higher education institutions to have an external benchmark and be able to monitor their advances on the processes of continuous improvement. Graduating students can identify the areas where they will have to work on future professional development work.

Third, the Chilean teacher evaluation aims to be a formative process (Exhibit 12). Teachers in the two lowest categories (Unsatisfactory and Basic) are offered remedial professional training to overcome weaknesses identified during the evaluation. If they fail after the third time they are dismissed. Teachers with good results (Competent and Outstanding) are eligible for a variable individual bonus and evaluation results enter into career ladder decisions.
IV. New Directions: Summary of Potential Projects to Support a Quality Teacher in Every APEC Classroom

Potential Overarching Teacher Quality Project

i. APEC Open-Education Resources on Teacher Quality would bring together in one electronic portal all EDNET proposed teacher quality projects and products (See Exhibit 13. The portal covers the project areas of Economic Profiles, Teacher Standards, Teacher Preparation, Teacher In-Service Development and Teacher Evaluation. It will provide access to key policy documents, curricula descriptions, best practices and videos that represent good teaching in each Economy.

Potential Project on Economic Profiles: Preparing a 21st Century Workforce

ii. EDNET collaborates with Labour and Social Protection Network (LSPN) to jointly monitor the education and workplace factors that affect labor productivity in economically developed and developing economies. This project would follow-on the labor productivity analyses developed at the New Zealand 2007 conference on high-performance workplaces.

Potential Project on Standards for High Quality Teachers

ii. Collect, monitor and place on the teacher portal, the teacher standards from across the APEC region. Conduct studies to document trends in the standards to respond to 21st Century changes in the workplace and in the delivery of education within a technological environment. This teacher standards-gathering activity would build on EDNET’s successful work in collecting math and science content standards across APEC Economies and making them internationally available on the APEC Wiki.
### Key Questions

- **ECONOMY PROFILES**: What are key workplace and skill requirements? What are key characteristics of Economy education systems as it applies to teachers (avg. salaries)?
- **ECONOMY TEACHER STANDARDS**: What are commonalities and differences across Economies' teacher standards? How do standards address 21st-century challenges (math/science for all, use of technology, real-world issues)?
- **TEACHER PREPARATION**: What are the teacher preparation institution's objectives? What is the students' course preparation to meet these objectives?
- **TEACHER IN-SERVICE DEVELOPMENT**: What are characters of effective induction programs? What are effective professional development strategies?
- **TEACHER EVALUATION**: What are effective evaluation designs to assess competencies (including assessing teacher knowledge)? What are effective procedures for evaluating students in terms of test scores & other student outcomes?

### Type of Information

- APEC ECONOMY
- STATISTICS
- INSTITUTIONAL SURVEYS
- BEST PRACTICES
- VIDEOS/ARTIFACTS

### Potential Projects in Teacher Preparation

These projects would build on the current curriculum and case study work in math and science:

- **iv. Exemplary Case Studies in Teacher Preparation.** This activity builds on the current work of the Quality of Teacher Preparation Study by collecting promising practices in teacher preparation across the APEC region. These practices would be evidence-based with documentation as to why the practices were exemplary and effective.

- **v. Virtual teacher training including videos of best Economy practice.** Extend China’s case study involving virtual professional learning by having Economies provide video examples of exemplary teaching in different subjects and grades. Accompanying each video would be a statement about what features make the teaching exemplary.

### Potential Project for Teacher In-Service Development

- **vi. Identify exemplary induction practices for new teacher education graduates.** This study builds on the New Zealand case study linking teacher preparation with teacher induction and the 1998 APEC Survey on Teacher Induction across APEC. A focus is on describing high-quality teacher induction, as research is suggesting that induction for new teachers will not improve teacher retention or teacher quality if the induction is also not of high-quality.
Potential Project for Evaluating Teacher Preparation Programs and Teachers

vii. Effective practices in designing different modes of assessment to evaluate teacher preparation programs and teachers. Collect evidence from case studies and evaluations to identify good practices for evaluating teachers based on (1) teacher competencies and (2) student outcomes and for tying teacher evaluation results formatively to improve teacher quality.
References


Digest of Education Statistics: 2010, Table 188. National Center for Education Statistics


Hill, H.C., Rowan, B., Loewenberg Ball, D., "Effects of teachers' mathematical knowledge for


Appendix 1

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

Recognizing the importance of mathematics and science competency for global competitiveness, this APEC project is studying the quality of mathematics and science teacher preparation in APEC economies. Its aims are to identify best practices and develop new models for the improvement of teacher quality and corresponding student outcomes. This is the first phase of an anticipated large study that will consider how teacher preparation impacts practice and how teaching practices affect student outcomes. The study will bridge the experiences of the East and West and enable mutual learning from diverse approaches.

Currently representatives from governments and leading educational organizations in Australia, Chile, China, Hong Kong China, New Zealand, Russian Federation, Singapore, Thailand, the United States, and other APEC economies are participating in the project. A project Executive Committee coordinates the integration of the research from participating economies. Each economy funds and conducts research on its own teacher preparation system.

The study will produce: profiles of each economy’s teacher preparation system, including the scope, sequence, and depth of content and pedagogical training provided in the program; beginning teachers’ content and pedagogical knowledge; and in-service opportunities for teachers. The project will also develop a common research protocol to enable valid comparisons of elements in economies’ respective teacher preparation systems.

A comparative analysis of teacher preparation systems, along with the educational outcomes in each economy, will provide a knowledge base from which economies can adapt interventions and assess their effectiveness. In addition to annual reports, final outcomes and corresponding recommendations will be presented in the APEC economies at the ministerial level in order to promote effective policies and practices.

Appendix 2
A Quality Teacher in Every APEC Classroom

Presentation by
Maureen McLaughlin
Director of International Affairs
Office of the Secretary
U.S. Department of Education
May 21, 2012

APEC Teacher Quality Work: Outline of Presentation

• Context
• Strategy
  – Teacher Standards
  – Recruiting and Preparing Teachers
  – Evaluating Teachers
• Complementary Learning: International Summit on the Teaching Profession
• Future Work
• Discussion Questions
Quality of Teacher Preparation Project Design
Economy Lead: United States

Project Executive
C. Davis: Columbia, USA
A. Jones: Waikato, NZ
S.K. Lee: NIE, Sing

Project Topics

Teach Prep. Cur
B. Xu
E. China Normal
Assessment*
J. Star
Harvard
Best Pract.
K. Y. Wong
NIE

Profess/Stand:
A. Porter
U. Penn

Australia
China
Hong Kong
Russia
Singapore
Thailand
USA

Context for APEC Teacher Quality Project

*Assessment has a math subgroup with Alexander Karp, Columbia and a science subgroup D. Corrigan, Monash & B. Cooper, Waikato
Having a Good Teacher Increases Students’ Earnings

![Graph showing the relationship between teacher value-added and student earnings.](image)


The Pace of Innovation Requires Preparing Students Who Learn How To Learn...

![Graph showing the increase in information and data volume over time.](image)

Source: Singapore Education Minister Heng, Presentation before the Center for Strategic International Studies, Feb. 2012.
And Therefore Teachers Who Teach Differently

Strategy for APEC Teacher Quality Project
Why APEC?
Opportunities to Learn and Improve

• Many high-performing education systems are in APEC economies.
• Range of reforms and good practice. For example:
  – Korea – recruit from top 5 percent
  – Japan – lesson study
  – Shanghai, China – pair weak and strong schools
  – Hong Kong, China – comprehensive reform and implementation
  – Singapore – career ladders
  – New Zealand – Education Review Office
  – Australia – My School database
  – Ontario, Canada – Leadership Framework

APEC Teacher Quality Strategy Responds to 21st Century Workplace & Skills
Teacher Standards

5 Common Attributes of APEC Economy Quality Teacher Standards

- Learner Centered
- Knowledge
- Commitment to the Profession & Community
- On-going Improvement
- Pedagogical Skills
- 21st Century ICT Classroom
- Missing Standard
- Internet Addiction
Recruiting and Preparing Teachers

Rigorous Selection of Candidates Into Teacher Education
- Top one-third, or higher, of class
- Free tuition
- Stipend while in school
- Complete Coursework

Easy-entry Into Teacher Education and Weeding-Out Candidates Prior To Teaching
- Regular post secondary institution entrance requirements
- Complete coursework
- Pass licensing exam
Comparison of Teacher Salaries in Seven APEC Economies

Ratio of salaries after 15 years of experience/minimum training to GDP per capita, 2009. Source: OECD (2011)

Non-Salary-Based Strategies for Attracting Quality Entrants into Teaching

- Compensate teacher preparation entrants for tuition and living expenses.
- Encourage substantive majors rather than majors in education program areas.
- Provide the support systems for success
- Encourage advanced coursetaking in teacher preparation programs.
- Provide more career pathways
- Raise the prestige of the profession.
Evaluating Teachers

Components of Teacher Evaluation Systems

Evaluating Teacher’s Competencies

- Range of approaches, including exams, group work and participation, analyses of portfolios and journals, and observations by peers and school leaders.

Evaluating Teacher’s Value-added

- Methodology involves assessing students of teachers
Case Study: Teacher Evaluation In Chile

The Chilean comprehensive evaluation system uses evaluation evidence at three stages to:

• encourage academically capable students to enter teacher preparation;
• evaluate potential teachers while in education school prior to entering teaching;
• systematically evaluate the quality of current teachers tied to incentives and corrective professional development.

Complementary Learning: International Summit on the Teaching Profession
International Summit on the Teaching Profession

• Secretary Arne Duncan hosted the first-ever International Summit on the Teaching Profession in 2011 with OECD and Education International

• Ministers, leaders of teacher unions, and other accomplished educators from high-performing and rapidly improving education systems
  – 16 economies in 2011; 23 economies in 2012

• Nine APEC economies at the 2012 summit: Canada, China, Hong Kong China, Indonesia, Japan, Korea, New Zealand, Singapore, and the United States
Impact of 2011 Summit on U.S. Teacher Policy

• “Last year's Summit, and the lessons learned from the practices of high-performing systems, has already had a big impact on our thinking in the United States.” -- U.S. Secretary of Education Arne Duncan, March 2012

• Lessons incorporated into a new initiative to elevate the teaching profession: RESPECT
RESPECT: Elevating the Teaching Profession in the U.S.

RESPECT: Recognizing Educational Success, Professional Excellence, and Collaborative Teaching – $5 billion request and dialogue with teachers

- Attract talented teacher and principal candidates and preparing them to succeed
- Build new career ladders with competitive compensation
- Strengthen evaluation and professional development
- Create school conditions that support effective teaching, such as time for collaboration
- Get the best educators to the students who need them most

2012 International Summit on the Teaching Profession

- Preparing Teachers and Developing School Leaders
  - Examine how to improve teacher preparation and the development of school leaders to provide students with 21st century skills.
- Asia Society Report summarizing the lessons leaned from the 2012 Summit will be available shortly (see ED’s website).
- U.S. partners agreed to develop a set of principles for the teaching profession.
Future APEC Work on Teacher Quality

Best Practice Case Studies on Teacher Quality*

<table>
<thead>
<tr>
<th>Recruitment &amp; Retention, Career Pathways</th>
<th>Teacher Preparation, Induction &amp; Professional Development</th>
<th>Teacher Evaluation</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Relationship between salaries and secondary class rank*</td>
<td>• Teaching content &amp; pedagogy</td>
<td>• Evaluating teacher practice based on teacher competencies</td>
</tr>
<tr>
<td>• Compare screening applicants before Education school acceptance versus licensing exam afterwards*</td>
<td>• Teaching gifted</td>
<td>- Assessing future teacher knowledge</td>
</tr>
<tr>
<td>• Nontraditional routes into teaching (Teacher residency programs)*</td>
<td>• Collaboration between schools &amp; teachers</td>
<td>• Value-added measures of teacher’s students*</td>
</tr>
<tr>
<td></td>
<td>- Induction &amp; mentoring part of teacher education</td>
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<td></td>
<td>- Math education of novice teachers using distance learning</td>
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<tr>
<td></td>
<td>- Paper &amp; pen assessment applied real-time in school</td>
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<tr>
<td></td>
<td>• Preparing teachers for ICT 21st Century classrooms*</td>
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</tbody>
</table>

*Suggested new case studies.
Teacher Quality Portal: Ongoing Knowledge Development in APEC

Authentic Documents
- Economy Teacher policies
- Relative Salaries
- Teacher Standards
- Teacher Education Curriculum
- Criteria for Teacher Evaluation

Best Practices
- Innovative teacher preparation
- Impacts of ICT on the classroom
- Videos of great teachers
- Teachers Effectively involve parents and the community

Discussion Questions
Discussion Questions

• How can Economies create a system with the conditions *optimal to recruiting and retaining effective teachers*?

• How Economies *prepare and provide ongoing development for teachers in a 21st Century classroom environment*?

Discussion Questions (Con’t)

• How can Economies *balance teacher preparation* that teaches content and pedagogical-content knowledge with the need for future teachers to have supported, practical classroom experiences?

• How can Economies *evaluate teachers’ effectiveness fairly and accurately* in a balanced way examining teacher performance and value-added evaluations of the learning outcomes of a teacher’s students?
Thank you!

A Quality Teacher in Every APEC Classroom

Presentation by
Maureen McLaughlin
Director of International Affairs
Office of the Secretary
U.S. Department of Education
May 21, 2012