出國報告（出國類別：國際會議）

參加「第 5 屆 APEC 教育部長會議」

出國報告

服務機關：教育部、外交部

姓名職稱：蔣偉寧　教育部部長

林文通　教育部國際文教處處長

翁勤瑛　教育部國際文教處科長

魯維廉　教育部國際文教處主事

林亨通　外交部國際組織司一等秘書回部辦事

派赴國家：韓國

報告日期：101 年 6 月 11 日

出國期間：101 年 5 月 20 日 至 5 月 24 日

摘　要

一、　第 5 屆 APEC 教育部長會議於本(101)年 5 月 21 日至 23 日在韓國慶州市舉行，本次會議計有來自美、俄、日、韓、星、泰、澳、紐、馬、印、墨及觀察員烏克蘭等共 22 個會員經濟體 (Economies) 教育部部長和代表團、國際機構人士以及教育專家等 500 多人參與。我國教育部蔣偉寧部長應邀出席並率同國際文教處林文通處長、翁勤瑛科長、魯維廉主事、外交部林亨通一等秘書以及我國駐韓梁英斌代表及教育部駐韓國文化組曹培林文化參事等人共同與會。這是繼本年 2 月 5 日至 10 日我方出席第 3 次 APEC 教育部長會議會前研討會暨第 34 屆 APEC 人力資源發展工作小組(HRDWG)會議之後，再次派遣高階教育官員參與 APEC 盛事。

二、　第 5 屆 APEC 教育部長會議主題爲「未來挑戰與教育因應：促進教育全球化、革新與合作(Future Challenges and Educational Responses: Fostering Global, Innovative, and Cooperative Education)」，在 3 大子題下又可分爲 4 個優先領域和 1 個獨立子題：數學、科學、語言及文化教育(主導國爲俄羅斯和祕魯)；技職教育與訓練及高等教育品質(主導國爲中國大陸和菲律賓)；ICT 在教育上的運用(主導國爲韓國和越南)；改善教師素質(主導國爲美國和智利)；獨立子題爲教育合作(主導國爲韓國)。

三、　在第 5 屆 APEC 教育部長會議正式會議上：

(1)　數學、科學、語言及文化教育(主導國爲俄羅斯和祕魯)：俄羅斯一些提出數學和科學教育發展的新方向與建議，如建立有助於 APEC 經濟體教育合作的開放環境─APEC 數學評估項目資料庫(APEC Math Assessment Item Bank)、建立數學和科學內容標準及實踐策略的資料庫等；祕魯則提出語言及文化教育發展的新方向與建議，如研究外語學習及文化理解的對個人及社群的經濟效益；對融合指導技術創新之實踐模式課程的支持等。

(2)　技職教育與訓練及高等教育品質(主導國爲中國大陸和菲律賓)：中國大陸提出技職教育與高等教育發展的新方向與建議，如改善終身技職教育體系的內容及傳遞、所有經濟體均應設立合作平臺機制以肯定高等教育品質的重要性等。

(3)　資通訊科技(ICT)在教育上的運用(主導國爲韓國和越南)：韓國提出 ICT 在教育上運用的新方向與建議，如提供 APEC 有關 ICT 的開放教育資源(OER)、推行全國性的教育 ICT 計畫、擬定 ICT 標準與訓練課程等。

(4)　改善教師素質(主導國爲美國和智利)：美國提出改善教師素質的新方向與建議，如提供 APEC 有關教育素質的開放教育資源(OER)、擬定有關教育素質的標準、收集師資培訓的

成功案例等。

(5) 子題爲教育合作(主導國爲韓國)：韓國認爲教育合作成爲獨立子題的重要性反映在兩方面：可檢視 APEC 各經濟體不同的教育合作類型；有助於提昇歷屆 APEC 教育部長會議優先領域結論落實的可行性；美國另報告「APEC Wiki」，從資源共享的觀點強調教育合作。

四、 我國教育部代表團團長蔣部長偉寧在會上三度發言，分享我國設立產業碩士專班的成功經驗；另提及我國目前正在規劃數位教育先導計畫，並允許開辦數位學習碩士在職專班。在國際合作方面，蔣部長分享我國踴躍參與 WTO 並適度放寬教育服務業相關法規、設立中華臺北教育中心，以及提供中華臺北及華語文獎學金等舉措，以加強國際教育合作的成功經驗。蔣部長同時建議適度修正教育部長聯合聲明草案的部份內容，是所有各與會經濟體教育部長及代表中發言最爲踴躍積極者，並獲其他經濟體讚許。

五、 第 5 屆 APEC 教育部長會議聯合聲明結論肯定 APEC 經濟體們與其他國際組織(如 OECD、World Bank、UNESCO 等) 在教育合作方面所做的努力，也肯定 EDNET 透過 APEC Wiki 和 ALCoB 網路建構和分享知識以研擬出 AEMM4 優先領域議題的舉措。韓國提出「教育合作」自籌資金研究計畫案(ECP)，同時宣布「教育合作行動計畫」，打算在未來四年內完成「APEC 教育合作策略」報告並透過 EDNET 提交給第 6 屆 APEC 教育部長會議討論；該研究計畫案也會在美國主導的 APEC Wiki 知識庫上面設立入口網站，以連結相關研究資源。韓方把本計畫案稱爲「慶州倡議」，並認爲此爲本次 AEMM5 的重要特色及成果之一。另外聯合聲明中也強調未來教育合作應同時包括資訊交流及合作實例，以同「莫斯科倡議」(主張加強公私部門的合作)相符。

六、 在 APEC 教育部長惜別會(Ministerial Retreatment) 上，蔣部長建議每兩年舉辦一次教育部長圓桌會議，以加強交流，獲得與會各經濟體一致同意，並爲主辦單位列入會談紀錄。

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壹、目的

一、APEC 爲我國參加之重要國際組織之一，其中人力資源發展工作小組(HRDWG)下設教育發展分組(EDNET)由本部主政。「亞太經濟合作教育部長會議」(APEC Education Ministerial Meeting, AEMM)是在 1992 年由美國前總統布希在澳洲坎培拉所發起的，希望各會員體能藉此就共同關切的教育問題進行廣泛討論。本會議每 4 年召開乙次，共有來自美、加、澳、日等 21 個 APEC 會員經濟體教育部長共同與會。教育部自 1992 年開始由部次長率同文教處長等相關司處人員與會。本屆會議爲第 5 屆 APEC 教育部長會議，主題爲「未來挑戰與教育因應：促進教育全球化、創新與合作」，包含 3 子題(Sub-themes)－ 教育全球化、創新與合作 和 4 大優先領域(Priority Areas)－ 數學、科學、語言及文化教育、技職教育與訓練及高等教育品質、資通訊科技(ICT)在教育上的運用及改善教師素質。

二、我國除出席教育部長會議外，亦積極參與相關週邊活動(如「第 8 屆 APEC 未來教育論壇」、「經濟體教育展」等)，旨在提升國際知名度和曝光率，更可進一步拓展高等教育、資訊教育及技職教育跨國合作，並分享我國優質教育成果。

貳、出國行程及議程

5 月 20 日：

下午 13 時 10 分由教育部蔣部長率領之我方代表團在桃園國際機場搭乘復興航空 GE-706 號班機離臺赴韓國釜山，並於同日當地時間下午 16 時 20 分抵達釜山金海國際機場，在機場由駐韓國代表處梁英斌代表、駐釜山辦事處羅添宏處長與黃志勝組長，以及教育部派駐韓國代表處文化組曹培林參事、劉又瑋秘書與黃恆勝雇員接機，再搭乘 APEC 機場專車至會議所在之慶州現代酒店(Hotel Hyundai Gyeongju)，並完成註冊報到。

5 月 21 日：

下午蔣部長率我國代表團出席與韓方代表團舉行之雙邊會談。我方出席人員有蔣偉寧部長、駐韓國代表處梁英斌代表、國際文教處林文通處長、魯維廉主事、教育部駐韓國文化組曹培林文化參事、外交部林亨通一等秘書；韓方與會人員有教育部李周浩部長、政策輔佐官洪聖昌、教育資訊與統計局申翊鉉局長、國際合作策略組金日秀組長、國際合作局 E-Learning 課趙善學課長、國際合作局全球合作策略組事務官李柱憲及傳譯員陳實嬉等 7 員。雙方一致認爲人才培育爲今後教育政策的推動重點。韓方李周浩部長表示韓國相當羨慕臺灣中小企業的發展，並表示臺灣與韓國的共通點爲重視人才，雙方可針對網路學習及 E-Learning 方面詳談合作事宜。蔣部長則表示我方正研擬「人才培育資料庫」及「人才培育白皮書」，且刻正推動「數位學習國家型計畫」，並於小學做推廣實驗，而臺韓未來可針對華語文數位學習研商合作之道，並透過工作小組會議進行實務交流。李部長並致贈所編著「Positive Changes」一書。會談持續約半小時，氣氛融洽。

同日下午也進行 APEC 教育部長會議之暖身會議─工作小組會議。該會議開幕式由 HRDWG 主導成員(Lead Shepherd)韓籍金博士榮桓(Dr. YoungHwan Kim)、EDNET 國際協調人美籍 Ms. Adriana De Kanter、韓國教育發展學院(KEDI)金美淑(Mee Sook Kim)博士、韓國教育科學技術部國際合作處處長徐裕美博士，以及教育科學技術部企劃調整室室長高京模(Kyeong-Mo Koh)博士共同擔任主席。韓國聯邦教教育科學技術部企劃調整室室長高京模(Kyeong-Mo Koh)博士致開幕詞時表示本屆教育部長會議的主題爲「未來挑戰與教育因應：促進教育全球化、創新與合作(Future Challenges and Educational Responses: Fostering Global, Innovative, and Cooperative Education)」。爲了培養學生具備未來所需的技能與達到經濟永續發展，教育所扮演的角色必須被重新討論。在上述三大子題(教育全球化、創新與合作)引領下，我們將分析未來社會的挑戰

與尋求教育因應之道。

HRDWG 主導成員(Lead Shepherd)韓籍金博士榮桓(Dr. YoungHwan Kim)則指出本屆教育部長會議三大子題由各負責相關優先領域之主導經濟體發表總結報告、會後發表教育部長聯合聲明，並於本年 9 月假俄羅斯海參威所舉行之 APEC 會員經濟體領袖會議上由 HRDWG 代表提交給與會領袖們參考。EDNET 國際協調人美籍 Ms. Adriana De Kanter 則表示 4 大優先領域主導經濟體分別爲：數學、科學、語言及文化教育─俄羅斯、祕魯；技職教育與訓練及高等教育品質─中國大陸、菲律賓；ICT 在教育上的運用─韓國、越南；改善教師素質─美國、智利。韓國另外主導獨立子題「教育合作」。

爲突顯教育合作的重要性，韓國提出「教育合作」自籌資金研究計畫案(ECP)，同時宣布「教育合作行動計畫」，打算在未來四年內完成「APEC 教育合作策略」報告並透過 EDNET 提交給第 6 屆 APEC 教育部長會議討論；該研究計畫案也會在美國主導的 APEC Wiki 知識庫上面設立入口網站，以連結相關研究資源。韓國正積極尋求各會員經濟體對該研究計畫案的支持。我方先前已要求應將我國歷年參與 APEC 教育合作的成果(如本部委託銘傳大學於 2009 至 2010 年辦理「外語教學課堂研究」計畫案)列入本屆教育部長會議聯合宣言內容，並獲主席國及各會員經濟體採納。

5 月 22 日：

爲第 5 屆 APEC 教育部長會議開幕式暨全體大會。開幕式由主席國韓國教育科學技術部部長李周浩博士、俄羅斯聯邦教育科學部副部長 Sergey Ivanets、APEC 秘書處執行長 Muhamad Noor 共同擔任主席。韓國教育科學技術部部長李周浩博士致詞時指出，本屆教育部長會議將是韓國有史以來主辦過最大規模的教育部長會議，接著表示韓國已從援助接受者轉型爲享有可觀經濟成長的提供者，是教育扮演經濟成長關鍵角色的最佳範例(李部長並提到韓國政府針對未來教育推動的一些政策，如「智慧教育」倡議(Smart Education Initiative)、「世界級大學計劃」(World Class University Program)與「韓國腦力 21」（Brain Korea 21）等)，且將致力於作爲已開發與開發中會員經濟體之間的橋樑。韓國提議在本屆會議上將「教育合作」視爲個別議題探討，並認爲未來教育合作努力的方向應該由資訊交流轉變爲著重實際行動的方案。唯有如此，我們才能達到 APEC 擬定的教育目標與包容性成長 (Inclusive Growth)。

俄羅斯聯邦教育與科學部副部長 Sergey Ivanets 致詞時表示各經濟體均致力形塑一個知識爲本的革新經濟體，且尋求適切的因應之道以應付各種未來挑戰。現今各經濟體所面臨最重大

的挑戰是人類潛能，即缺乏高素質、受過高度訓練的人力以便因應所有未來挑戰；知識累積及發展最有效與先進的科技若沒有通曉如何將它們應用到實務上的專家協助便無意義，因此客觀情勢需要新的途徑來教育及發展人力資本，即全球化與合作的途徑，此與俄羅斯本年所提 APEC 2012 的優先議題密切相關。俄國提案加強在 APEC 會員經濟體間發展跨境教育機制，旨在結合眾人之力建構一個亞太高等教育共通空間。它著重於與 APEC 優先議題相關領域討論之研究生課程的教育研究與學術活動，是對所有參與者極有益處的。

APEC 秘書處執行長 Muhamad Noor 致詞時表示 1992 年在美國舉行之首屆 APEC 教育部長會議上成員們承認教育與經濟體的發展密切相關；在隨後於新加坡、智利及秘魯舉行之 APEC 教育部長會議均著重探討教育在 21 世紀所扮演的角色。與會部長們強調發展克服新興挑戰所需之下一世代的技能與能力。透過培育 APEC 巨大的人力資本已經成爲永續經濟復甦與成長的關鍵因素。就本屆會議的主題及子題而言，在「教育創新」方面，更妥善運用資通訊科技(ICT)以學習 21 世紀所需的高度技能，同時促進 APEC 區域內更多創新及包容性的成長。人力資源發展工作小組及教育發展分組透過 APEC Wiki 知識庫與 APEC 學習社群建立者(ALCoB)網路，以建構與分享知識。這些網路協助發展教育方面的優先領域，特別是數學與科學教育、職業教育與訓練，以及資訊與通訊訓練。所有 APEC 會員需要持續關注教育，以作爲促進區域經濟整合與繁榮的重要手段之一。

在各優先領域專題報告方面，優先領域 1—「數學、科學、語言及文化教育」(主導國爲俄羅斯和祕魯)：俄羅斯提出一些數學和科學教育發展的新方向與建議，如建立有助於 APEC 會員經濟體教育合作的開放環境—APEC 數學評估項目資料庫(APEC Math Assessment Item Bank)、建立數學和科學內容標準及實踐策略的資料庫、舉行會議來分享研究策略及實踐，以確保所有學生具備完整的數學與科學基礎，以及享有專業化發展的機會、建構發展 21 世界問題解決技能之數學與科學課程、改善數學與科學教師培訓素質與專業訓練等；祕魯則提出語言及文化教育發展的新方向與建議，如研究外語學習及文化理解對個人及社群的經濟效益；對融合指導技術創新之實踐模式課程的支持、全面檢視從幼稚園至大學之語言學習與文化教學方式與課程、提升 APEC Wiki 知識庫入口網站在語言學習與多文化教育方面的功能等。

優先領域 2—「技職教育與訓練及高等教育品質」(主導國爲中國大陸和菲律賓)：中國大陸與菲律賓提出技職教育與高等教育發展的新方向與建議，如改善高等及技職教育品質(如成立全國性的學歷認證架構、技職教育品質保證機制的建立、運用資通訊科技改善教學品質等)、改善終身技職教育體系的內容及傳遞(如生涯教育與諮詢、APEC 會員經濟體的教師與學生交流及合

作與相關資料收集、研究建立學歷承認的架構及方法等)、擬訂協議來定義在全球化、知識爲本的經濟體、包容性成長與高品質的高等教育脈絡下所謂的「高等教育品質」、所有經濟體均應設立合作平臺和機制以承認高等教育品質的重要性(如推廣 APEC 區域高等教育機構的能力建構計畫、透過個案研究提供改善高等教育品質的成功創新案例等)、建立定期對話與交流活動機制(如建立有關高等教育線上學習社群或特別網站、編輯 APEC 高等教育電子報、舉辦定期有關高等教育品質線上討論會等)等。

優先領域 3—「資通訊科技(ICT)在教育上的運用」(主導國爲韓國和越南)：韓國提到美國的「線上學習」機制、俄羅斯教育與科學部設立的聯邦 IT 教育資源中心(Federal Center of IT Educational Resources)、韓國的 ICT 大師計畫(ICT Master Plan)及成立 APEC 合作教育學院(IACE)等，並提出 ICT 在教育上運用的新方向與建議，如提供 APEC 有關 ICT 的開放教育資源 (OER)、推行全國性的教育 ICT 計畫、擬定 ICT 標準與訓練課程、成立 APEC 教育資訊支援中心、擬訂新興科技聯合研究議題、舉行 ICT 和 21 世紀技能專題研討會、ICT 高等教育程式化、研究 ICT 在人格養成教育上的運用等；香港則分享 ICT 運用在教育的發展現況，如建立課程爲本的學習與教學資源資料庫、額外補助學習實驗 E-learning 資源、開發 E-Learning 產業市場、透過學校推廣永續實踐 E-Learning 試驗計畫及 E-Textbook 市場開發計畫等。

優先領域 4—「改善教師素質」(主導國爲美國和智利)：美國和智利提出改善教師素質的新方向與建議，如提供 APEC 有關教育素質的開放教育資源 (OER)、擬定有關教師素質的標準、蒐集師資培訓的成功案例、提供虛擬教師訓練影片、教師在職培訓、教師與教育培訓計畫的評估等。

在獨立子題—「教育合作」 (主導國爲韓國)方面：韓國認爲教育合作成爲獨立子題的重要性反映在兩方面：可檢視 APEC 各經濟體不同的教育合作類型；有助於提昇歷屆 APEC 教育部長會議優先領域結論落實的可行性；再者，經濟挑戰、數位落差、全球金融危機、環境保護、永續成長等重大議題在在彰顯教育合作的重要性。在今年 2 月於莫斯科舉行之「第 3 次 APEC 教育部長會議會前專題研討會」上，與會者一致同意將往後 4 年視爲教育合作倡議期，並且應探索適當層級的教育合作。在最初合作倡議期(2013~2016)，應該建立全面合作機制作爲第一步，因此韓國提議建立「教育合作專案小組」(Educational Cooperation Task Force, ECTF)以促進及評估 APEC 區域的教育合作，同時提供有關教育合作的指導方針及指標。「教育合作專案小組」的主要目的在於發展可行及永續的教育合作策略與模型；再者，該小組旨在定期聚集研究者來分享及討論相關成果，並決定下個階段的教育合作重點。該小組將撰擬成果報告，摘要其 4 年

的活動。報告題目暫定爲「APEC 教育合作策略」，且將透過教育發展分組(EDNET)提交給於 2016 年舉行之第 6 屆 APEC 教育部長會議。「教育合作專案小組」也將在 APEC Wiki 知識資料庫設立教育合作入口網站提供相關資訊；美國另報告「APEC Wiki 合作」，從 Web 2.0 資源共享的觀點強調教育合作。

我國教育部代表團團長蔣部長偉寧在會上三度發言，分享我國設立產業碩士專班的成功經驗。該專班旨在支援國內科技產業之研發創新，舒緩碩士級研發人才不足現象。該班由企業與學校合作，學生入學即簽訂培訓契約，未來須至贊助企業服務 2 年。透過此種合作模式，企業獲得研發人才、大學獲得資金補助從事創新研究，學生則獲取實務經驗，同時得到畢業後的工作保障，此爲三贏之策略；另提及我國目前正在規劃數位教育先導計畫，此計畫擬透過實踐、進入教學現場，致力轉變傳統學校成爲二十一世紀之數位學校，進而促進數位學習能更深化、持續、更具推廣性；在相關軟硬體設施建置方面，自 2009 年每校皆建置有 e 化教室、發展資源分享平臺、在全國偏鄉地區設置數位機會中心、推動資訊志工與國民電腦計畫等，而我國自 2006 年公布大學遠距教學實施辦法施行細則，學生以數位學習學分總數達到畢業所需學分的一半，並允許開辦數位學習碩士在職專班及鼓勵大專校院分享教學資源。在國際合作方面，蔣部長分享我國踴躍參與 WTO 並適度放寬教育服務業相關法規以便全球教育服務提供者進入我國教育服務業市場、於美國、韓國、越南、泰國、日本等經濟體設立中華臺北教育中心，以及提供中華臺北及華語文獎學金鼓勵優秀海外學生來臺攻讀學位或學習華語文，以加強國際教育合作的成功經驗。蔣部長同時建議適度修正教育部長聯合聲明草案的部份內容，是所有各與會經濟體教育部長及代表中發言最爲踴躍積極者，並獲其他經濟體讚許。

在週邊活動方面，國際文教處林文通處長於 22 日上午代表我國參加第 5 屆 APEC 教育部長會議週邊活動之一「第 8 屆 APEC 未來教育論壇」，並應邀於圓桌會議上提出報告「Chinese Taipei Educational Strategies Regarding Global Cooperation for the APEC Region (中華臺北針對 APEC 地區的教育合作策略)」，闡述我國從華語文教學、國際組織、公私部門及官方機制等四種管道推廣國際教育合作與交流的進展和結果；另我國於 5 月 21 日至 24 日參與第 5 屆 APEC 教育部長會議週邊活動之一「經濟體教育展」，藉此展示我國教育制度及華語文教學成果，盼吸引更多韓國學生赴臺求學及學習華語文。蔣部長於 5 月 22 日下午親臨我國教育展攤位，並參觀汶萊等其他經濟體攤位，以了解其他會員經濟體教育制度。

5 月 23 日：

爲 APEC 教育部長會議閉幕式、會後聯合記者會及惜別會。閉幕式由主席國韓國教育科學技術部部長李周浩博士、俄羅斯聯邦教育科學部代理部長 Sergey Ivanets、APEC 秘書處執行長 Muhamad Noor 共同擔任主席。確認第 5 屆 APEC 教育部長會議聯合聲明及宣佈計有來自 22 個經濟體的 25 位代表參與(其中包含 7 位部長)。

與會代表們發表第 5 屆 APEC 教育部長會議聯合聲明：首先確認教育在促進 APEC 會員體間區域經濟整合與繁榮的關鍵角色；其次，進一步承認工作性質的改變要求工作者具備高程度的教育背景與能力，以及由於科技整合與引進創新教學和學習實例所發生的教育性質改變，且引發更多教育合作需求。在教育創新方面，分享 ICT 應用在教育的經驗、加強教師運用 ICT 教學、增加教師參與 APEC E-Learning 課程的人數、分享強化教師生涯發展的管道；在未來教育合作方面，肯定 EDNET 透過 APEC Wiki 和 ALCoB 網路建構和分享知識，以研擬出第 4 屆 APEC 教育部長會議優先領域議題的措施；在教育全球化方面，部長們同意朝下述方面努力：持續提升數學和科學教育能力、創造一個在數學及科學教育上合作的開放環境、支持外語教育及發展一個系統來培育和訓練高品質的、可反映文化多元性的語言教師；探究學生參與技職教育與訓練的機會。結論肯定 APEC 經濟體們與其他國際組織(如 OECD、World Bank、UNESCO 等)在教育合作研究與提供實例方面所做的努力，同時要求教育發展分組於今年 9 月假俄羅斯海參威舉行之 APEC 領袖會議上發表報告本屆會議結論，並提供部長們有關年度進度報告。

蔣偉寧部長在教育部長聯合記者會上，引用孔子古諺「有朋自遠方來，不亦樂乎」來表示 APEC 教育部長會議是個能讓各會員經濟體教育部長及代表們齊聚一堂交換意見的極佳平臺，並重申我國將會持續積極參與 APEC 活動以加強國際教育合作與交流。在隨後舉行之「APEC 教育部長惜別會」上，蔣部長提議 APEC 教育部長會議可改爲每兩年舉辦乙次，並以非正式之圓桌會議方式進行，以加強交流，獲得主席國韓國及與會各經濟體一致同意，並被列入會談紀錄，日後 APEC 秘書處亦將依相關會議程序，徵詢各會員經濟體意見。

在週邊活動方面，國際文教處魯維廉主事於同日下午代表我方參加第 5 屆 APEC 教育部長會議週邊活動之一「第 8 屆 APEC 未來教育論壇」指導委員會議，會中主席兼 APEC 人力資源發展工作小組(HRDWG)主導成員韓籍金榮桓博士宣佈，將與我國科會主政之 APEC 緊急應變工作小組(Emergency Preparedness Working Group, EPWG)共同向 APEC 經濟暨技術合作指導委員會(SCE) 提出「APEC 未來捍衛者 (APEC Future Safeguard)」3 年期研究計畫案，建議透過 ALCoB 平臺推廣「防災教育」(主題首先著重在洪水和地震)，並積極爭取亞洲開發銀行 (ADB)及 APEC

大會的資助；另同日下午我代表團亦參加韓國安排的文教參訪(Cultural Tour)之旅，參觀月城國小(Smart 教育)及慶州高中(教育科技教室)、佛國寺及瞻星台。蔣部長並於慶州高中示範數學教學，同時接受韓國教育廣播電視台 (Educational Broadcasting System, EBS)採訪，就當前全球化時代，我國應如何鼓勵學生學習以及培育人才作介紹和說明。

5 月 24 日：

上午趕赴釜山，由駐釜山辦事處安排參觀著名景點 Nurimaru APEC House(2005 年 APEC 會員經濟體領袖高峰會所在地)。傍晚 17 時 10 分我方代表團搭乘復興航空 GE-705 號班機離開釜山，並於同日晚間 18 時 45 分返國。

參、心得與建議

一、 APEC 資深官員及相關會議(Senior Officials' Meeting and Related Meetings, SOM)主題包涵甚廣，設有工作小組及主導成員(Lead Shepherd)，其下尚有工作分組，負責各經濟體優先關心議題之研究與經驗分享，包括: ECSG(Electronic Committee Steering Group)、LFIF(Life Science Innovative Forum)、ACTWG(Anti-Corruption and Transparency Working Group)、CD(Chemical Dialogues)、IPEG(Intellectual Property Rights Experts Group), BMG(Business Mobility Group)、HRDWG(Human Resources Development Working Group), PPFS(Policy-Partnership on Food Security)、HLDAB(High Level Policy Dialogue on Agricultural Biotechnology)等，21 個會員經濟體均分別有相對應政府部門之資深官員或學者與會，相關會議決議或建議尚可作爲各會員經濟體政策制訂之參考。

二、 教育部提交之 2012 年度新研究計畫案「APEC 技職教育與證照資料庫─現況研究及建議(APEC Career and Technical Education (CTE) and Licensing Portal─(1) Study on Current Status & Recommendations)」，已相繼得到美國、智利等 7 個經濟體支持與人力資源發展工作小組核可(研究計畫編號爲 HRD 01/2012S)。我方將遵循 APEC 研究計畫指導手冊(APEC Project Guidebook) 內相關規定執行該研究計畫，並積極尋求包括韓國在內更多 APEC 會員經濟體支持。

三、 在第 5 屆 APEC 教育部長會議週邊活動之一「第 8 屆 APEC 未來教育論壇」指導委員會議上，主席兼 APEC 人力資源發展工作小組(HRDWG)主導成員韓籍金榮桓博士宣佈，擬與我國科會主政之 APEC 緊急應變工作小組(Emergency Preparedness Working Group, EPWG)共同向 APEC 經濟暨技術合作指導委員會(SCE)提出「APEC 未來捍衛者(APEC Future Safeguard)」3 年期研究計畫案，建議透過 ALCoB 平臺推廣「防災教育」(主題首先著重在洪水和地震)，並積極爭取亞洲開發銀行(ADB)及 APEC 大會的資助。此舉既可強化跨 APEC 跨論壇和工作小組的交流與合作，又可分享我國在防災教育上的成果與努力，教育部將持續關注此提案進展，並與國科會商討積極參與之道。

四、 韓國將原先建議提案「教育合作專案小組」改爲「教育合作」自籌資金研究計畫案(Educational Cooperation Project, ECP)，同時宣布「慶州教育合作行動計畫」(Gyeongju Action Plan for Educational Cooperation)，打算在未來 4 年內完成「APEC 教育合作策略」報告並透過 EDNET 提交給第 6 屆 APEC 教育部長會議討論；該研究計畫案也會在美國主導的 APEC Wiki 知識資料庫上面設立入口網站，以連結相關研究資源。韓方把本計畫

案稱爲「慶州倡議」(Gyeongju Initiative)，並視此爲本次 AEMM5 的重要特色及成果之一。另外在前述第 5 屆 APEC 教育部長會議聯合聲明中也強調未來教育合作應同時包括資訊交流及合作實例，以呼應「莫斯科倡議」(Moscow Initiative)(主張加強公私部門的合作)。教育部將持續注意與評估此行動計畫之進展。

肆、附錄

一、議程

Asia-Pacific
Economic Cooperation

2012/AEMM/XXX
Agenda Item:

The 5th Education Ministerial Meeting Agenda:

Future Challenges and Educational Responses:
Fostering Global, Innovative and Cooperative Education

Purpose: Consideration
Submitted by: Korea

5th APEC Education Ministerial Meeting
AEMM 2012 KOREA

5th APEC Education Ministerial Meeting
Gyeongju, Korea
21-23 May, 2012

The 5th APEC Education Ministerial Meeting
May 21-23, 2012
Gyeongju, Korea
Draft Agenda *(as of May 15, 2012)*

Monday May 21, 2012

(Location: Hotel Hyundai)
(Dress Code : Business Attire)

08:00 – 19:00 **Registration of delegates, Accreditation desk, 1F Hotel Hyundai**

14:00 – 17:00 **Working Group Meeting**

(Location: Convention Hall, B1F, Hotel Hyundai)

Chair : Korea Host Co-chairs (Kyeong-Mo Koh, Deputy Minister for Planning & Coordination, Ministry of Education, Science and Technology / You-Mi Suh, Director general for International Cooperation Bureau, Ministry of Education, Science and Technology / Mee Sook Kim, Ph.D. Korean Educational Development Institute) / HRDWG Lead Shepherd (Young-Hwan Kim) / EDNET Coordinator (Adriana De Kanter)

14:00 – 14:20 **Opening Session of Working Group Meeting**

14:00 – 14:10 1. Opening Remarks (Kyeong-Mo Koh, Deputy Minister of MEST, Korea)
14:10 – 14:15 2. Welcoming Remarks (Young-Hwan Kim, HRDWG Lead Shepherd)
14:15 – 14:20 3. Congratulatory Remarks (Adriana De Kanter, EDNET Coordinator)

14:20 – 14:45 **Working Group Meeting**

14:20 – 14:25 4. Adoption of the Agenda on the high-level working group meeting (Chair)
14:25 – 14:35 5. Review of Pre-Ministerial Research Symposium (EDNET Coordinator)
14:35 – 14:45 6. Presentation on the Ministerial Meeting Programs.(AEMM Preparatory Team)

14:45 – 15:00 **Coffee Break**

15:00 – 16:10 **Working Group Meeting Continued**

15:00 – 15:10 7. Presentation on Draft Joint Ministerial Statement
15:10 – 15:30 7.1. Discussion on session 1: Globalization
15:30 – 15:50 7.2. Discussion on session 2: Innovation
15:50 – 16:10 7.3. Discussion on session 3: Cooperation

16:10 – 16:20 **Coffee Break**

16:20 – 17:00 **Working Group Meeting Continued**

16:20 – 16:55 8. Final Discussion on the Joint Ministerial Statement
16:55 – 17:00 9. Closing Remarks (You-Mi Suh, Director General for International Cooperation Bureau of MEST, Korea)

17:30 – 19:30 **Welcoming Reception**
Welcome dinner hosted by the Governor of the Province of Gyeongsangbuk-do

(location: Terrace Garden, Hotel Hyundai)

Tuesday May 22, 2012

(Location: Hotel Hyundai)
(Dress Code: Business Attire)

5th APEC Education Ministerial Meeting

07:45 – 19:00 **Registration of delegates, Accreditation desk, 1F Hotel Hyundai**

8:56 – 09:00 **Play a Video Clip about the 5th APEC Education Ministerial Meeting**

09:00 – 09:50 **Opening Session**

(Location: Convention Hall, B1F, Hotel Hyundai)

Chair: Korea Host Chair (Ju-Ho Lee, Minister of Education, Science and Technology of Korea) / Russia (Sergey Ivanets, Acting Minister of Education and Science of the Russian Federation) / APEC Secretariat (Amb. Muhamad Noor, APEC Secretariat Executive Director)

09:05 – 09:10 **1. Opening Remarks**

President of Korea, TBD

09:10 – 09:20 **2. Congratulatory Remarks**

H.E. Sergey Ivanets, Acting Minister of Education and Science of the Russian Federation

09:20 – 09:30 **3. Address (Theme: TBD)**

Amb. Muhamad Noor, APEC Secretariat Executive Director

09:30 – 09:50 **4. Keynote Speech**

"Future Challenges and Educational Responses: Fostering Global, Innovative and Cooperative Education"

H.E. Ju-Ho Lee. Minister of Education, Science and Technology(MEST) of Korea

09:50 – 10:05 **Official Photograph Session**

10:05 – 10:15 **Coffee Break**

10:15 – 11:45 **Session 1 : Globalization**

Globalization – Preparing students with the future skills required for college and career readiness in a globalized, knowledge-based economy.

Chair: Korea (Ju-Ho Lee, Minister of Education, Science and Technology)

10:15 – 10:35 **5. Priority Area Discussion: Mathematics and Science Education**

(Necessary for global competitiveness)

10:15 – 10:30 **5.1. APEC Mathematics and Science Instruction (The Russian Federation)**

H.E. Sergey IVANETS, Acting Minister of Education and Science

10:30 – 10:35 **5.2. Appointed Discussant Reaction (Japan)**

H.E. Takashi KII, Vice Minister of Education, Culture, Sports, Science and Technology

10:35 – 11:00 6. Priority Area Discussion: Language and Culture Education
(Necessary for global competitiveness)

10:35 – 10:50 **6.1. Language and Culture Education (EDNET)**

Ms. Adriana De KANTER, EDENT Coordinator

10:50 – 10:55 **6.2. Appointed Discussant Reaction (Thailand)**

H.E. Suchart THADA-THAMRONGVECH, Minister of Education

10:55 – 11:00 **6.3. Appointed Discussant Reaction (Mexico, TBD)**

H.E. Jose Angel Cordova VILLALOBOS, Secretariat of Public Education (TBD)

11:00 – 11:05 **6.4. Discussion for Priority Area**

11:05 – 11:45 7. Priority Area Discussion: TVET and Higher Education Quality
(Necessary for transitioning into the workforce)

11:05 – 11:25 **7.1. TVET and Higher Education Quality (China)**

TBD

11:25 – 11:30 **7.2. Appointed Discussant Reaction (Indonesia)**

H.E. Mohammad Nuh, Minister of Education and Culture

11:30 – 11:35 **7.3. Appointed Discussant Reaction (Canada)**

H.E. Jeff Johnson, Minister of Education, Alberta

11:35 – 11:45 **7.4. Discussion for Priority Area**

11:45 – 13:30 Official Luncheon

Official Luncheon for Heads of Delegation
Hosted by Hwang-sik Kim, Prime Minister of Korea
(Location: Grand Ballroom, Hilton Hotel)

Luncheon for the rest of the delegates
(Location: Dynasty, B2F Hotel Hyundai)

13:30 – 15:00 Session 2: Innovation

Innovation-the need to create instructional delivery system that help students address challenges in innovative ways

Chair: Korea (Ju-Ho Lee, Minister of Education, Science and Technology)

13:30 – 14:15 **8. Priority Area Discussion: ICT in Education**

13:30 – 13:50 **8.1. ICT in Education for Innovative Growth of the APEC Region (Korea)**

Mr. Kyeong-Mo Koh, Deputy Minister for Planning and Coordination

13:50 – 14:00 **8.2. Development in the use of ICT in Education (Hong Kong)**

H.E. Kenneth Chen, Under Secretary

14:00 – 14:05 **8.3. Appointed Discussant Reaction (Thailand)**

H.E. Suchart THADA-THAMRONGVECH, Minister of Education

14:05 – 14:10 **8.4. Appointed Discussant Reaction (Indonesia)**

H.E. Mohammad Nuh, Minister of Education and Culture

14:10 – 14:15 **8.5. Discussion for Priority Area**

14:15 – 15:00 **9. Priority Area Discussion: Teacher Quality**

14:15 – 14:35 **9.1. A Quality Teacher in Every APEC Classroom (The United States)**

Ms. Maureen McLaughlin, Director of International Affairs

14:35 – 14:40 **9.2. Appointed Discussant Reaction (China)**

H.E. Gui ren YUAN, Minister of Education

14:40 – 14:45 **9.3. Appointed Discussant Reaction (Korea)**

H.E. Ju-Ho LEE, Minister of Education, Science and Technology

14:45 – 15:00 **9.4. Discussion for Priority Area**

15:00 – 15:15 **Coffee Break**

15:15 – 16:30 **Session 3 : Cooperation**

Cooperation-changes in the nature of work and instruction demand that education policymaking, reform efforts, and program implementation should be more collaborative and global

Chair: Korea (Ju-Ho Lee, Minister of Education, Science and Technology)

15:15 – 16:30 **10. Priority Area Discussion: Cooperation**

15:15 – 15:35 **10.1. Educational Cooperation in the APEC Region: Envisioning Together for the Future and Hope (Korea)**

Mr. Kyeong-Mo Koh, Deputy Minister for Planning and Coordination

15:35 – 15:50 **10.2. APEC Wiki Cooperation (The United States)**

Ms. Adriana De Kanter, EDNET Coordinator

15:50 – 16:00 **10.3. Appointed Discussant Reaction (TBD)**
16:00 – 16:30 **10.4. Discussion for Priority Area**

16:30 – 16:40 Coffee Break

16:40 – 17:40 Wrap up Discussion

16:40 – 17:10 **11. Summary discussion**

11.1. Summary remarks – 10 min.

H.E. Tony Miller, Deputy Secretary of Department of Education, The USA

11.2. Free Discussion

17:10 – 17:30 **12. Discussion of Ministerial Goals**

17:30 – 17:40 **13. Closing remarks for first day**

H.E. Ju-Ho Lee, Minister of Education, Science and Technology

17:50 – 18:10 Moves to Dinner Venue
Departure from Hotel Hyundai

18:10 – 20:00 Official Dinner
Hosted by Ju-Ho Lee, Minister of MEST, Korea
(Location: Art Sonje Museum)

Keynote Dinner Speech (Minister of Korea)
Congratulatory Dinner Speech (APEC Secretariat Executive Director, TBD)

Wednesday May 23, 2012

(Location: Hotel Hyundai)
(Dress Code: Business Attire)

07:45 – 12:00 Registration of delegates, Accreditation desk, 1F Hotel Hyundai

09:00 – 09:50 Closing Session

09:00 – 09:40 **14. Adoption of Joint Ministerial Statement**
09:00 – 09:30 14.1. Review & Discussion on Joint Statement
09:30 – 09:40 14.2. Adoption of Joint Ministerial Statement

09:40 – 09:50 **15. Closing Remarks**

H.E. Ju-Ho Lee, Minister of Education, Science and Technology

09:50 – 10:00 Coffee Break

10:00 – 10:40 **Press Conference**

10:40 – 11:40 **Ministerial Retreatment**
10:40 – 11:00 16. Photograph Session
11:00 – 11:40 17. Ministerial Retreatment

12:00 – 13:30 **Luncheon**
Luncheon hosted by the Superintendent of Education, Gyeongsangbuk-do
(Location: Gyeongju Education & Arts Center)

13:30 – 18:00 **Field Trip : Outstanding School Visits and Cultural Tour**

Departure from Gyeongju Education & Arts Center

18:00 – 20:00 **Farewell Dinner**
Farewell Dinner hosted by the Mayor of Gyeongju City
(Location: Hotel Hyundai)

Keynote Dinner Speech (Yang Sik, Choi, Mayor of Gyeongju City)
Toast (TBD)

二、活動照片

我方教育部代表團與韓方教育部代表團舉行雙邊會談

APEC 各會員經濟體代表於「第 5 屆 APEC 教育部長會議」會前合影留念

教育部蔣偉寧部長在第 5 屆 APEC 教育部長會議上代表我國發言

教育部蔣偉寧部長與代表團成員在「第 5 屆 APEC 教育部長會議經濟體教育展」我國攤位合影留念

教育部國際文教處林文通處長參加「第 8 屆 APEC 未來教育論壇」

教育部蔣偉寧部長於「第 5 屆 APEC 教育部長會議」會後文教參訪行程中與慶州高中教職員合影留念

教育部蔣偉寧部長與美國教育部常務副部長 (Deputy Secretary of Education) Tony Miller 在「第 5 屆 APEC 教育部長會議」會場合影留念

教育部蔣偉寧部長出席「第 5 屆 APEC 教育部長會議」會後聯合記者會

教育部蔣偉寧部長同「第 5 屆 APEC 教育部長會議」各會員經濟體與會代表於會後合影留念

Asia-Pacific
Economic Cooperation

2012/AEMM/XXX
Agenda Item:

APEC Mathematics and Science Instruction

Purpose: Consideration
Submitted by: Russian Federation

5th APEC Education Ministerial Meeting
2012 KOREA

5th APEC Education Ministerial Meeting
Gyeongju, Korea
21-23 May, 2012

APEC Mathematics and Science Instruction

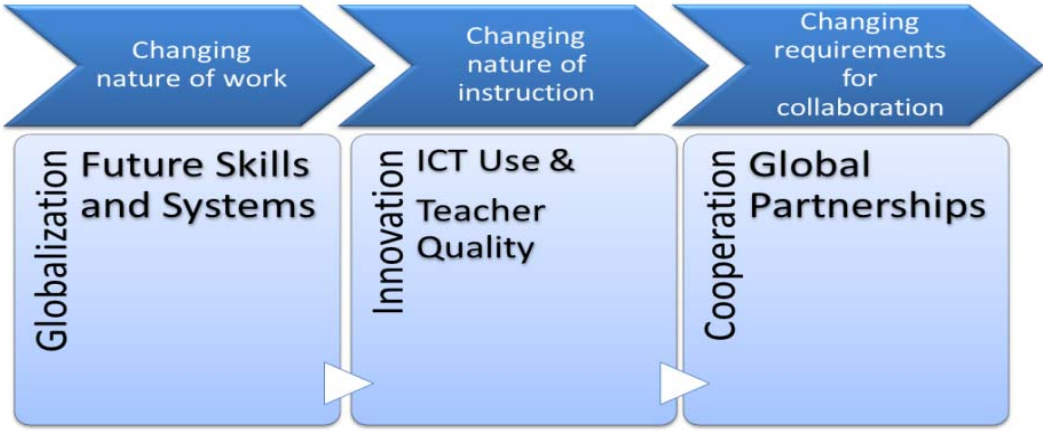
This priority identifies research-based strategies and potential future APEC projects to strengthen the skills necessary to succeed in the 21st-century workforce. Specifically, it focus is on skills related to content areas of mathematics and science education – academic subjects critical to establish the knowledge, skills, and values to meet the regional challenges of the Asia-Pacific and succeed in a dynamic technology driven work place.

An overarching proposed project is to create a digital library of exceptional open-education resources (OER) initially in mathematics and then science. The digital library will be a one-stop shop featuring a problem bank of international mathematics items. The digital library, include content standards, teacher standards, lesson study and other instructional videos, key research articles and digital instructional materials. These resources are compiled from APEC member submissions and freely accessible across APEC.

Other proposed APEC projects will address strategies for providing effective access to math and science for all students, math and science applied to support 21st Century problem solving skills and coordination with other APEC work on math and science teacher preparation and development.

I. Background on the Topic

This theme showcases how the Education Network (EDNET) has been and will continue to respond to: the rapidly evolving, knowledge-based and globalized economy (the changing nature of work), creating demands for students to understand how to work with others (changing requirements for collaboration), while building their knowledge and skills to innovate (the changing nature of instruction).



APEC Ministers are aware that the economy is becoming increasingly international and increasingly knowledge and data driven. It was highlighted on the APEC Education Ministers meeting in 2008 that "Mathematics and Science are essential to navigating the data-driven and technological world of the 21st century, no matter one's occupation"(APECWIKI, 2008).

The global job market is changing rapidly, requiring workers to have a strong set of adaptable skills if they are to succeed. Students must learn-how-to-learn while applying the knowledge of mathematics and science to real world problems. This is because tomorrow's workplaces may look totally different than today's and will use innovations that don't even exist today. It is clear that schools across the region must change the way they teach students if students are to have the skills they need to cope in the new global environment.

For purposes of APEC in this thematic area, we are focusing on those 21st Century Skills integral to the need to know and be able to apply math and science within the new digital Economy. We also include understanding each other's languages and cultures to support globalization and cooperation within the math and science area, for example to read international scientific articles.

- **Stimulating Learning in Math and Science.** Facility with mathematics and science is a key to success in a global economy driven by technological development and the use of information and data to solve problems as diverse as global warming, the need for alternative energy sources, and disaster risk. However, international comparison studies have found significantly different levels of achievement and practice in science and math education in the East and West. In general, the Asian educational systems seem to excel in producing students with a strong grasp of the content knowledge and include some of the highest scoring economies on the Third International Mathematics and Science Study (Mullis, et. al., 2008). The Western systems have other strengths; they are successful in helping students develop problem-solving skills and the ability to apply knowledge to real life situations to build 21st Century competencies. Indeed, many Western economies

are among the most scientifically innovative in terms of such indicators as new scientific patents and Nobel prizes. The pressing issue is how to combine the best of both systems.

- **Learning Each Other's Languages and Culture.** The ability to communicate across language barriers is essential to international trade and to building mutual understanding among interconnected global economies. All APEC members are faced with the issue of how to effectively prepare multi-lingual citizens who can appreciate the culture of and communicate with speakers of other languages. In many APEC member economies, second or third language learning has historically occupied an important place in the school curriculum. Because of the primacy of English in trade today and in mathematics and scientific journals, many APEC members from Eastern economies have further stressed English language education, extended this to the early elementary grades, and raised their expectations for proficiency. English speaking economies, on the other hand, find it hard to motivate their students to take a second language in high school and to find teachers qualified to teach a language other than English.

The recommendations moving forward build off of previous work conducted by APEC to build a body of knowledge to support improvements in mathematics and science education throughout the region.

II. Key Research

21st Century Analytic Framework

Math and science education is the content area that forms a common part of the education systems of APEC economies. That is why the first step in creating a common educational environment and to identify research that would guide developing this environment would be to understand Economies' common goals of math and science education.

To inform the achievement of these goals, research in APEC Economies is highlighted in four areas: essential to producing students who know and are able to do mathematics and science (Exhibit 1):

Effective Teachers

- To increase the level of subject and pedagogic *teacher preparation* in science and math fields
- To increase the *real and virtual mobility* of APEC economies students to facilitate better coordination of the efforts of APEC organizations in the field of highly-qualified teachers preparation

Students Knowledgeable and Able in Math and Science

- To promote gradual buildup of math and science literacy among *all students* within an economies population and not just those who intended to go into math and science careers.
- To search for *gifted students* and stimulate their progress and self-actualization

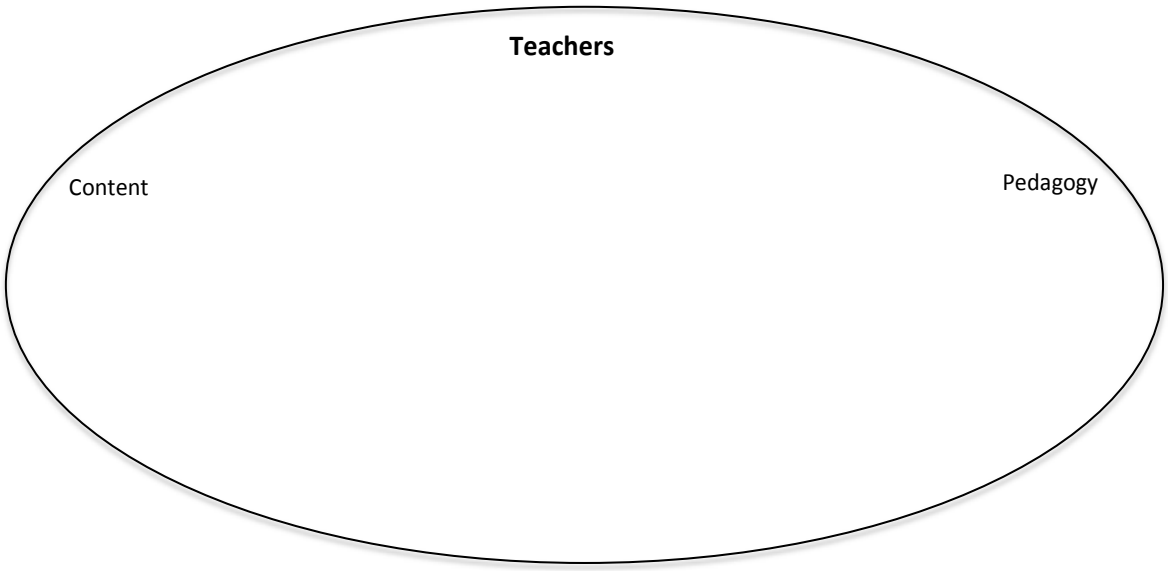
Relevant Standards and Curriculum

- To provide students with an understanding of the importance of *mathematical way of thinking* and rational recognition of the world in the society as a base for future development
- To increase the share of curriculum devoted to the theory and application of *probability and statistics* as those parts of math that are the closest to the real world phenomena
- To increase *motivation* to studying math and science

21st Century Skills

- With the above goals in mind – to shift towards developing education *skills that are focused on solving the problems of the real world*

Exhibit 1: 21st Century Math and Science Goals



Teachers as Main Drivers of Achievement

As Barber and Mourshed (2007) discovered when studying the 25 worlds best performing school systems: the main school factor contributing to student learning at school is teacher

quality. Despite the many different cultural and political contexts and challenges among the systems the researchers looked at, the study concluded that "high-performing school systems consistently do three things well:

- They get the right people to become teachers (the quality of an education system cannot exceed the quality of its teachers).
- They develop these people into effective instructors (the only way to improve outcomes is to improve instruction).
- They put in place systems and targeted support to ensure that every child is able to benefit from excellent instruction (the only way for the system to reach the highest performance is to raise the standard of every student)." (p. 13)

EDNET's projects to improve math and science teachers have focused on effective teacher preparation and professional training. Recognizing the importance of mathematics and science competency for global competitiveness, EDNET is studying *mathematics and science teacher preparation* in APEC economies (Exhibit 2). The project involves examining economy teaching profiles, teacher standards, and teacher preparation programs and assessing future teachers. The products will identify best practices and develop new models for the improvement of teacher quality and corresponding student outcomes. This project involving leading universities in 6 APEC Economies (Australia: Monash University, China: East China Normal, New Zealand: Waikato University, Russia: Moscow Institute of Open Education, Singapore: National Institute of Education, Thailand: Koen Kaen University, USA: Columbia, Harvard and Pennsylvania).

Exhibit 2. APEC Quality of Teacher Preparation Project: Secondary Math and Science (Ongoing)

Economy Context		Teacher Preparation (Sample of Institutions)		Prospective Teacher ASSESSMENT of Math/ Science
Economy PROFILES	**Economy Teacher STANDARDS**	**Secondary Math/Science Teacher Preparation CURRICULUM**	**Exemplary Practice CASE STUDIES**	
Key Questions • What are key characteristics of the economy's education systems? • What are key characteristics of teacher education schools?	**Key Questions** • What are the math/ science standards? • How do standards address 21st century challenges (math/ science for all, use of technology, real-world issues)	**Key Questions** • What are the institution's secondary math/ science educational objectives? • What is the students' course preparation plan to meet these objectives?	**Key Questions** • What are promising practices in improving the content or pedagogical preparation of secondary math/ science teachers?	**Key Questions** • What is the prospective teachers' level of: - High school student math content knowledge? -Advanced math content knowledge? - Pedagogical content knowledge?

With respect to improving current teachers through professional development, APEC work on Classroom Innovations through Lesson Study is widely acknowledged to have led to the understanding and dissemination of this Japanese approach (Exhibit 3). APEC members learn how lesson study works to improve teacher quality through peer and expert critiquing of teacher lessons. Led by Tsukuba University - Japan and Khon Kaen University – Thailand, the project has produced a Lesson Study Guide and videos of sample lessons in mathematics (Lesson Study on APEC Wiki). The project has moved forward toward applying math and science concept to the real-world problems and to contribute sustainable development. And it aims to provide students and teachers the necessary scientific and practical knowledge about disaster risks and related competencies, which was attached importance to in the APEC Education Ministers meeting in 2008. Electric materials for getting scientific knowledge of disaster will be developed for math classes in APEC economies through the lesson study approach.

Exhibit 3. APEC Lesson Study demonstration: 5th graders solving an equation in front of the class

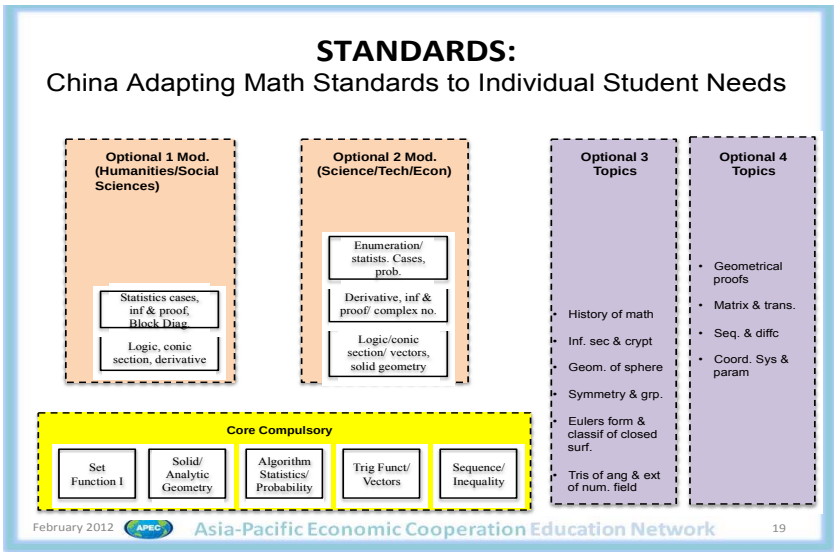
Math and Science for All Students

All students need extensive exposure to math and science at both primary and secondary levels to succeed in the 21st Century digital Economy. This requires a change in education philosophy as often math and science courses are geared to those students who are most adept at math and science.

Two specific Economy examples of practices suited for at-risk students that would also typically help all students are:

- *Chinese math standards provide optional math choices on top of a common core compulsory program.* To respond to the need for all secondary students to have extensive expose to math, the Chinese math standards (APEC Wiki) offer a flexible curriculum that recognizes students' varying needs. Chinese standards provide a compulsory core of 5 components of fundamental secondary mathematics. The optional curriculum satisfies students' special interests. For example, in Exhibit 4 below, you see an optional module on the left if for humanities/social studies and a second for science and technology majors.

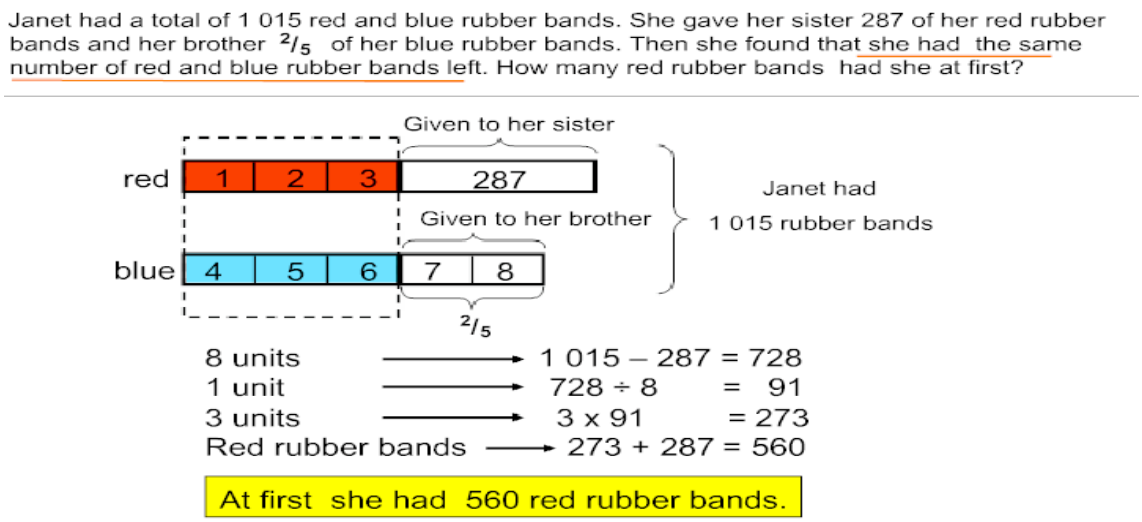
Exhibit 4. Allowing Secondary Students Math Course Choices
On Top of a Common Core Foundational Math Program For All Students



Source: APEC Wiki. Available online March 2012: http://hrd.apec.org/index.php/Education_Network_%28EDNET%29.

- *Singapore's visual representations of mathematical ideas.* Mathematics and science ideas may represent abstract concepts that many students have difficulty grasping in a meaningful way. Visual approaches give students a grounding of these ideas in reality. For example, the number line is a powerful way to visually represent such concepts as greater than and less than, negative numbers, fractions and decimals. The Singapore Math curriculum employs a concrete-to-pictorial-to-abstract approach to provide students visual scaffolding in understanding math concepts. Singapore's Bar model method (Singapore Ministry of Education, 2009) (Exhibit 5) delivers "a pictorial model to represent the known and unknown quantities and their relationships in a problem," to develop their mathematical problem-solving skills.

Exhibit 5. Singapore's Visual Approach to Math: Model Drawing



Source: *The Singapore Math Teacher.* Available online April 2012: http://www.thesingaporemaths.com/

Part of assisting the special needs all students is helping the mathematically and science gifted students fully develop their special capacities.

- Japan's *Super Science High schools* (SSHs) have developed enriched curricula, teaching methods and materials on science and mathematics in *partnership with Japanese universities and research institutes.* (http://rikai.jst.go.jp/eng/e_about/e_sshs.php). Some SSHs also promote classroom teaching in English to prepare students for international activities
- Russia's *Moscow State School 57th Math School* introduces university math students who may have a desire to teach to tutor gifted children in very small groups under supervision of mentor teacher (APEC Quality of Teacher Preparation project).

APEC's work would examine these and other promising practices across APEC education systems for helping all children learn math and science.

21st Century Math and Science Standards

21st Century mathematics and science content standards address the need to expose students to a mathematical way of thinking, real-problem solving and adequate levels of probability and statistics.

APEC has been an international leader in the compilation of math standards (http://hrd.apec.org/index.php/Mathematics_Standards_in_APEC_Economies) and science standards (http://hrd.apec.org/index.php/Science_Standards) across APEC Economies. These standards identify what students need to know and be able to do at primary and secondary grades. And hence are critical to framing instruction and assessment.

APEC analyses (Achieve, 2009) have compared the standards to identify common topics and differences across standards at primary and secondary grades for math and science. Examples of findings with respect to the goals above:

Unlike most countries, New Zealand devotes a *third of standards to statistics and probability* at every grade span. New Zealand credits its relatively high ranking on PISA to its standards that emphasize statistical word problems.

- The newer math and science standards are shifting away from rote memorization and highly rigorous mathematical proofs to stressing students being able apply and solve *real-world applications of math and science concepts*. An example from the Chinese standards of introducing real-world applications even in grade 3.

Exhibit 6. Chinese Math Standards Emphasize Real-World Math Problems As Early As Grade 3

1. *What is the approximate thickness of 1200 sheets of paper?*
2. *What is the approximate number of classes that may be formed comprising of 1200 students?*
3. *What is the approximate length of 1200 footsteps?*



Source: Chinese Math Standards: Available online April 2012: http://www.apecknowledgebank.org/file.aspx?id=1894.

As APEC educational systems evolve and update their standards, APEC members should also be able to share good practices in implementing the new standards to change teaching and learning.

Math and Science Problem-solving

Today, nearly every worker in the global economy needs to know how to apply scientific thinking to make "green" decisions that help to preserve the health of our natural systems and our citizens. Focusing on how to teach and assess scientific literacy that encompasses both knowledge and application may produce important benefits.

In a study designed to look at how well students were mastering scientific reasoning—the transferable ability to apply scientific thinking to a variety of situations—researchers from U.S. and Chinese universities compared the knowledge mastery and scientific reasoning ability of 5,760 students who were about to begin their university careers as science and engineering majors (Bao, et al., 2009). The students had experienced very different types of curricula in their K-12 years, with the Chinese students being exposed to more extensive content knowledge. The instruments designed to measure content knowledge reflected greater mastery by the Chinese students. Results on the instrument designed to measure scientific reasoning, however, were nearly identical across the two countries. This suggests that content-rich instruction is not sufficient to produce deep understanding and application of scientific reasoning. The researchers noted that blending inquiry-based learning with content instruction gives a more balanced approach that prepares students to use higher-order scientific reasoning to apply their knowledge.

The APEC WIKI contains a pilot collection of problems to demonstrate the feasibility of collecting and comparing mathematics problems on different math topics and grades. These data were used in a study, Measuring Up: How the Highest Performing U.S. State (Massachusetts) Compares to the Highest Performing Country (Hong Kong) (Leinwand & Ginsburg, 2009). Hong Kong grade 3 items were more likely to require students to: (1) construct a response than Massachusetts items; (2) were more likely to require more than low computational difficulty, compared with Massachusetts items; and (4) fall into the moderate or high cognitive complexity category compared with Massachusetts items.

The interesting results from the feasibility study suggest that EDNET should fully develop an open environment containing mathematics and science problems, assessments and possibly other resources.

III. New Directions and Recommendations

Proposed Project 1: Open Environment for Educational Collaboration of APEC Economies– An Initial Focus on an APEC Math Assessment Item Bank (See Appendix for Details)**.** To enhance APEC economies' cooperation in the area of education, EDNET will

establish an open system for access to the educational resources, with the goal of evolving an open environment of math education resources in the APEC region. Such an environment would promote the level of teaching and of citizens' math literacy and would also encourage popularization of math education.

In the course of future development, the system would:

- Initially develop an open bank of mathematical problems for tests, exams, and math progress monitoring that would be gradually expanded by APEC project participants. Each problem would include various attributes and descriptors, such as the age of the pupil, number of students that took this problem on the exam, and percentage of student shaving successfully passed the exam. The bank would also include Economy examples of full assessments, and contain all the tools for implementation and monitoring of the assessment.

- Expand the open education environment to include resources in the areas of natural science, cultures, and languages of APEC economies.

Proposed Project 2: a Repository of Math and Science Content Standards and Implementation Strategies. This project continues to maintain and update the repository of math and science standards across APEC Members on the APEC Wiki.
Further, it collects best practices in effective outreach, professional training and implementation of new or significantly changed standards through case studies and sharing of materials.

Proposed Project 3: Meeting the Math-Science Needs of All Students. Hold a conference to share research-based strategies and practices for ensuring all students receive a sound foundation in math and science and that students with different math and science interests and abilities have adequate specialized developmental opportunities. Agenda would cover best practices for making math accessible to all (visual approaches to explaining abstract math concepts) and realizing the math talents of gifted students, especially girls.

Proposed Project 4: Math and Science To Support 21st Century Problem-Solving Skills. Project would examine strategies for teaching the application of mathematics and science ideas to real-world problem solving. A special focus would be on effective methods for teaching statistics and probability such as New Zealand's emphasis on using the statistical inquiry cycle. Another focus would be Education for Sustainable Development whose concept is to integrate the current issues such as environment, poverty, human rights, peace and development, etc. into math and science curricula in order to foster human resources who can contribute to a sustainable future with regard to the environmental, economic and social aspects. The on-going Japan-Thailand project on disaster preparedness into math education could be one of the exemplar.

Proposed Project 5: Focus on improving the quality of teacher preparation and professional training in math and science (link to ongoing APEC Quality of Teacher Preparation Project: Math and Science).

Project Details:

APEC Open Environment for Education Collaboration - Math Education

Background (environmental scan)

Math and science education is the common part of the education systems of APEC economies. That is why the first step in creating a common educational environment would be to understand the common goals of math and science education and to create a common approach in this educational area.

Creating a joint open data base of math problems and assessment methods could become the first main step in the process of progressive integration of different elements of school math education and mutual enrichment of educational systems of APEC economies. Such a database would be used by educational institutions for assessments (to compare pupils' results with other economies), as problems for intellectual contests (Olympiads) and to form a "problem core" for teachers.

Some economies already have a positive experience when using an open bank of math problems. Russia, for example, has been using this system for 3 years to develop The Unified State Exam in math as well as to inform the professional community about requirements set for students' preparation.

The Australian Government has initiatives to increase the pool of digital learning resources and assessment tools available nationally to teach math and science. Some of these resources and assessment tools would be able to be made available to other APEC economies through an APEC digital library of resources.

APEC agenda motivation

Creating a joint open data base of math problems will contribute to regional economic integration, cross-border education and systemic reform, as it will bring together the best experience from across the APEC region, facilitate interaction and cooperation between various institutions within APEC economies and promote student mobility. Currently, apart from direct mobility that is seen as relocation of students between the economies, there's another type of mobility that is called "remote mobility" which is implemented through computer technologies and allows to plan and to carry out remote education.

An efficient system of interaction between APEC economies' educational institutions is urgently needed. Creating an open bank of math problems and open procedures in evaluating individual progress of each student could be the step towards this system.

In any case, whichever interpenetration of educational systems we will face in the future, there's a need for a solid base for mutual understanding at all levels. That is why a well thought-out policy of language education is becoming more important and should become a part of the APEC project.

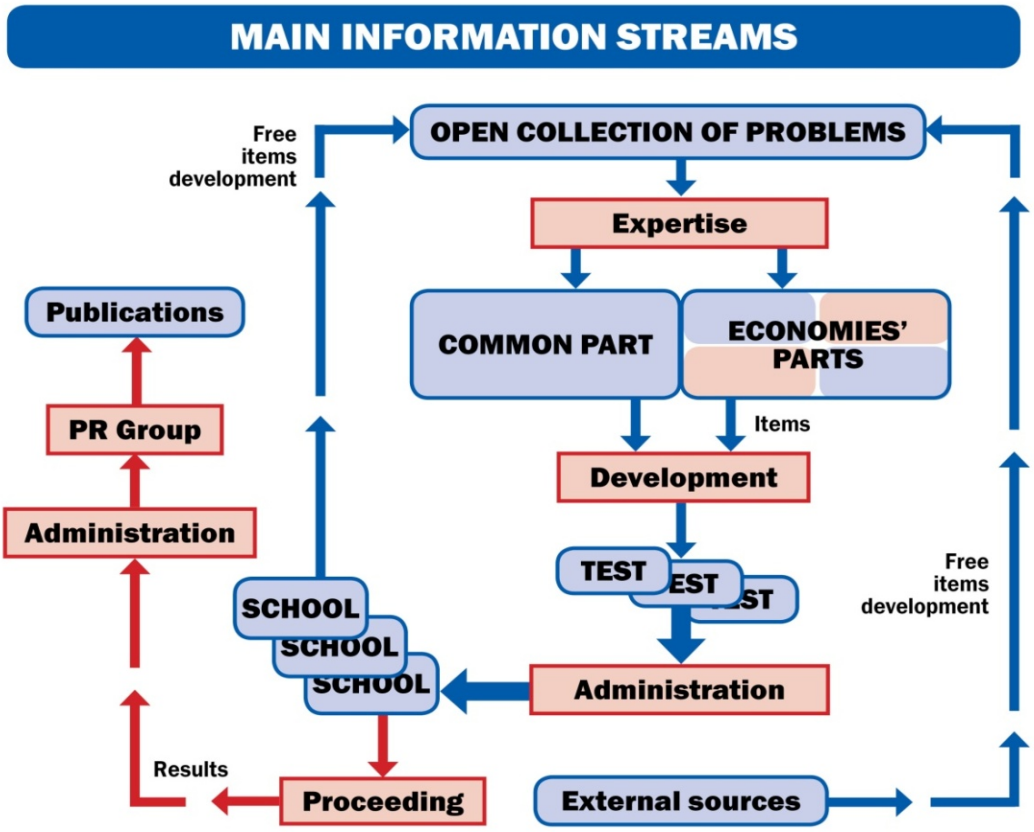
Key research

The data bank would be formed and the exchange of experience will start take place in a pilot project of APEC math quiz. Every school in APEC economy would be able to participate in the project (voluntarily). It is assumed, that the quiz will take place twice a year. Around a half of problems would be formed by an international committee. APEC economies would take turns to form the rest pool of problems.
Another important element of the project would be constructing an environment for remote interaction and cooperation for teachers.

1. In the context of the APEC economies co-operation in the area of education, an open system for access to the educational resources and to indices of quality of math education, which are supposed to become a part of open environment of math education in the APEC region, is proposed to be formed. Forming such an environment in the APEC region would promote the level of teaching and population's math literacy. It will also induce popularization of math education. In the course of future development the system will include recourses in the area of natural science, culture and languages of APEC economies.

Structure of the working group, which ensures the Open access to educational resources system operation

2. The system should include an open bank of mathematical problems for tests, exams and math progress monitoring and be gradually expanded by project participants. Each problem must include various attributes and descriptors, such as the age of the pupil, number of students that took this problem on the exam, percentage of students having successfully passed the exam. The bank would contain all the tools for implementation and monitoring of the assessment.



The scheme of major information flows of the System

3. It is proposed to run an open pilot research on students' math education progress in APEC economies in October 2012. The research would be based on the materials that are developed in collaboration with Russian Federation, United States of America and Thailand. It is proposed that any school submitting the application would be able to participate. The decision on participation in the research must be taken on a level of school headmaster provided that the economies' government agrees. One of the main goals of this research is to examine the perspectives of collaboration and interaction and also to estimate the expected start results of the whole project.

The project would enable to study the dynamics of educational progress for every individual and will also provide the data for monitoring of the level of math education within one economy and the whole region. APEC economies may be interested in the proposed environment's

comparison studies (as an addition to PISA research and others) in order to enrich and modernize the education content providing increase in students' mobility and the educational process management.

New directions and recommendations

According to the goals declared above, a set of measures is proposed to be implemented:

1. Research of common and individual problems that Economies face in the field of math and language education and looking into the optimal ways of collaboration
2. Creating a common educational space, that includes common bases of educational materials as much as common approach of realization of educational goals.
3. Selecting target groups of students that are motivated to achieve certain level of math and/or science education.
4. Developing a common procedure to evaluate the progress of each target group on each subject. These procedures must be based on modern mathematical methods and estimation theory.
5. Developing feedback mechanisms that will simplify decision-making process and make it possible to modify the educational space as a reaction to changes in it.
6. Creating a search engine that will facilitate the search and development of gifted students in APEC framework, that includes running Olympiads, supervise extracurricular activity, publishing popular and semi-popular literature for students as much as developing methodology of getting students involved in research in the field of mathematics
7. Creating a system of refresher training for teachers, that works according to unified standard in the APEC framework.

Creating and putting into operation the joint open bank of math problems would help to meet these points.

It is proposed to develop the joint open bank of math problems in several stages:

1. Creation of international project group. Its aims would be:
   - To define the target groups of individual and corporate users of the future system;
   - To define the properties and develop the structure of the database (including defining types and constructive elements of problems).
   - Developing means of database operating for each target group;
   - Developing technical requirements for the System.
   - Developing specifications for data input subsystems, and presenting results of assessment procedures.

2. Expertise and project adjustment based on the results.
3. Creating an international working group, whose aims are:
   - To create a database prototype;
   - To create a multilingual system program shell that facilitates various means of interaction between user and the database.

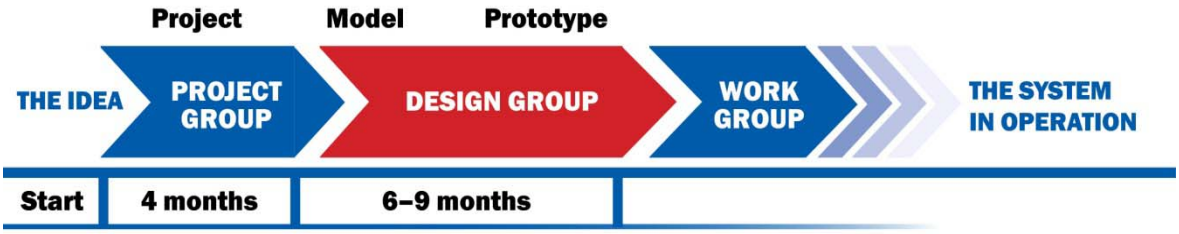
- To develop means to regulate interaction between system components and users and system components and operational team of experts.
- To developing technological documentation

4. Expertise, testing and modifying system prototype based on expertise results.

5. Creating and training an international operational team for methodological and technical support of the project.

6. Developing regulations on interaction between participating economies that include defining test procedures and their processing results with dates, periodicity and duration. Defining structure and content of the conducted research report.

7. Making the open bank of problems available on computers, laptops and e-books (alike the idea that came from Japan and Thailand on 34th Human Resources Development Group Meeting).



The timeline

Teacher interaction environment

The system that is about to be created should not be restrained to problem collection and storage, to carrying out the research. Another important thing is the informational subsystem that allows education administration institutions, teachers and all the concerned individuals to communicate and actively participate in system development. The subsystem can be implemented as a specialized web-site (or a group of web-sites) that contains the following components:

- on-line Information and methodological support for the project that gives the access to database of problems and various levels of test procedures;

- operational reports on implemented research with comments and recommendations from experts;
- on-line forum on professional teacher communication.

Further opportunities

1. Developing and introducing similar systems of educational resources access in other educational areas – in science, languages and cultures.

2. Developing teacher preparation programs and programs on working with gifted pupils based on the research results.

3. Gradual transition to unified educational space, that unites all the APEC economies' education systems on a base of uniform understanding of math and science education goals, bearing in mind the regional and other participants' features.

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Asia-Pacific
Economic Cooperation

2012/AEMM/XXX
Agenda Item:

APEC 2012 Education Ministers'

Language and Culture Education Paper

Purpose: Consideration
Submitted by: Peru

5th APEC Education Ministerial Meeting
Gyeongju, Korea
21-23 May, 2012

5th APEC Education Ministerial Meeting
AEMM 2012 KOREA

APEC 2012 Education Ministers'

Language and Culture Education Paper

Background

In a world that relies increasingly on the development of knowledge to drive economic growth, 21st century skills such as critical thinking, pattern recognition and communication have high value in the workplace. Today's learners, youth and adults, need strong interpersonal and communication skills that enable them to function in teams that may have members spread across more than one location, even across two or more economies.

> *"Globalization and modernization are creating an increasingly diverse and interconnected world. To make sense of and function well in this world, individuals need for example to master changing technologies and to make sense of large amounts of available information. They also face collective challenges as societies – such as balancing economic growth with environmental sustainability, and prosperity with social equity. In these contexts, the competencies that individuals need to meet their goals have become more complex, requiring more than the mastery of certain narrowly defined skills."* (DEELSA 2003: 4)

Developing a strong network of language and culture experts is essential for supplying workers for the globalizing economy. Globalization in today's world has bridged many gaps in terms of geography, languages, and cultures. Our lives today both depend on and influence the lives of people we don't know, thousands of kilometers away from us. Information and communication technologies are continually changing, improving, creating new social and working conditions. People today can now find themselves face-to-face with one another or access information from the other end of the world in just a few clicks. Workers and learners now connect in virtual meeting and learning spaces to build solutions to theoretical and

real-life problems. Such uses of technology demand both technical capacity and social abilities.For these collaborations to succeed, the collaborators must, metaphorically and actually, speak the same language. Further, in order to solidify and build business partnerships and relationships that will expand the economy, workers and learners must have an understanding of the cultural norms of the people they are working with across the globe.

APEC has made learning each other's languages an education priority since 2004. In 2010, APEC held the APEC-SEAMEO Language Conference, entitled: “Language Education: An Essential for a Global Economy,” to discuss the relevance of a multilingual education in a global economy.[1] The overall consensus from the conference was that multilingual education is becoming increasingly important not only for the purpose in and of itself, but also for purposes of economic success in a global workforce..

APEC also implemented the *Best Practices Language Applications Lesson Study Project* which analyzed the best practices for professional development in language education using lesson study. A DVD Workshop on Lesson Study, called *Study of Best Practices in Teaching and Learning Languages in APEC Economies*, was prepared for key language educators and primary and secondary school language teachers in APEC Member Economies. Distribution of the DVD provides widespread access to examples of lessons used to teach languages so that teachers have access to professional development materials from the cultural perspectives of member economies. .

Additionally, APEC set out the *Strategic Plan for English and Other Languages* project which addressed language education in each of the major dimensions of learning such as content standards, assessment (including performance standards), curriculum and instruction, and

[1] See the APEC-RELC International Language Seminar page on the APEC Wiki for more information about this project: http://hrd.apec.org/index.php/APEC-RELC_International_Language_Seminar

policy, as well as exchange programs.[2]Activities in this project included collecting language learning standards from the Member Economies, promoting and extending the APEC E-Language Program and inventorying student foreign language assessments. The APEC Knowledge Bank also features programs on the importance of knowing Business English and developing cross-cultural competencies.[3]Together, these programs have sought to emphasize the importance of language and culture education and their specific connections to economic placement and opportunities.

APEC Agenda Motivation

Our globalized world connects diverse cultures, not only because it has fostered intercultural contacts but because of the new inter-dependencies it has generated, these being political, economic, environmental, and work-related contexts. We now belong to an inter-dependent community in which individual and national actions and decisions affect countries and citizens in other places of the world. In this respect, we need to exercise our liberties and enhance our responsibilities in a global scope.

Bearing in mind the specificities of today's world and the objectives and goals of APEC, the 21 APEC Leaders defined Five Growth Attributes:

- Balanced Growth
- Inclusive Growth
- Sustainable Growth
- Innovative Growth
- Secure Growth.

[2] See the Strategic Plan for English and Other Languages page on the APEC Wiki for more information about this project: http://hrd.apec.org/index.php/Strategic_Plan_for_English_and_Other_Languages

[3] These materials were developed for International Education Week. For more information about this project, please see the International Education Week page on the APEC Wiki: http://hrd.apec.org/index.php/International_Education_Week_2010

For education, Inclusive and Innovative Growth are often seen as the most relevant attribute areas. These areas support economic growth through supply-side policies that provide education and training opportunities designed to give present and future workers access to essential employability skills and 21st century skills that can further APEC goals/priorities. Taking into account these attributes, the development of language and intercultural skills is considered a priority to meet the challenges of globalization. In an increasingly interdependent world, individuals need to be able to engage with others, and since they will encounter people from a range of backgrounds, it is important that they are able to interact in heterogeneous groups. Individuals need to be able to take responsibility for managing their own lives, situate their lives in the broader social context and act autonomously. (DEELSA 2003: 5)

Competency in these subjects will help individuals qualify for a variety of positions in a wide range of industries and will be useful throughout one's life. Moreover it will generate a sustainable development dialogue from diverse societies, cultures, and ways of thinking. Language and cultural competencies contribute toward the accomplishment of APEC goals to develop a labor force that can meet the job opportunities that economic integration will offer. It will also foster development of sustainable, inclusive, and green growth by promoting capacity-building to manage oneself in culturally diverse contexts and to respond to the world's economic, political, social and environmental issues through actions.

Currently businesses conduct commerce in more than one economy and must continually adapt to changing economic conditions. Workers must be able to communicate and negotiate in more than one language. A 2005 survey of international executive recruiters found that nearly 88 percent of recruiters in Asia and 95 percent of recruiters in Latin America agreed that speaking two or more languages fluently is necessary for success in a competitive job

market (Korn/Ferry, 2005). Recruiters also felt that knowing a foreign language would become increasingly important in the next decade and would give business executives “a significant competitive advantage” (Korn/Ferry, 2005).Education can respond to emerging reality by providing authentic language instruction supported by teacher training and innovative instructional technology. Knowing a foreign language also promotes cross-cultural collaboration and communication, providing an ideal setting for cooperation across multiple economies.

Language and intercultural education is the key to addressing the challenge of cultural diversity in regional integration because it addresses our need to understand and learn from one another, while promoting a citizenship that is responsible for its local and global relevance. In all, language and culture education contributes toward the accomplishment of the APEC goals to develop a labor force that can meet the job opportunities that economic integration will offer.

> *“The economic, environmental, religious and political problems that we are facing are global in scope. It is altogether hopeless to think of solving them if the people who are remote from one another don’t unite to cooperate like they have never done before. Let’s take the example of global warming, international trade schemes, environmental and species protection, the future of nuclear power, the dangers of nuclear weapons, labor flows, the elaboration of decent work standards and child protection from sexual exploitation and abuse. Addressing these issues for real requires the existence of a multi-national dialogue.”*(Nussbaum 2010: 114)

In terms of inclusive growth, we should also bear in mind as a ruling principle addressing social processes based on the recognition of the right to diversity, in opposition to any kind of discrimination or social inequality, developing dialogic and equitable relationships among the

members of culturally diverse worlds. Intercultural competencies enable individuals to thrive in cross-border educational situations, as they are led by respectful curiosity and interest towards participating in a space of cultural exchange and professional development.

In terms of secure growth, intercultural education provides the necessary tools to develop a culture of dialogue that can go beyond the prejudices and stereotypes that condition human relationships through the use of critical, creative and sympathetic thinking. Acknowledging that all human beings are equal, that we all share the same human abilities such as the ability to imagine, to feel and to reason, is the first step towards respecting, valuing and developing a respectful curiosity towards the diversity of cultures and people. In doing so, cultural contact turns into an opportunity for personal enrichment and global collective benefit rather than fostering attitudes that can lead to conflict.

> *"The ideal of interculturality is based upon the challenge to engage all the cultures without limiting itself to just promoting mutual respect between them: it aims to foster dialogue, not just tolerance."* (Alfaro 2008: 208)

The 2012 Pre-Ministerial Symposium Thematic Overview Paper identified three themes: globalization, innovation and cooperation. APEC's Education Ministers and its Education Network (EDNET) aim to encourage educational practices that address these themes through a set of four priorities; one priority emphasizes 21st century skills of subjects including mathematics, science, language, and culture education. Success in a knowledge-based economy is a primary goal of education. To achieve success, students must master future skills, such as fluency in a foreign language as well as competency in a foreign culture to navigate commerce in multiple economies. Foreign Language Education and Intercultural Education are critical components for students to achieve college and career outcomes in a

globalizing society.

- **Globalization.** In terms of globalization, language and intercultural education will provide citizens with the necessary competencies to know how to successfully adapt and adjust to cultural contexts. Intercultural education doesn't only lie in transmitting knowledge on cultural diversity, but primarily aims to train individuals in the skills and attitudes necessary to become a truly intercultural person.

- **Innovation**. In terms of innovation, language and intercultural education makes innovation possible from the very heart of the various cultures and their creative experience. Thanks to critical and creative thinking, individuals are aware of their own culture's knowledge and of how it can benefit humanity. In this respect interculturality is key to innovation and problem-solving because it draws from a diverse set of ways of thinking.

- **Cooperation.** In terms of cooperation, language and intercultural education is aimed at promoting dialogue and exchange between cultures. It is intended to overcome cultural impositions as well as to bridge the gap of social inequality and to foster cultural inter-learning between people and between societies and nations. It can pave the way to legitimized local, national, regional and international projects, each of them holding different development visions.

Key Research

Education priorities must change in accordance with the changes in the nature of work.Studies in the US and Canada find that introducing children to foreign languages benefits ultimate proficiency in those languages, cognitive development, and performance in other content areas and on standardized assessments (Lazaruk, 2007; Soderman 2005; Stewart 2005;

National Education Association 2007; Jackson and Malone 2009).Effective communication in a foreign language requires full fluency and proficiency when students graduate from high school.

Elementary/primary and secondary foreign language programs must be well articulated and use a sequenced curriculum that builds on learner knowledge from year to year can maximize instructional impact (American Council on the Teaching of Foreign Languages 2011; Pufahl and Rhodes 2011; Lenker and Rhodes 2007). Norwood and O'Connell (2007) argue for enhanced articulation of elementary/primary and secondary language programs, to: (a) provide learners with opportunities for more advanced level and more in-depth area and language studies, and (b) help students who reach fluency in foreign languages and cultures experience enhanced career opportunities and competitive advantages in the workforce. Singapore has a strong example of a language program that is comprehensive and well-articulated. Children are provided content and language instruction in English and a "Mother Tongue" through all levels of schooling (Rubdy and Tupas, 2009). Such examples of a systematic approach to language learning supports APEC economic interests, as workers who can communicate well in multiple languages are more competitive.

Many non-English speaking APEC economies have already instituted programs that place special focus on learning English, as this is the primary language of the global economy. As a part of a mid-1980's strategic economic strategy, Singapore required all students to learn English and uses English as the official language of instruction (Suarez 2005). Additionally, China uses a program of teaching students content instruction using a foreign or second language with the intent of mastering the language, as well as the subject knowledge (Xiong and Shao 2009). There are actually more people learning English in China than in any other economy, including the U.S. Additionally, researchers in the U.S. have found that having English as a second language is one of the biggest economic success indicators of

immigrants or minority groups in the U.S., Canada, and Australia (Chiswick 2008). According to the U.S. Census, Average Foreign-born Income in the U.S. is significantly higher for adults who are proficient in English (Nadkarni, 2010).

English has become a standard international language. English is important for trade and commerce: as the numbers of English speakers in a Non-English speaking country increase, the amount of trade between the US and the Non-English speaking country increases (Melitz, 2005). Additionally, English has become increasingly important for diplomacy:key international bodies such as the United Nations (Secretariat), APEC, The Asia-Pacific Economic Cooperation (APEC), The Association of Southeast Asian Nations (ASEAN), the International Criminal Court, and the North Atlantic Treaty Organization for Economic Cooperation and Development have adopted English for their working language. Thus, knowing English can be beneficial in both industry and diplomacy and can provide a multitude of additional opportunities for the job seeker. The U.S. Department of State has partnered various organizations, such as Teachers of English to Speakers of Other Languages (TESOL) that promote English language learning opportunities. These programs are taking place across the globe in economies such as Thailand, China, Peru, Mexico, and Chile (Brady, Scacco, and Scholz 2010).

The cultural aspect of learning a language results aint myriad benefits, too (National Education Association 2007). Learning about a foreign culture in conjunction with that culture's language provides an important context that in turn helps engage students and create more authentic learning experiences. This cultural understanding promotes increased global awareness and respect for cultural differences (Jackson and Malone 2009). Cultural education is linked to language learning because second language competency requires intercultural contact, and also because of the benefit and overall value that it constitutes in helping the foreign language speaker participate and be accepted in the life and society of the native speakers. The

development of intercultural competencies requires putting into practice an intercultural education system that develops individuals' intercultural skills along with knowledge.

Intercultural education should also be understood as an ongoing learning endeavor that can build and foster mutual respect beyond cultural and social differences (Walsh 2001). As was framed earlier in this paper under the *APEC Context*, intercultural education helps individuals to:

- relate well to others,
- co-operate and work in teams,
- manage and resolve conflicts,
- act within the big picture,
- form and conduct life plans and personal projects, and
- defend and assert rights, interests, limits, and needs.

Cultural understanding and awareness can also play a large role in commerce and trade. Research has shown the levels of trade within religious groups are higher on average than levels of trade between religious groups in East Asia (Guo, 2007). This demonstrates that there may be some hesitation to trade or engage with people from outside of one's own religious or cultural group. Therefore, raising awareness about other's cultures and religions and trying to breakdown these barriers can help to increase trade. And, if we give students the tools necessary to be able to do this, they will have unique opportunities to cross religious and cultural lines.

As the skills demanded in a globalizing market become more knowledge based, schools must implement innovative instructional programs. For example, technological competenceis a current reality that will only continue to grow. Technology is changing; in addition to equipping

students with the skills to use current technology, educators must provide them with the skills to prepare for and help create future technology.In secondary schools in the US, using classroom-based technology to teach foreign language has increased significantly (Pufahl and Rhodes 2011). In China, a recent study found that teaching a language through a computer-based gaming approach increased language proficiency and student motivation to learn the target language (Green, Sha, Liu, 2011).Technology as an integral aspect of instructional strategy reflects shifting trends and paradigms in education and addresses practical concerns such as teacher shortages and budget restrictions (Nielson, Gonzalaz-Lloret, and Pinkney 2009; Winke, Goertler, and Amuzie 2010). Distance courses and blended online (hybrid) courses create a flexible teaching model in which one instructor can reach multiple classrooms in multiple schools. This allows more students to participate, including those in rural or low-income areas, and more languages to be offered, without increasing the demand for personnel.

According to the Partnership for 21st Century Skills, global awareness and multilingual proficiency will be essential in preparing students to both find opportunities for themselves in the global marketplace and also to be engaged and effective citizens of the world. A central part of this education is utilizing technology in an educational framework- to both facilitate teaching and give children experience with 21st century technology that they will need to be able to work with in their future careers and endeavors. The Partnership for 21st Century Skills calls this type of learning ICT (Information, Communications, and Technology) Learning and they rank this as one of the most important types of learning that should be done in the classroom.[4]

To promote cooperation and collaboration, educators and policy makers should examine successful foreign language and cultural education programs and policies from other

[4] Please see the Partnership for 21st Century Skills "Skills Framework" for more information http://www.p21.org/overview/skills-framework

economies. The average age for the introduction of second languages merits consideration. In the APEC region second language instruction typically begins in grade 3, while in Hong Kong, China, Malaysia, Singapore, and Thailand second language instruction starts in Grade 1 (Chen et al. 2011). Most European Union (EU) countries introduce foreign language instruction in primary grades, and recent efforts have encouraged school systems to require instruction in two foreign languages (Commission of the European Communities 2008). In 2007, 60 percent of EU secondary students were studying at least two foreign languages (Eurostat 2009). In the United States, only an estimated 41 percent of secondary students are enrolled in at least one foreign language (Pufahl and Rhodes 2011). Cultural instruction can also be used in conjunction with the foreign language instruction in order to enrich and round out the language instruction.

Professional development programs are essential in supporting teachers to effectively place emphasis on language and culture education. Lesson study has long been a well-respected method of professional development since it was first developed in Japan over a hundred years ago. Researchers at Columbia University's Teachers College Lesson Study Research Group have studied the merits of Lesson Study and have reported that lesson study is a valuable technique for evaluating and analyzing teaching methods in the classroom and has been particularly effective in the Japanese education system (Fernandez, 2002). Lesson study is not only important for distilling best practices, but also helps to create a professional learning community. This gives teachers the opportunity to reflect on their own strengths and weaknesses, help reduce stress, and help to allow teachers to plan ways to incorporate best practices in their own teaching methods.

Students must reach advanced proficiency in languages and cultures to be competitive job candidates in a global economy. Instructional programs must be well articulated and designed based on successful, evidence-based programs that are already producing bilingual and

trilingual students. There is a lack of research about effective instructional models and strategies for teaching foreign language (Jackson and Malone 2009). Starting in early primary grades, researchers should further investigate the extent to which different program interventions impact language learning and other content learning over time. As more and more technology is implemented in the classroom, additional studies should be conducted to determine how technology is implemented and how technology-based interventions influence learning.

New Directions/Recommendations

Learning a foreign language has cognitive and academic benefits and can help to advance cultural study and build the 21st century skills needed for careers in a global market, with the extra benefit of improving general learning. Additional studies are needed to determine the most effective policies, programs, and strategies for teaching foreign languages and cultural instruction. Findings from these studies can inform the design of coherent, consistent, and well-integrated models for teaching foreign language at the elementary, secondary, and postsecondary levels. The models should also reflect the demands of an increasingly digital society by incorporating effective and innovative instructional technology.

Action 1: Research the economic benefits and advantages of foreign language acquisition and cultural understanding for individuals and communities with detailed analyses of:

- Different market sectors and what foreign language and culture skill gaps exist within those sectors
- What levels of proficiency required to achieve different levels of economic gains/wage earning potential
- What specific languages are more beneficial for economic gains

Action 2: Examine systematic approaches to language learning and cultural education including examining articulation of language programs from K-16including:

- Comparisons of how different economies align key system components (i.e. textbooks, teacher development, assessments, etc.) to systematically implement language programs over the academic career of students
- Comparisons of how different economies differentiate foreign language instruction for students on various academic and vocational pathways
- Design teacher training and counseling programs on pedagogy (curriculum, programming, lesson preparation, teaching methods, assessment, etc.)
- Identify learning processes from different cultures and cultural perspectives
- Develop research on pedagogical assessments measuring the quality of students communication skills as well as social interactions in the classroom

Action 3: Support programs implementing models infused with instructional technology innovation including

- the exploration and replication of successful instructional methods from other economies and support experimental and other rigorous research studies to determine the effectiveness of specific program interventions to maximize their impact on foreign language teaching.
- Identifying promising practices in teacher preparation and teacher development for blended learning environments language instruction
- identifying promising practices on using virtual environments to facilitate cooperative learning models of foreign language and cultural exchange including cooperation on the classroom level and cooperation on the individual student level

Action 4: Enhance the portal on the APEC wiki devoted to language acquisition

and multi-cultural education that provides the most up-to-date research, issue briefs, articles, and commentaries from the APEC member Economies.

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Asia-Pacific
Economic Cooperation

2012/AEMM/XXX
Agenda Item:

TVET and the Higher Education Quality

Purpose: Consideration
Submitted by: China and Philippines

5th APEC Education Ministerial Meeting
2012 KOREA

5th APEC Education Ministerial Meeting
Gyeongju, Korea
21-23 May, 2012

TVET and the Higher Education Quality

I. Background on the Priority Area

A. Technical Vocational Education and Training[5]

1. General Background

APEC members have achieved impressive growth rates in recent years. According to Forbes magazine, about one-third of the 2000 largest companies in the world are now based in Asia. ADB's recent study[6] projects that by 2050, Asia could account for 51% of world GDP (27% in 2010), with a six fold increase in per capita income, to reach European levels of today. However, Asia is also home to the largest number of the worlds poor. Unemployment and underemployment remain vexing issues. Assuring sustainable and quality jobs still is one of the most important policy imperatives of current times. Education and training are occupying center stage in public policy and private investment more than ever before[7]. Whether developed or developing, APEC economies are concerned with finding the appropriate talent for jobs and building a highly skilled workforce to maintain and increase their competitive strength in global markets.

A number of APEC economies have reached or are approaching middle income levels. The structural transformation, such as the share of manufacturing and services in GDP and employment, is ongoing and diverse. Some economies have pursued policies of industrial upgrading and diversification towards more sophisticated products which increase labor productivity, while others have pursued service-led growth. These economies need to consider aligning TVET policies with economic and industrial polices to sustain growth, productivity and competitiveness. There is the need for re-engineered, modernized, and innovative TVET system, contributing to employability and sustainable livelihoods.

2. TVET Situation of 10 Economies[8]

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[5] Technical and Vocational Education and Training (TVET) is concerned with the acquisition of knowledge and skills for the world of work. Throughout the course of history, various terms have been used to describe elements of the field that are now conceived as comprising TVET. These include: Apprenticeship Training, Vocational Education, Technical Education, Technical-Vocational Education (TVE), Occupational Education (OE), Vocational Education and Training (VET), Professional and Vocational Education (PVE), Career and Technical Education (CTE), Workforce Education (WE), Workplace Education (WE), etc. Several of these terms are commonly used in specific geographic areas.

[6] ADB. 2011. Asia 2050-Realizing the Asian Century. Asian Development Bank, Singapore.

[7] Stephen P. Groff. Vice president of ADB Speech on December 12, 2011

[8] The P. R. China designed a survey in November, 2011. Ten economies answered and returned the survey to PRC by the end of 2011. They are: Australia, Brunei Darussalam, Chile, the People's Republic of China, Indonesia, Japan, Mexico, New Zealand, Chinese Taipei, and the United States.

China developed and administered a TVET and HEQ questionnaire in 2011. When the information was gathered from the surveys, it was found that different government departments are in charge of TVET in different economies. TVET systems are quite different in economies dealing with the students' age, length of programs, credentials, etc. The large differentiation in the results of the surveys indicate that there may be some ambiguity in the interpretation of the terms used in the surveys. With regards to the different education framework across the APEC economies, survey should be improved to ensure the survey results are comparable across APEC economies. Even so, we can still gain a lot from the survey. If we focus on TVET in the education area, we can gather up the students' age and general enrollment ratio, as follows (see table 1):

<Table 1> Students' Age and Enrollment in the Respondent Economies

Economy	Students' Age	Enrollment
Australia	15-64	6.05% (see note)
Brunei Darussalam	15-22	50%
Chile	15-21	45%
China	15-21	50%
Indonesia	16-18	32%
Japan	15-no limitation	28%(high school level), 22.9%(higher education level)
Mexico	14-17	9.6% at the secondary education level9
New Zealand	15- no limitation	impossible to estimate[10]
Chinese Taipei	15-30	70.88%
USA	14-65	99%[11]

Note: The facts and figures for this group of Australians is as follows: 13.8% are enrolled in higher education; 6.5% are in VET taking an apprenticeship or traineeship; and 5.8% were enrolled in non-apprenticeship publicly funded VET. There is also an unknown number of VET students in non-publicly funded VET places (this data is not available to the National Centre for Vocational Education Research (NCVER), the publicly funded data collection agency))

According to the survey and other research, we found that TVET system in some economies is still separate from other types of education. Some economies (Japan, Australia and New Zealand) offered specialized courses and integrated courses in the secondary level and tertiary level. It is difficult to estimate the TVET enrollment. The USA Students may begin taking classes of a technical and occupational nature starting in the ninth grade, approximately 14 years old. As defined in the United States, "career and technical education" does not extend past an "associates degree," which can be earned ordinarily through a course of study based on two

[9] It is important to mention that the majority of students do attend general high school or technical high school programs that do provide access to higher education.

[10] As many students combine vocational and academic study. TVET is not always provided separately from other types of education.

[11] Almost all secondary students (ages 14 through 18) take some courses that are in the TVET group, although only approximately 20 percent of secondary students concentrate in TVET as a substantial part of their secondary educational program. According to the US Department of Labor; in October 2011, it was just under 70% that high school leavers who progress into Colleges, including to vocational colleges.

full-time years of tertiary training. Workers seeking retraining may reenter education and training programs at any age. Since the traditional retirement age in the United States is generally 65 years old, that figure is used above as an upper limit for the age of trainees; however, some students are older.

Students who access to Tertiary TVET have more varieties in educational backgrounds and ages. Some members' TVET institutions at tertiary level are closely connected to secondary school. In some economies, with their lifelong TVET system, students could access tertiary level TVET by various approaches. Length of the TVET program needed to obtain credentials varies in the different members. It is very flexible in some members. The length of the program at the secondary level ranges from a few months to 3 years, according to the students' need and qualification demands. We can see clearly there are two paths of TVET in APEC economies: integrated system and separate system.

(1) At Secondary level

In Brunei, China, Chinese Taipei and Thailand, students can choose specialized TVET institutions such as secondary vocation schools. Some members offer student vocational courses in the institutions of general education. In Peru, secondary level technical education is given to all students in the last years of Basic Education (upper secondary education) through the curricular area "Education for the Workplace". In New Zealand, Government funding allows schools to provide students with access to vocational training with Tertiary providers and workplace learning with local employers. Australia has arrangements in place for students to undertake apprenticeships at secondary school. Participation in VET in schools peaks at around 16 years of age with 2.4% of secondary school students undertaking a school based apprenticeship and a further 27.3% enrolled in other VET programs.

(2) At Tertiary Level

In China, most TVET at the tertiary level is offered in specialized institutions. Peru's tertiary TVET system is similar to China. The survey also shows that there is a greater proportion of specialized TVET institutions at the tertiary level than at the secondary level. (See table2).

<Table 2> two different paths of TVET[12]

Members	percentage of general educational institutions offering TVET		the percentage of these specialized TVET institutions among the total institutions	
	Secondary	Tertiary	Secondary	Tertiary
Brunei	100%	Will have in 2008	27%	40%
China	<10%	<10%	46%	58%
Hong Kong, China	40%	100%	N/A	100%
Peru	100%	N/A	0%	64.37%
The Philippines	N/A	72%	5.70%	16.10%

[12] By the APEC survey of 2007.

Chinese Taipei	45%	51%	N/A	N/A
Thailand	5%	30%	40%	40%
USA	99%	99%	7%	41%

* Japan and New Zealand have all forms of TEVT in both Secondary and Tertiary Level, but no data available

** In the Australian context it is difficult to disaggregate participation in tertiary studies from participation in vocational education and training. Vocational education and training is delivered by Registered Training Organizations (RTOs) which are accredited and regulated by the national regulator Australian Skills Quality Authority and where appropriate state-based regulators. The RTOs deliver a range of VET qualifications from Certificate 1 through to Graduate Vocational Certificates and Diplomas; a range of qualifications that encompass both "secondary" and "tertiary" qualifications as described by ISCED 2011. Public universities may also be RTOs and deliver both tertiary and vocational education and training.

B. Higher Education Quality

1. Overview

In the context of knowledge economy, information communication technology and globalization in the world, the relationship between the economic growth and higher education is more and more connected. According to the World Bank, the global gross ratio in higher education had increased from 18.1% in 1999 to 27.1% in 2009. The quantitative expansion of higher education was not only from the increasing social demands for higher education, but also from the labor market of human resource for higher education. The importance of the higher education market is increasing greatly and also challenging its development in the competitive ages. During the expansion of higher education in the past two decades, there are always some debates and discussions, especially with regard to the quality of higher education.

In the 21st century, the higher education quality becomes one of the priorities, which the governments, the industries, employers, students and families all are taking into consideration. But, the term "quality" of higher education is difficult to clarify clearly. As Georges Haddad noted, "higher education quality is a very complex issues, including the history and the tradition, the culture and the ancient wisdom, the economy and the employment, the society and the development, as well the individual roles as a citizen" (GUNI, 2007). In the massive higher education era, the higher education quality should be re-defined with academic and practical perspectives.

A seminar titled "Quality in Higher Education: Identifying, Developing and Sustaining Best Practices in the APEC Region" was hold in Hawai'i last year. And now higher education quality had become one of the priorities in educational cooperation areas among APEC. How to implement the priority of higher education quality is an urgent task for all of APEC at all levels including by region, economy, educational system, institution, program and faculty/course.

2. Factors

The higher education is influenced directly and significantly by the knowledge economy and the globalization. And the higher education development in one economy is also constrained with its pattern of economic development, the amount of population, the scale of education and so on. APEC is a diversified region so that the regional features of APEC should be considered when the higher education quality is focused now. The following main features of APEC, especially the external factors relates to higher education quality, should be taken consideration into when we discuss the higher education quality.

（1）Population and growth

It is a mutual cause-effect relationship between the population and the economic & social development perhaps. The population and its growth are not always the positive or negative influence on economic and social development for one economy or a region. In the world in 2009, the total population reached to 6.7 billions and the average percent of population growth was 1.1%. APEC total population is nearly about 40 percent of the world. The differences in population and population growth in APEC members are listed in Table 3.

Table 3: Population and growth among APEC (2009)

Economy	Total Population	Population growth (%)
Australia	22,328,800	2.1
Brunei Darussalam	398,920	1.8
Canada	34,108,752	1.3
Chile	17,113,688	0.9
China	1,338,299,512	0.5
Hong Kong, China	7,067,800	0.4
Indonesia	239,870,937	1.0
Japan	127,450,459	-0.1
Korea	48,875,000	0.3
Malysia	28,401,017	1.6
Mexico	113,423,047	1.3
New Zealand	4,367,800	1.1
Papua New Guinea	6,858,266	2.3
Peru	29,076,512	1.1
Philippines	93,260,798	1.7
Russia	141,750,000	-0.1
Singapore	5,076,700	3.0
Thailand	69,122,234	0.6
United States	309,050,816	0.9
Viet Nam	86,024,600	1.1
Chinese Taipei	23,214,620	2.1

Source: http://data.worldbank.org.cn/indicator/SP.POP.TOTL; http://data.worldbank.org.cn/indicator/SP.POP.GROW/countries

（2）GDP per capita

GDP is always recognized as one of indicators related to social and economic developmental for an economy. In the world, GDP per capita are 9161.1 US$ in 2008, 8586.8 US$ in 2009, 9216.3 US$ in 2010. According to the data of GDP in 2010, United States, China and Japan are the first, second

and third largest economy respectively both in APEC and in the world. But among APEC, there is quite gap of GDP per capita between the developed members and the developing members.

The GDP growth was positive in 2010 for the most of APEC members. This well economic development trend will provide better conditions for higher education development. Meanwhile, this also will bring forward new demands and high criterions for higher education quality.

Table 4: GDP per capita in 2008—2010（unit：US$）

Economy	2008	2009	2010
Australia	48,348	42,131	—
Brunei Darussalam	37,414	27,390	—
Canada	45,003	39,599	46,148
Chile	10,166	7, 948	11,888
China	3,414	3,749	4,428
Hong Kong, China	30,865	29,882	31,758
Indonesia	2,172	2,272	2,946
Japan	38,212	39,456	43,137
Korea	19,162	17,110	20,757
Malysia	8,066	6,909	8,373
Mexico	9,909	7,880	9,166
New Zealand	27,599	29,352	—
Papua New Guinea	1,223	1,181	1,382
Peru	4,456	4,412	5,291
Philippines	1,925	1,836	2,140
Russia	11,700	8,615	10,440
Singapore	39,136	36,758	43,867
Thailand	3,993	3,838	4,613
United States	46,971	45,745	47,184
Viet Nam	1,070	1,130	1,224
Chinese Taipei	—	—	—

Sauce：http://data.worldbank.org.cn/indicator/NY.GDP.PCAP.CD

（3）Internet users

Information and communication technology has brought new opportunities for the world and the society. Internet is becoming an important indicator that measures the social development and individual living. Internet user with access to the worldwide network is adopted as a new indicator of the development, the amount of internet users per 100 people. Another detailed indicator is the amount of users with broad band per 100 people. According to International Telecommunication Union, the average levels of internet users are 27.1 in 2009, and the amount of users with broad band is 7.3 in the

world.

Table 5：Internet users among APEC（Unit: per 100 people）

Member	Internet users			Internet users with broad band		
	2007	**2008**	**2009**	**2007**	**2008**	**2009**
Australia	67.9	70.6	71.8	22.92	24.65	24.6
Brunei Darussalam	46.2	69.4	81.4	3.08	4.39	5.11
Canada	72.8	75.3	77.7	27.52	29.55	29.55
Chile	31.0	32.5	34.0	7.83	8.50	9.82
China	16.1	22.5	28.8	5.04	6.29	7.78
Hong Kong, China	57.2	59.1	61.4	27.42	28.13	29.42
Indonesia	5.6	7.7	8.4	0.34	0.42	0.72
Japan	74.1	75.2	77.7	22.15	23.58	24.86
Korea	78.0	80.2	80.9	30.36	31.84	33.54
Malysia	54.7	54.8	56.6	—	—	—
Mexico	20.2	21.0	25.4	4.18	6.86	8.86
New Zealand	69.2	71.4	83.4	20.17	21.43	22.73
Papua New Guinea	1.8	1.8	1.9	0.00	0.00	—
Peru	24.9	25.0	28.1	2.02	2.55	2.83
Philippines	6.0	6.2	6.5	0.56	1.16	1.88
Russia	24.6	32.0	42.1	3.45	6.54	9.09
Singapore	67.7	69.6	73.3	19.53	20.73	22.52
Thailand	19.8	23.6	25.5	1.35	1.39	1.45
United States	73.5	75.8	78.1	23.28	25.27	27.78
Viet Nam	20.9	24.2	26.8	1.54	2.41	3.74
Chinese Taipei	—	—	—	—	—	—

Sauce: http://data.worldbank.org.cn/indicator/IT.NET.USER.P2/countries

In table 5, the digital gap in ICT should be mentioned. ICT will be a possible key factor which influences seriously the higher education development both in quantitative expansion and in qualitative improvement.

（4）Gross enrollment in higher education

Gross enrollment is an indicator which shows the scale and the access in tertiary education. Based on World Bank statistic data, the average global gross enrollment in tertiary education has been increased from 18.1% in 1999 to 27.1% in 2009， and there is a quite differences among APEC. .

Table 6：Gross enrollment in the tertiary education among APEC（Unit：%）

Member	2007	2008	2009
Australia	22	23	25
Brunei Darussalam	15	16	17
Canada	—	—	—
Chile	52	55	—
China	22	23	25
Hong Kong, China	43	56	57
Indonesia	18	21	24
Japan	58	58	59
Korea	96	98	100
Malysia	32	36	—
Mexico	26	27	28
New Zealand	79	78	84
Papua New Guinea	—	—	—
Peru	—	—	—
Philippines	—	29	—
Russia	75	77	—
Singapore	—	—	—
Thailand	46	45	45
United States	82	83	86
Viet Nam	18	19	20
Chinese Taipei*	85.13	83.18	82.17

Sauce: http://data.worldbank.org.cn/indicator/SE.TER.ENRR/countrie
*http://www.edu.tw/statistics/content.aspx?site_content_sn=27359

The enrollments in higher education among APEC all are rising steadily, but there are still big gaps among different economies, and the growth rates are not same. The more critical issue is that how about the relationship between the quantity and the quality. In the transition from elite stage to massive stage in higher education, there is a lot of question or blame on higher education quality inevitably.

（5）Expenditure per student

Usually, public expenditure per student is the public current spending on education divided by the total number of students by level, as a percentage of GDP per capita. Public expenditure includes government spending on educational institutions (both public and private), education administration

as well as subsidies for private entities. This level of expenditure is called the input level in education. The table 5 is a list of expenditure per student in tertiary education among APEC. The necessary input is important, but not means that the more in expenditure, the better in quality.

Table 7：Expenditure per student in tertiary education among APEC

(Unit: % of GDP per capita)

Member	**2006**	**2007**	**2008**	**2009**
Australia	20.6	20.2	19.8	—
Brunei Darussalam	—	—	—	—
Canada	—	—	—	—
Chile	11.8	11.5	12.1	—
China	—	—	—	—
Hong Kong, China	57.2	38.5	28.6	56.3
Indonesia	—	18.7	16.2	—
Japan	19.1	20.1	20.9	—
Korea	9.5	9.0	10.1	—
Malysia	59.6	49.4	33.9	—
Mexico	35.3	37.0	—	—
New Zealand	25.9	28.1	—	31.0
Papua New Guinea	—	—	—	—
Peru	10.9	—	—	—
Philippines	—	9.5	—	—
Russia	13.2	—	14.2	—
Singapore	—	—	—	27.3
Thailand	29.3	—	22.0	22.3
United States	25.0	21.7	21.1	—
Viet Nam	—	—	61.4	—
Chinese Taipei	—	—	—	—

Sauce: http://data.worldbank.org.cn/indicator/SE.XPD.TERT.PC.ZS/countries

（6）Ratio of female to male

Gender is an important factor in education. Education equity includes the gender equity certainly. The table 6 is about the ratios of female to male tertiary enrollment among APEC, which come from UNESCO Institute for Statistics. The global average ratio in tertiary education is 108.2 in 2009.

Anyway, the gender equity or gender sensitivity should be taken into consideration while the higher education quality is addressed.

Table8： Ratio of female to male tertiary enrollment among APEC

Member	2007	2008	2009
Australia	128	130	133
Brunei Darussalam	187	197	173
Canada	—	—	—
Chile	101	103	106
China	100	104	107
Hong Kong, China	99	101	101
Indonesia	99	92	96
Japan	88	88	89
Korea	67	69	70
Malysia	130	130	—
Mexico	98	98	98
New Zealand	146	146	145
Papua New Guinea	—	—	—
Peru	—	—	—
Philippines	—	125	—
Russia	136	136	135
Singapore	—	—	—
Thailand	124	122	124
United States	143	141	141
Viet Nam	100	98	99
Chinese Taipei	105	106	107

Sauce: http://data.worldbank.org.cn/indicator/SE.ENR.TERT.FM.ZS/countries

（7）Labor force with tertiary education

The ultimate result of higher education quality should be transferred into the performance of labor force. Labor force with tertiary education is the proportion of labor force that has a tertiary education, as a percentage of the total labor force. This data always be seen the evidence which is able to promote the economic growth.

Table 9: Labor force with tertiary education (of the total) in 2007 （Unit: **%** ）

Member	Total	Male	Female
Australia	33	25	37

Brunei Darussalam	—	—	—
Canada	46	41	52
Chile	25	22	31
China	—	—	—
Hong Kong, China	26	25	26
Indonesia	7	6	8
Japan	40	40	39
Korea	35	38	31
Malysia	20	17	26
Mexico	17	16	19
New Zealand	37	33	43
Papua New Guinea	—	—	—
Peru	34	36	32
Philippines	28	24	34
Russia	53	45	61
Singapore	24	23	24
Thailand	—	—	—
United States	61	58	64
Viet Nam	—	—	—
Chinese Taipei	—	—	—

Sauce ： http://data.worldbank.org.cn/indicator/SL.TLF.TERT.ZS
http://data.worldbank.org.cn/indicator/SL.TLF.TERT.FE.ZS
http://data.worldbank.org.cn/indicator/SL.TLF.TERT.MA.ZS

（8）Unemployment with tertiary education

Unemployment is related to the education sometimes, but there is still unemployment with tertiary education. This is a complex problem. Is there any relation between higher education quality and unemployment? At least, from Table 10, the gender gap in unemployment with tertiary education is obviously. In the labor market, the female with higher education seems to be in disadvantage, compared to male with higher education.

Table 10： Unemployment with tertiary education in APEC in 2007（unit：%）

Member	Total	Male	Female
Australia	18	15	21
Brunei Darussalam	—	—	—
Canada	31	27	37
Chile	25	21	29
China	—	—	—

Hong Kong, China	17	15	19
Indonesia	10	7	13
Japan	33	31	36
Korea	35	34	37
Malysia	25	19	35
Mexico	23	20	27
New Zealand	27	24	30
Papua New Guinea	—	—	—
Peru	38	36	39
Philippines	39	37	45
Russia	32	26	40
Singapore	43	40	48
Thailand	—	—	—
United States	46	42	50
Viet Nam	—	—	—
Chinese Taipei	—	—	—

Sauce: http://data.worldbank.org.cn/indicator/SL.TLF.TERT.ZS
http://data.worldbank.org.cn/indicator/SL.UEM.TERT.FE.ZS
http://data.worldbank.org.cn/indicator/SL.UEM.TERT.MA.ZS

（9）Others

Obviously, besides the above factors, there are some factors which are from the inside of higher education system and institutes, such as:

- Faculty (number, quality, education, experience, etc.)
- Types of programs offered
- Relationship with secondary education
- Relationship with business and industry

Anyway, higher education quality is a comprehensive and complex issue.

3. Critical Challenges

According to the statistics above, the socio-economic development status, population size and the ICT development levels of APEC members diverge in an individual sense, which naturally lead to diversified differences in terms of higher education development level. As consequence, when the issue of higher education quality is approached, the diversified pattern demonstrated by members should be kept in mind. In fact, since the accession into the 21st century, great challenges as well as opportunities have been brought along to the development of higher education by speedy social advancement and constantly expanding human needs. As it is found through literature review, the critical challenges existing in higher education quality are listed as the follows.

（1）Multi-dimensional understanding on higher education quality

As it was pointed out in the *World Declaration of Higher Education for the Twenty-First Century: Vision and Action* passed in the first World Conference on Higher Education in Paris in 1998, "Quality in higher education is a multidimensional concept, which should embrace all its functions, and activities: teaching and academic programmes, research and scholarship, staffing, students, buildings, facilities, equipment, services to the community and the academic environment", and "Due attention should be paid to specific institutional, national and regional contexts in order to take into account diversity and to avoid uniformity".

The complexity of higher education quality is best demonstrated by its own nature which is a collective result taking shape under the numerous driving forces. Those areas it concerns apart from teaching and research in an internal sense, also include increasingly profound relativity to social, scientific and technological aspects. Governments, enterprises and employers, higher education institutions, students and parents all play their due part in the great mechanism of higher education quality. Those plentiful of different expectations held towards higher education products give rise to diverse value about this issue, which at the same reflect the differentiation of people understanding.

In the *Declaration about Higher Education in Asia and the Pacific* (Tokyo): "quality is a multidimensional concept and it is not possible to arrive at one set of quality standards applicable to all countries and against which institutions can be assessed." The quality of higher education should be discussed in a dynamic context, rather than an ossified one. And the measurement standard should not be set in an absolute way, but a relative fashion. From a global perspective, the concept itself as well as its measurement standard should be allowed to vary in different economies, regions and levels. Uniformity is inappropriate require in the discussion of this issue.

Although the diversity has been recognized by most member regarding the concept of higher education quality and evaluation and recognition system most coordinated to specific reality has been formulated under the principle of pertinence, certain topics, for example, the exact content to be cover by a diversified value of higher education quality, the defining of an applicable concept of higher education quality and how to coordinate diversified values to accept a particular quality evaluation standard still share much room of debate.

（2）Changing roles in different context: Government, Market and Institute.

The service function of contemporary higher education has become increasingly complex and diverse. In order to better satisfy the needs of students, enterprises and employers, higher education institutions are working hard in opening new majors and academic directions, or providing numerous training programs. The relation between higher education institution and students has been transformed into a connection bridging service provider and consumers. In the meantime, profit-gain

enterprises start their involvement in this field in ways of establishing modern education agencies, offering scholarships and kicking off various kinds of cooperative educational and research projects, and their vitality is clearly on the rise worldwide.

Disagreements have never abated in terms of the impact market imposed upon higher education. One of the most heated topics rests on the nature of this impact – whether it is positive or negative. Some people believe that with the penetration of market competition universities would be more aware of self-improvement thus lifting up education quality; others consider market mechanism never shift its focus away from short-term gains, and the fact that higher education institutions' blind involvement in a business manner would undermine the academic and teaching liberty and dragging down education quality as a result.

As we look at the funding issues, we can see that since the market reform, higher educations institutions has to reluctantly let go some of the chunk from the government and adjust to be more market dependent. Market reform has enabled higher education institutions to be more competitive, independent and flexible. The role transformations among institutions, government and market are being considered as the most influential factor behind the quality of higher education. Here are some critical questions expecting further answering: what can government do to better coordinate institution's position between public service and market gains; how can institutions adjust their development orientation to fit in the needs of market and seize more developmental opportunities with good education quality; how to ensure the quality edge to last amid intensive market competition, and so on.

（3）The role of ICT in higher education quality

The field of information communications technology has been bearing most frequent breakthroughs in recent years. With the popularization of information communication technology, multimedia and internet technology has instilled higher education with new vitality and has become an essential component of higher education and a new driving force for educational reforms and advancement. Distance on-line courses and training programs has greatly lift up the enrollment opportunities into tertiary education institutions, and the same time prioritize the allocation and sharing of international educational resources. College course videos available online largely reduced the time and space limitations the common crowd may have when enjoying higher education. At the same time, information communication technology has brought long internal development opportunities as well for institutions. Reforms taking place in lecture content, teaching, evaluation and management methods have had great impact or partially changed traditional knowledge structure and thinking style. Open courses with global perspectives, multi-lingual teaching and cross-border learning and teaching have become ever more commonplace. Worldwide, more and more economies have participated in the construction of a global higher education market as well as network.

Information communication technology poses numerous challenges to higher education quality as well. In lots of trans-boundary regions and economies, within their evaluation system of higher education quality information communications technology is always listed as a vital factor influencing higher education quality. Compared with public policy and school operation regulations which may have more direct influence on the quality of higher education, the impact brought along by information communications technology can only be visible when its coverage is wide enough, which accordingly requires endless and abundant financial support. However, the limitation of public education expenditure is right now capping this expensive momentum. Developed economies with advanced scientific and technological background are more likely to win in this race. In another word, developing economy would need to invest more if they want to score the same record.

While admitting the positive changes brought by information communication technology and set it as a critical indicator in our evaluation system, we must be aware of the overdone superstition or even heterization of this overwhelming trend. During the process of quality accreditation and evaluation, much emphasis has been laid on the equipment ratio other than the actual usage ration. Meanwhile, deep empirical study has been rarely conducted relating to the differences between technological and traditional teaching methodologies. Questions we need to answer in the future include: do we need to evaluate all the majors and disciplines with certain emphasis on information communication technology; is more coordination work going to be required to help move the status quo forward from equipment ownership and usage ratio to the actual impact on learning efficacy; against a general backdrop of increasing enrollment thanks to the popularization of distance education, we are faced with communication and management problems. How to improve our management and evaluation work so as to ensure quality stability is another indispensable indicator we may consider to add into our quality indicator system.

（4）The role of stakeholders in higher education quality

In the past few years, under the topic of higher education quality, the gravity of research and practice has evolved from pure academic definition discussion to the practical conversation about quality assurance and accreditation. From a global perspective, more and more developed economies have management to establish their own quality assurance system in regard of higher education. Bilateral or multi-lateral cooperation in higher education quality assurance is on constant expansion. A comprehensive quality accreditation at different levels has been gradually built up and has started to exert its positive impact. More and more economies have included higher education quality as one of their essential education policies and a basic condition in higher education management.

Government has always been considered as the leading driving force in the construction of higher education quality system. What the government is most frequently committed to formulating related strategies and plans at an economy level, offering correspondent indicator system and

conducting monitoring over the practice. Among the established quality accreditation and evaluation agencies worldwide, apart from those independent from the government, quite a few of them are government run or are founded under government authority. In the past few years, the issue of higher education quality is no long just an inevitable task the government needs to shoulder. It has also attracted close attention from other people involved, for instance, enterprises, employers, students and parents. University rankings have been used by the public as an important reference when talking about higher education quality. Public opinion and media, enterprises, employers, students and parents are far more enthusiastic about the ranking results than the universities engaged themselves, a contradictory fact which may indicate that although a group of stakeholders are extremely eager to play their due part in the quality evaluation system while the universities are not even ready for that.

As higher education enters into the massive age, even more aspects of problems await to be dealt with. As it was mentioned in the *World Declaration on Higher Education for the Twenty-First Century* proposed in 1998, "National and institutional decision-makers should place students and their needs at the centre of their concerns, and should consider them as major partners and responsible stakeholders in the renewal of higher education".

From a market perspective, students are entitled with the right to know about the general development situation of the school and to play a right part in the quality evaluation process; at the same time, higher education institutions, as service providers, have the obligation to be open about relevant evaluation standards, process as well as final results.

Students are an essential component of higher education quality. They should be encouraged to impose more active impact on the assurance and accreditation of higher education quality, other than a detached group. However, the participation of students would make the evaluation process even more complex. Thus, how to ensure an efficient conduct while allowing in more stakeholders other than a solo control of the government is another key issue needs more in-depth discussion.

II. APEC Agenda Motivation

A primary goal of APEC is regional economic integration, cross-border education and systemic reform. That can help our members innovate in education institutions through competitive forces, benchmarking, organizational learning etc, contribute to economic growth in the region through building the stock of highly skilled human capital, lowering costs, building educational capacity through partnerships, driving improvements in the quality and relevance of educational offerings, and contribute to social capital in the region through improved relations and understandings between APEC economies. Member economies' cooperation around education can then build talent among the region's workers to meet the needs for present and future skills and to contribute to sustainable growth in a globalized economy. Today, people who enter the workforce cannot count on spending most of their working lives with one company. Learners of all ages need to master 21st century skills such as problem solving, critical thinking, data-driven decision making and pattern recognition to help them move from one stage of

learning to another and from one industry to another.

A recent OECD report looked at 2009 employment rates in 35 countries, including seven APEC economies. It found that degree-educated workers had employment rate advantages of 7% to 53% over their counterparts with less education, depending on the economy (2011, Chart A7.1). The research told us that TVET and higher education both are very helpful for providing skilled workers with livelihoods financially more secure than their less educated peers. Thus, educators and policy makers should focus equal attention on TVET programs as on college preparation programs.

Inclusive growth begins with inclusive education. We should create infrastructure for vocational technical education and training, as has been done for higher education. We should collaborate with other educational institutions and with the business sector. This can expand opportunities for students, including diverse learners, thus contributing to inclusive growth.

We need to strengthen the curricula for higher education and TVET, especially for teachers. TVET and higher education systems that help students transition from school to career can ensure that employers have effective workers and workers have jobs that pay living wages. Career counseling, internships, and programs that combine on-the-job and academic learning can help students become college and career ready. Also we should hold the institutions of TVET and higher education accountable for providing a high-quality education.

III. Key Research

A. Key Research on TVET

1. The Regional Challenges of TVET

(1) The Challenges Faced by Ten Economies

To question in the survey "In your economy, what regional challenges and difficulties do you have in TVET? Please tick √ in blank:", the answers are as following (see table 11):

<Table 11> the answers from respondent economies

No.	Challenges and Difficulties	Severity				
		Critical	Above average	Average	Below average	None
1	Traditional mindset and discrimination held by society towards TVET	√√	√√	√√√	√√	
2	Lack of strong govt. support or policy backup			√√√	√√√√√	
3	Funding difficulties	√	√	√√√√	√√√	
4	Shortage of qualified teachers and trainers		√√	√√√√√		√
5	Difficulties for the TVET graduates to get employed		√	√√√	√√√	√
6	Curricula do not match industry needs, reform direly needed		√√	√√	√√√√	
7	Lack of sufficient facility	√	√	√√√√	√	√
8	Graduates cannot go to a school of a higher grade		√√√	√	√√√	√√
9	System of TVET need to be modernized	√√	√	√√√√	√√	

* Although all the topics shown below are regarded as our challenges, it is difficult to assess each severity (Japan).

Compared with general education, "Funding difficulties"," Lack of sufficient facility", and" Traditional mindset and discrimination held by society towards TVET" are additional difficulties for TVET. "Shortage of qualified teachers and trainers" and "Curricula do not match industry needs, reform direly needed" are particular challenges to TVET institutions.

There are five issues universally relevant to APEC economies: (1) the economic relevance; (2) access and equity; (3) organization & management effectiveness; (4) quality of skills acquisition; and (5) cost, financing and efficiency. These issues are especially acute for developing APEC members.

(2) Other challenges of TVET

From other research[13], we know some other challenges of TVET: mismatches, educational attainment and efficiency, large informal sector, high youth unemployment, demographic shift and implications, image and mobility, how to stimulate private sector, balance between existing and emerging jobs, and middle income trap. We also know there are other[14] big issues TVET has to tackle:

- Importance of private-public partnerships including financing of skills development for employability and responses to demand side forces and industry partnerships
- Importance of National Qualifications Frameworks and Sector Skills Councils
- Vocationalization of formal education: secondary schooling and higher education in particular
- Breaking down the barriers between formal, informal and non-formal education and training, and placing an emphasis on lifelong learning
- TVET for poverty alleviation, 'decent work' and equity; expanding employment opportunities for youth and other marginalized or disadvantaged groups
- quality assurance; improving the status of TVET in communities
- Contribution to green growth and sustainable development
- Importance of 'soft' skills; key place of work-related values, attitudes and ethics
- Creating an effective 'bridge' between research, policy and practice in support of skills development for employability

2. Educational Responses of Ten Respondent APEC members

Facing the above challenges, all APEC economies had their own responses. From the answered questionnaire, for example, the following information was collected. To the question 2.2, "Please tick "√" at the blank on the right if there are responses which were taken by your economy and make orders for them by priority", the answer is as table 12:

<Table 12> the responses taken by the respondent economies

No.	Responses	

[13] *Skills development for employability and inclusive growth: emerging strategies and priorities in Asia's developing economies,* Brajesh Panth, Lead Education Specialist, SAHS, ADB, 2011

[14] Rupert Maclean, The Hong Kong Institute of Education, *Skills development for employability and sustainable livelihoods in the Asia-Pacific*, ADB International Consultative Forum, 2011

1	National qualification framework	√√√√√√√ (8)
2	Competence-based program	√√√√√√√ (8)
3	More opportunities to access higher education	√√√√√√√√ (9)
4	Improve the TVET quality	√√√√√√√√√(10)
5	There is flexibility of access and delivery as well as permeability across the different parts of the system	√√√√√√√ (8)
6	More options mixing general education and TVET	√√√√√ (6)
7	Improved guidance and counseling	√√√√√√ (7)
8	Others(please describe)	

Compared with challenges, the responses seem more varied but still there are commonalities in the responses from both developed and developing economies. For example, "Improving the TVET quality (meet the need of industry） " is the most important response to the challenges raised. Responses include curriculum reform, "teaching factory or business center", strengthening the relationship between industry and schools, NQF, and competence-based program, etc. The "better development of graduates (meet to need of students and parents)" is the second most important response. More opportunities to access higher education, more options mixing general education and TVET, improved guidance and counseling, career education, subsidy funds, etc. are concrete measures.

The ten responding economies provided many good practices on how they are meeting the challenges of TVET:

Australia

- Additional funding
- Government will introduce a National Partnership to reform the VET system
- Improve qualification completions by quality and quantity
- Strengthen quality assurance
- COAG agreed to a revised National Agreement for Skills and Workforce Development and a new National Partnership on Skills Reform at its meeting on 13 April 2012.

Brunei

- Secure the funding required
- working with relevant industry players so that students and instructors are continuously adopted with the changing industry needs

Mexico

- New curriculum content will be more aligned to real industry needs
- Give VET students more opportunities to continue in to higher education

Chile

- The ministry has put into place grants to stimulate students to attend VET high schools and institutions
- To establish a fruitful dialogue between VET schools and industries

Indonesia

- Make the TVET graduate easier continue to higher grade
- Improve student's competences and skills that needed by industry or doing entrepreneur

Japan

- Promoting structured career education as well as vocational education ranging from early childhood education to higher education
- The goals regarding career education and vocational education were set in the Basic Plan for the Promotion of Education
- Making efforts for further improvement of career education and vocational education

New Zealand

- Introduction of new school qualification from 2002:the NCEA Levels 1-3
- "Creation of Industry Training Organizations (ITOs) and the Industry Training Federation (ITF)" and The "Youth Guarantee"

Chinese Taipei

- Reorganization of technical & vocational education system's structure
- Encourage schools to develop their own unique characteristics and specialty areas

The USA

- Business and industry has worked cooperatively with the US federal government to help define particular "career pathways." Many states have begun to adopt the maps of the career pathways and the 16 clusters.
- Develop strong relationships with businesses and other employers – such as help define course sequences, providing faculty to TVET providers, providing equipment, and providing reliable employment

China

- The National "Medium and Long-Term Plan on Education Reform and Development (2010-2020)" and "Medium and Long-Term Plan on Developing High-Skilled Workers (2010-2020)" targets :TVET should evolve into a modern system to meet the needs of high technology talents demand from industry and desirability of accessing qualified TVET from students and parents
- Strengthen TVET development by promoting school-enterprises partnership
- TVET colleges and schools should reform the curriculum content and delivery to meet the need from industry and local economy
- Introducing market mechanism, strengthening the interaction between employment and training to improve the relevance and effectiveness of the training
- Increase the Government's financial inputs
- Further involvement of stakeholders
- Strengthen the TVET in rural regions

B. Key Research on Higher Education Quality

The results from the questionnaire about higher education quality are listed below

1 · Concept of HEQ

(1) Definition of HEQ
Seven economies said they have the operational definition of HEQ in their economies and 8 Economies have the standard system of HEQ. But, these definitions or explanations with key words are quite different

(2) Degree of satisfaction on HEQ
Seven economies answered the question "How do you feel about higher education quality in your economy at present" with the following responses: 2 are "Dissatisfied", 4 are "Satisfied" and 1 is "Very satisfied". This is an interesting result when we compare the response to how stakeholders view higher education in their economy: "The industry and employers" in 6 economies and "the public" in 5 economies are "dissatisfied".

(3) Some indicators related to HEQ
There are some indicators related to higher education among 9 economies.

<Table 13> some educational indicators among APEC (2010) [* Quarter 3 of 2011]

Item	Australia	Chile	China	Japan	Mexico	New Zealand	Chinese Taipei	Thailand	USA
Has the compulsory education been implemented	11 years	--	9 years	9 years	9 years	Age 6-16	9 years	9 years	YES
Gross enrollment ratio in higher education	--	52%	25%	79.7%	34%	--	67.27 %	56.21 %	--
The number of higher education institutes	189	173	2,358	4,135	3,817	31	148	170	4,495
The total of full-time students in higher education	1,192 ,657	1,068, 000	23,75 6,000	3,740, 126	2,976, 100	466,0 13	1,240, 814	1,731 ,724	12,722 ,782 (2009)
Annual economic growth rate	2.7%	5%	10.3%	2.1%	3.5%	1.3%*	10.88 %	7.8%	1.3%
The ratio of unemployment	5.2%	7%	4.1%	5.4%	4.5%	6.6%*	5.21%	1.04%	9%
The rate of unemployment in graduates	3.45 %	--	--	9%	8.9%	--	5.62%	1.4%	4.5%

(4) Functions of Higher education

Nine economies had not reached agreement on the functions of higher education. Relatively, only two functions were recognized, “to do scientific research and innovation” and “to promote economic growth

2. Factors on higher education quality

(1) Degree of factors
There are a lot of factors which influence higher education quality in practice, but each factor seems to have a different effect in different economies. “Teaching forces in higher education” seems to be the most important factor. And, the factor of “Linkage between higher education with the society and business” is also ranked as important.

(2) Gender
Gender equity is one of the APEC’s priorities and may be a component of HEQ. Eight economies agreed that “gender equity is an important component of higher education quality”, and another one economy said females had overtaken males in higher education enrollment.

(3) Top Priority
Five economies put as their top priority to “To improve the quality of higher education” and 3 economies ranked “To focus on the balancing the improvement and the expanding” as their top priority.

3. Ways to enhance higher education quality

(1) Quality assurance system
9 participating economies said they have “a clear and operational system in higher education quality assurance”, but the content among members is not the same based on their answers.

(2) Approach of evaluation
9 economies have “governmental agencies responsible for the monitoring and evaluation of higher education quality”; and 7 economies have “non-governmental independent agencies implementing the monitoring and evaluation of higher education quality”. 6 economies use “regular review by the peers or/and associate of HEI’s”. Only one economy mentioned “international ranking”.

(3) Emphasized Aspects
Economies ranked “to improve gainful employability of graduates” and “to increase the investment in HE” as their two most important aspects of quality. In addition, “to make the effective evaluation in HE” and “to carry out more global cooperation in HE” were ranked as the next most important aspects quality.

(4) Experiences
Through this survey, some valuable information about successful experiences or/and best practice in higher education quality improvement from economies are collected.

4. Perspective

(1) Challenges

All economies had pointed out their challenges in improving higher education quality. Obviously, these challenges are diverse among APEC economies.

(2) Focused fields

There are two areas for future work agreed to by economies to do in future among APEC: "to achieve a better understanding of quality and quality indicators" and "to research mechanisms in higher education quality assurance".

IV. New directions/recommendations for next steps

Based on the APEC survey and studies we have done that have been focused on responding to the challenges of globalization, to prepare students with 21st century skills, and to be college and career ready, China and the Philippines suggest the priority area of "TVET and Higher Education Quality" should recommend to ministers at the 5th AEMM the following:

Suggestion1(TVET)[15] We should improve the quality of TVET as well as higher education.

Possible Modalities of Cooperation

- Link policy engagement to capacity building to implement reform (Focus on needs of developing economies)
- Stakeholders involvement
- Public Private Partnerships
- Link with Aid Donors to fund reform and capacity building
- Policy Exchange

Priorities/Activities

- National Qualifications Framework (Based on the each economies' separate work on NQF, we could sharing good practice from developed members)
- QA in TVET in order to develop a common understanding of quality and quality assurance (Improving qualifications, professional and skills recognition by experiences sharing, good practice, study project, etc. We could leverage the work being undertaken through the ASEAN East Asia Summit TVET Quality Assurance Framework project: produce a technical and vocational education and training quality assurance framework for EAS countries, consisting of a set of principles, guidelines and tools which will help EAS countries develop, improve, reform, guide and assess the quality of their TVET systems)
- Identify Skills Needs of APEC (research project)
- Develop and assess student's 21st century skills (study project)
- ICT application for improving the quality (experiences sharing, good practice, etc.)
- Improve high quality international comparisons of TVET systems (enhancing data collection and research project)
- Promote and facilitate flexible content and delivery systems that meet the needs of college and career ready (Seminar)
-

Suggestion 2(TVET) We should improve lifelong TVET system in content and delivery.

Possible Modalities of Cooperation

[15] When education sectors and delivery are culturally grounded in widely different education and training systems, there are difficulties in developing modalities across APEC.

- Link tertiary TVET programs to secondary TVET programs for lifelong learning and training
- Link learning to real world training for career ready
- Green skill training

Priorities/Activities

- Career counseling/education (experiences sharing, good practice, etc.)
- Integrated TVET content into general education (good practice, etc.)
- The opportunity of exchange and cooperation for the teachers and students around APEC members (Research project)
- Data collection in order to develop a common framework to the collection of data on cross-border education exchange and cooperation (research project)
- Develop a common understanding of effective approaches and frameworks to facilitate qualifications recognition (research project)

Suggestion 3(HEQ) We should make an agreement on the definition of Higher Education Quality in the context of globalization, knowledge-based economy, inclusive growth and qualified higher education for all.

In the coming of massive age of higher education, higher education is becoming a high focus in the society, which the changes and reforms of higher education are inevitably in time. The relationship between higher education and the external environment is more and more closely tighten. As the expansion of higher education and the frequent global mobility, the complex issues are increased. Although the investment both from the government sectors and from the student families in higher education is increasing gradually, the expenditure of higher education always seems to be limit. Although the higher education quality improvement is making progress, the industries and employers are still not satisfied with the graduates; their demands for higher education quality are increased in the present changing era. Toward the future HEQ among APEC, we should seek the basic common view on higher education quality with consideration the differences in histories and realties of members. To establish the inclusive development view of HEQ in respecting the differences among APEC is the first task in educational cooperation and exchange.

Possible Modalities of Cooperation

- Build mutual understanding on importance and definition of HEQ
- Link policy engagement to capacity building to implement reform(demand and supply)

Priorities/Activities

- Development of APEC Basic Framework of HEQ (indicators and common principles, assessment, etc.) through seminars, workshops and research activities.
- Identification and Share of Good Practices on Quality Assurance of HEQ (accreditation, certification or/and diploma recognition) through meetings and forums.

Suggestion 4(HEQ) All economies should set up the cooperative platform and mechanism TO RECOGNIZE the importance of HEQ in APEC

In the process of globalization, cross border higher education has been developed quickly. The personnel mobility and the institute union are also increasing in the world. Higher education has been given much high expectation in global economic competition. In the changing world, the HEQ has the

dynamic features, which are relied on the external social environment and the internal educational development. As present, APEC members had known the importance of assurance and evaluation system in higher education in promoting quality improvement, and these approaches such as quality control, quality assurance, quality accreditation, quality evaluation mentioned by members at governmental and systematic levels have been recognized to some extent.

Possible Modalities of Cooperation

- Public Private Partnerships
- Policy reform and exchanges(Focus on needs of developing economies)
- Professionals and students exchanges(student, academic, and providers)
- Links with academics/industry

Priorities/Activities

- Capacity Building Program for Higher Education Institution among APEC.
- Joint Research Project on Higher Education Quality among APEC
- Study on new demands for HEQ in terms of 21st century skills,
- Investigation on the issues and barriers in cooperation and exchange among APEC
- Developing the examples of successful innovation in improvement of HEQ through cases studies

Suggestion 5(HEQ) We should build the regular dialogue and exchange activities

Globalization of higher education is also becoming the significant trend as the economical globalization. The information and communication are playing more important role. The new ideas from different parts in higher education quality improvement should be encouraged as well exchange and sharing of experiences and best practices are done. The open and interactive development in HEQ among APEC will be aimed to.

Currently, there are some experiences and lessons in quality assurance, accreditation and evaluation in higher education, which are the wealth in quality improvement. Anyway, the critical task for APEC is to build an open platform for releasing information and dialoguing in HEQ.

Possible Modalities of Cooperation

- Seminar , workshop, conference and website
  (Capacity building, Access and equity, Effectiveness and efficiency, Teaching, research and social service, Governance and cooperation)

Priorities/Activities

- To Create online learning community or special website of HEQ for policy-makers , staff and researchers in APEC website
- To edit a e-newsletter of HEQ in APEC periodically
- To conduct regular on-line discussion on higher education quality
- To make professionals exchanges with bi-lateral or/and multi-lateral among APEC.

Asia-Pacific
Economic Cooperation

2012/AEMM/XXX
Agenda Item:

ICT for Innovation in Education

Purpose: Consideration
Submitted by: Korea

5th APEC Education Ministerial Meeting
2012 KOREA

5th APEC Education Ministerial Meeting
Gyeongju, Korea
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INFORMATION COMMUNICATION TECHNOLOGIES (ICT) FOR INNOVATION IN EDUCATION

I. Background

Innovation in education, especially utilization of ICT for innovative education, is a common interest of the APEC member economies, and this interest is steadily increasing. Since the establishment of the APEC, utilization of ICT for educational purposes has continually been a topic of discussion and cooperation. However, because the development of ICT requires advanced technology and sufficient financial support, the level of ICT use in education of APEC member economies varies depending on each member's economic condition. Also, depending on its usage, the results and outcomes of ICT use in education may differ. In the classroom, for example, ICT could simply be a method to deliver knowledge or information effectively, but it can also be used to promote higher-level thinking and problem solving. Moreover, the educational use of ICT may provide students an opportunity to attain necessary ICT skills and apply them in real-life situations. Being equipped with good ICT skills is important in the 21st century society, especially as the desire is to have everyone naturally utilize ICT into their daily lives.

In this context, desirable outcomes can be achieved for the APEC member economies by pursuing discussion and cooperation of utilizing ICT in education. This topic has come up as a leading issue at the past four times APEC Education Ministerial Meetings (AEMM). For the upcoming 5th AEMM, the discussion of ICT utilization should focus on how APEC member economies can cooperate to maximize the facilitation of ICT use in education.

II. Alignment with the APEC Agenda

APEC's main efforts and research in relation to the utilization of ICT has been examined by reviewing three key APEC collections of information showcasing ICT and innovation. The first collection is the ICT content found in the 2010 and 2011 Leaders' Meetings and their five-pronged Growth Strategy.

The second collection is the Thematic Overview Paper presented by the EDNET coordinator for the 2012 APEC Pre-ministerial Symposium. The third collection involves the Education Ministers' Joint Statements and the meeting outcomes over the last twenty years.

A. APEC Leaders' Meetings and the Growth Strategy

The issues discussed and decisions made during the APEC ministerial meetings must contribute to the co-development of all the APEC Economies. They in turn must be able to support the issues discussed and decisions agreed to during the APEC Leaders Meetings.

During the November 2010 Economic Leaders' Meeting, representatives of the 21 member economies conducted an annual review of initiatives and developed Five Growth Attributes and an Action Plan for the APEC Growth Strategy for the coming years. These areas of growth include:

- Balanced Growth;
- Inclusive Growth;
- Sustainable Growth;
- Innovative Growth;
- Secure Growth.

One pillar of the growth strategy was devoted to innovation in which ICT was emphasized. They stated (APEC Leaders, 2010):

> *The adoption of policies that foster an enabling environment for innovative growth will be increasingly crucial for future prosperity. Technology breakthroughs and ICTs play a significant role as a primary driver of economic growth, and innovation in new products and services can enhance progress on critical global issues, including the environment, energy, transportation, agriculture, health care, logistics, emergency response, administrative services, and education.*

In particular, their ICT focus to promote innovative growth included:

- *Realize smart socioeconomic activity through ICT applications. APEC will promote smart socioeconomic activity through enhanced ICT use in various fields, by working toward solutions to economic, technical, and systemic challenges, as well as by sharing best practices.*

- *Promote Digital Prosperity. APEC economies are encouraged to adopt policies and regulations to foster innovation and use of ICTs, including by promoting trade and investment in ICT products and services; adopting globally accepted standards and international practices; promoting investment in next generation high speed broadband infrastructure; creating a competitive environment conducive to emerging technologies and innovative services, such as cloud computing; promoting effective privacy protection, while avoiding unnecessary barriers to information flows; and ensuring information and communication flows. This will help economies to reduce the digital divide and allow all segments of the population to reap the benefits of innovative growth.*

- *Develop a skilled, adaptable, and professional APEC work-force. APEC will promote the development of technical and vocational education and training to nurture more skilled personnel and promote new skills and human resource development to drive growth in strategically desirable directions, particularly in equipping individuals with necessary skills, including those prerequisite to utilizing ICTs to contribute to the 21st century economy.*

- *Enhance dialogues and information sharing on innovation policy. Innovation policy requires multi-dimensional approaches, including human resource and entrepreneurship development, R&D investment, tax incentives, financial measures, public-private partnership, and international cooperation. APEC will strengthen innovation policies by sharing best practices for more effective policy making and implementation.*

Of the many issues agreed to among the leaders during the APEC Leaders' Meeting over the last three years, the core agreement lies in the economic co-development and continuous growth within the

APEC member economies. Furthermore, in the latest APEC Leaders' Meeting, held in 2011, the leaders have committed to taking concrete steps towards enhancing economic integration, thus paving the way for APEC community to develop into a seamless regional economy.

Education is the underlying factor in economic growth and development. In order for the economy to grow, the level of education of the member economies needs to increase. The truth of the matter is that while most of the developed countries have maintained a high level of education, the developing countries have a lower average education level compared to the developed countries. Hence, in order to achieve the economic co-development and continuous growth, pursued by the APEC leader's declaration, continued investment in education must be sustained.

Also, in order for the economic integration of the APEC community to develop as one, economic level of each members economy must be at a similar level. But in reality, there is a big gap between the economic levels of APEC member economies based on own economy. Therefore, APEC and its developed economies must support and cooperate with the developing economies to achieve actual economic integration. Only when the economic vitality of these developing economies advances, via such support and collaboration, will true economic integration be realized.

Use of ICT in education can be one of the ways to raise educational levels efficiently. The effects of the utilization of ICT in education have already been verified by different researchers and met-analyses of studies (Green, et. al., 2011; Means, et al., 2010) Students' educational levels can rise by using ICT in education, leading to economic development as a result.

Ultimately, mutual cooperation by the APEC member economies in utilizing ICT- implemented education will be the cornerstone to achieving co-development of the APEC community and various economic development and integration proposed during the APEC Leaders meeting.

B. Thematic Overview Paper Content Analysis

Adriana de Kanter, EDNET coordinator, presented the three themes of Global, Innovation, and

Cooperation at the APEC Pre-ministerial Symposium held in Moscow in February 2012. Her presentation was reflected in the *Thematic Overview Paper* which signified following three issues on the topic of innovation and utilization of ICT.

First, it was pointed out that, all students will need to use ICT in education in a knowledge-based economy. According to the result of the 2010 IBM Tech Trends Survey (O'Connell, 2010), Ms. de Kanter also pointed out the fact that most students lacked the knowledge to remain competitive in the changing technology environment. For example, the IBM global survey of 2,000 IT professionals indicates cloud computing and mobile application development are hot topics today, and are expected to emerge as the most in-demand platforms for software development over the next five years. However, what about the five years after that? There will be a new innovation. Therefore, workers in the technology arena and workers who rely on ICT to do other jobs will need future training to maintain their skills. It was also predicted, that most industries, in the future, will require some levels of ICT usage.

Second, improving teacher quality will play an important role in achieving innovation in education and moreover, economic integration in the APEC region. Instructional use of new technologies should be applied within education to enable students to connect academic learning to real life experience by accommodating them with the skills needed to succeed in the 21st century.

Third, on the basis of these findings, EDNET presented three challenges and four responses. The challenges are to use ICT effectively, use ICT appropriately, and know how to identify best practices. The suggested educational responses were strengthening teacher practices by helping teachers better understand what works for their students, strengthening the teacher pipeline, measuring teacher effectiveness on the basis of student achievement, and harnessing ICT to better individualize learning.

C. The Outcomes of the Past APEC Education Ministerial Meetings Regarding ICT Utilization on Education

The AEMM was first held in Washington, D.C. in August 1992. The second meeting was held in Singapore in 2000. Since then, the meetings were held every four years rotating among the member economies, and at the end of every meeting, a ministerial statement was declared.

The first AEMM held in 1992, carries a symbolic significance as the representatives of member economies reached a consensus for joint collaboration in education. The priority areas were identified then and therefore. The topic of utilization of ICT in education was not, however, discussed in detail as the term ICT was not commonly shared and the utilization of ICT in education was not yet actively pursued at that time.

It was during the second AEMM held in Singapore in April 2000, where the utilization of ICT in education was presented in detail. In the 2nd AEMM Ministerial Statement, the importance of utilizing ICT in education was mentioned as a subtopic entitled with *The Use of Information Technology in a Learning Society*. It can be summarized as follows;

- IT is very important as it provides both students and adults the opportunities to continue education. Also, it provides education at all levels through innovative means and expands long-distance collaborative research and distance education.
- IT in education is an innovative strategy that satisfies all the needs in a knowledge-based society.
- In order to utilize IT in education, the objectives of the program must be clearly identified, resources and the parties involved need to be managed accordingly, teachers need to be equipped with knowledge and skills, and policies and programs must be implemented in order to minimize the informational gap.

Third, during the third APEC Education Ministerial Meeting held in Chile in April 2004, the outcome of the collaboration efforts in utilizing ICT in education was reviewed and a future developmental plan was proposed. The main content is summarized as follows:

- It was recognized that ICT can enhance learning by providing greater opportunities for independent work and collaboration among learners through facilitating the communication

process and the processing, analysis, and synthesis of information. As teachers play an important role in integration of ICT into the curriculum, it was suggested for teachers to develop necessary proficiency in the use of a range of ICT applications. However, the full potential of ICT as an integrating force in education was only in the stage of understanding the value of ICT as an education tool.

- Singapore presented its Master plan for IT in Education which was a national blueprint launched in 1997. This 5-year strategy aimed to enhance linkages between the school and the world, develop creative thinking, lifelong learning and social responsibility in students, generate innovative processes in education, and promote administrative excellence in the education system. This 1997 Master plan is evaluated highly as it enabled professional growth of teachers, development of a supportive school IT culture, and enhancement of relationship between schools and the community.

- Philippines recognized the importance of utilization of technology in teaching and learning as it could be used to develop more innovative and/or efficient pedagogy; open up vast opportunities for more research collaboration through networking among educational institutions and other providers; reinforce the quest for lifelong learning; and evolve the new role of teachers and trainers. It was indicated that the use of multi-media instructional materials was on the rise, and teachers were deviating from the traditional learning modes in the Philippines.

- It was also recognized that the "Digital Divide" broadens the socio-economic gap in APEC region, and APEC Consortium for Future Education and Future Schools Network was proposed by the Republic of Korea and was implemented in order to share plans, resources and programs for ICT implementation in education and to organize exchange programs for teachers, students, and school administrators.

Fourth, during the fourth APEC Education Ministerial Meeting held in Peru in June 2008, 'Quality Education for All' was recognized as the joint theme of the meeting. ICT was grouped with

systemic reform as a priority area.

- Indonesia reported the current Action of Penetration in which two actions were based on ICT. These were total ICT implementation for e-learning & e-administration and total reform of textbooks based on electronic (e-book). The roles of ICT to support educational policies of Indonesia were to expand access and increase equality; improve quality, relevance, and competitiveness; and strengthen governance, accountability and public image which all aimed to provide education that is qualified, accountable, affordable, equitable, and achievable by society.

- The key tasks to provide society members with access to quality education and bridge the digital gap within and between the APEC member economies were identified, and the Republic of Korea shared its experiences in ICT and systemic reform. Plans to increase digital access and teacher quality were suggested along with the commitment of member economies on future endeavours in building framework for a more sustainable and holistic educational reform by use of ICT and ensuring the harmonious co-existence of human value and technology.

- Through platforms, such as APEC wiki, that provide a body of knowledge, the collaborative network of the member states become strengthened.

- IT must be fundamentally be integrated into instructional guide, skill evaluation, and accountability systems.

- The usefulness of an open access approach (e.g., open education resources and creative commons licensing) in APEC for resource sharing to address intellectual property rights issues was supported.

III. Key Research in ICT

A. International Experiences with Technology in Education (IETE)

The APEC economies studied in this synthesis include Australia, Canada (Alberta), Chile, Hong Kong China, Japan, New Zealand, Singapore, Korea, and the United States. The study found that Economy participation in international collections is limited. Many of the international studies reviewed had a limited international scope. For example, Second Information Technology in Education Study (SITES) 2006 had limited participation with 22 education systems. Only the International Association for the Evaluation of Educational Achievement (IEA) through the Progress in International Reading Literacy Study (PIRLS), Trends in International Mathematics and Science Study (TIMSS) and the Organization for Economic Co-Operation and Development's (OECD) Programme for International Student Assessment (PISA) assessment studies had a broad base of economy participation that addressed educational policy issues.

Key findings were broken out across five categories:

- Political and Economic Context Impacting ICT in Education
- ICT Infrastructure for Supporting Education
- ICTs to Enhance Instruction and Student Learning
- Building Teachers' Capacity with ICTs
- National ICT-Supported Continuous Improvement Efforts

Political and Economic Context Impacting ICT in Education

During the recent global economic crisis economies have continued to invest in ICT for education. Several economies recently invested in large-scale ICT infrastructure projects that will benefit educational systems and increase access to broadband Internet within schools and homes or increase hardware access in schools (e.g., Australia, Canada, Japan, New Zealand, and Korea). In some economies, however, plans for updating schools, including their technology, have been put on hold or severely cut back because of government budget cuts. For example, the Australian Government is investing over $2.4 billion through the Digital Education Revolution to support the effective integration of ICT in Australian schools which has result in a one-to-one computer to student ratio for students in all secondary schools across Australia.

Most economies that participated in the IETE study had national-level documents that provided a vision for integrating ICT into primary and secondary education. Whether in stand-alone documents or integrated into cross-sector ICT strategies, national educational technology plans are widely used to convene stakeholders and coordinate activities across levels of government. Of the economies participating in the survey, the economies of Canada, Australia, Chile, Hong Kong, Singapore, and the United States reported active, comprehensive plans in place to guide policy and programs while some economies (Canada, Japan, New Zealand, and Korea) were in the process of developing systematic national plans.

The private sector is involved in many aspects of economies' ICT in education programs. Private sector involvement in national educational efforts ranged from contributing in-kind resources (e.g., equipment and software) or direct financial contributions to explicit partnerships and service agreements between governments and technology companies to provide digital resources or maintain infrastructure. For some economies participating in the study (such as Japan, Singapore), there was limited private sector involvement in the educational system. Cultural norms against the involvement of the private sector in public education appear to limit the role of the private sector in some economies.

Governments reported agreements with outside entities to develop educational resources for teachers and students. Participating economies reported having some type of formal incentive in place for the development of ICT-related materials for instruction. Of these, some incentives are intended solely for the private sector and others include university researchers and semi-governmental agencies. At the same time, some economies (e.g., Australia,) reported pursuing specific copyright agreements or copyright reform in order to make some existing digital materials freely available. The U.S. Department of Education has a role in stimulating the development and use of OER in ways that address pressing education issues. The federal government is investing $50 million per year for the next 10 years to develop exemplary next-generation instructional tools and resources for community colleges and workforce development programs. These materials will be available for use or adaptation

with the least restrictive Creative Commons license. The Australian Government is investing over $44 million to provide teacher professional development and digital resources directly to the curriculum.

ICT Infrastructure for Supporting Education

Improving Internet connectivity in primary and secondary schools is a top priority in national efforts to improve education. Economies surveyed reported that improving school access to the Internet was a major priority. Economies have prioritized improving Internet connection speeds to extend access to quality instruction to underserved populations and regions. New Zealand reported exploring ways to use technology to better serve geographically isolated communities, and Canada is focused on extending the learning environment and time beyond the school building, especially for students who are academically at risk, homebound, or in need of more flexibility in their schedules. Other economies such as Japan, United States, and Singapore reported efforts to improve Internet connections in schools. In the U.S., Non-profit private schools, public schools, and libraries, can receive discounted telecommunications services through the E-rate program based on percentage of school poverty. Finally, three economies (Australia, Canada, and New Zealand) have invested in nationwide efforts to provide universal Internet access, benefiting the education system directly by expanding the availability of the Internet while also increasing Internet-based opportunities for learning outside school. Australia, Canada, and New Zealand instituted programs with the goal of bringing broadband Internet to their entire populations.

Economies continue to focus on improving access to computers for teachers and students. Economies reported that increasing the computer-to-student ratio was a top national priority (Australia, Canada, Japan, and Korea) reporting a goal of a one-to-one ratio for students. The economies of Japan and New Zealand reported a goal of reaching a one-to-one ratio for teachers.

The integration of mobile technologies into the instructional environment is an emerging priority for many economies. Mobile communication devices are becoming increasingly prevalent in society, affordable and powerful in regards to their technical capabilities to share, display, analyze, and process information. Four economies (Canada, Japan, New Zealand, and Korea) reported having

in place programs to investigate the use of mobile devices for teaching and learning. For example, Korea reported piloting digital textbooks that students access on tablet computers.

Several economies are adopting Internet-based computing or cloud computing to address server costs, cyber security, and shared access to updated software resources. Economies that reported a move to cloud computing include Japan and Korea.

ICTs to Enhance Instruction and Student Learning

A majority of economies have established ICT standards for ICT competencies for students. Economies reported that ICT standards for students were either embedded in other academic content standards or in separately articulated documents. In these economies, either no standards are in place or standards are determined at the local rather than national level.

In some economies, the nationwide adoption of learning management systems offers new possibilities for managing courses and delivering instruction. Learning Management Systems (LMSs), also known as curriculum or course management systems, are platforms that offer discrete digital spaces for courses in which teachers and students can upload or download material, and respond to one another's materials in blogs, wikis, and discussion forums. Teachers have access to additional functions, such as the ability to post assignments or announcements and to maintain an e-grade book. Hong Kong, and Singapore reported having LMSs in either most (over 70 percent) or nearly all schools. Korea reported having LMSs in place in almost every school.

Two economies reported national initiatives to deliver online instruction for students (Canada and Korea). The Alberta Distance Learning Centre (Canada) serves 30,000 elementary and secondary students with distance learning services, including fully online courses, and manages the province's virtual school. Korea is using online tutoring courseware to provide struggling students with individual supplementary help by using the courseware to help focus the instruction on areas of greatest individual need.

A few of the participating economies reported the online delivery of national assessments. Two economies reported the implementation of programs for using ICT for summative assessments (Canada, New Zealand). Some economies are investigating online assessment initiatives with a specific goal of providing real-time feedback on student academic progress to both teachers and students. The U.S. Department of Education has awarded $330 million to two state consortia that cover 44 states to develop online assessments that will provide students with realistic, complex performance tasks, immediate feedback, computer adaptive testing, and incorporate accommodations for a range of students all tied to Common Core standards.

Building Teachers' Capacity with ICTs

Most economies consider the development of standards for teachers' ICT skills a national priority, but only a handful of economies have instituted national assessments designed to measure teacher ICT skills. In this study, ICT standards for teachers were defined as a framework or set of guidelines that describes desired teacher outcomes or competencies relative to ICT, whether or not those competencies are assessed and whether or not they are mandatory or recommended. By this definition, economies reported teacher technology standards in place in 2010. Of those economies with standards, three economies conduct some form of assessment of teacher ICT skill (Canada, Chile, and Japan). Canada ties ICT skills to teacher licensing requirements. In Chile, there is an optional assessment, but it is not a licensing requirement.

The provision of digital resources for teachers is the most prevalent national ICT initiative to build teacher capacity. The most frequently reported governmental activity addressing ICT-supported efforts to build teacher capacity focused on the provision of digital learning resources, including home-grown and commercial materials and software tools, through online portals. Economies reported the availability of a national website or online portal that houses digital resources, including open education resources.

Some economies are using ICT to support interactive, collaborative models of material development and to share instructional materials and strategies. Some governments

participating in the study reported using ICTs to support communities of practice among teachers. Canada, New Zealand, Singapore, and Korea Web-based tools (blogs, chat rooms, wikis) support nationwide communication, collaboration, and sharing among teachers. The U.S. Department of Education has created communities of practice for many of their grant programs.

Online professional development for pre- and in-service teachers is available in almost half of participating economies. Chile, New Zealand, and Korea, reported providing formal online or blended courses to either build teachers' capacity to integrate ICT or for more general pedagogical training.

National ICT-Supported Continuous Improvement Efforts

The participating economies have invested in information systems to support national and local continuous improvement efforts. Economies with national systems covering their primary and secondary level education systems include Canada, Hong Kong, and Korea. Singapore is currently in the planning phase for a national administrative system to systematically monitor student academic performance across local jurisdictions and schools.

Over the last decade, many economies began to institute their own internal ICT indicator monitoring and collection systems. Representatives reported national-level efforts to regularly collect data on ICT use by educational jurisdictions, schools, teachers, and students inside and outside school (Australia, Canada, Chile, and Japan). Data on ICT indicators is typically collected through regular national surveys of school administrators and teachers in Chile. Surveys are administered annually or every two to three years. By far the most common metrics implemented are measures of access to technology (e.g., Internet access per number of students) and infrastructure (e.g., connection speeds and age of computers). Canada, Chile, and Japan reported collecting such data. However, economies are also focusing on how ICTs are being used in teaching and learning particularly Canada. Chile is collecting data on local ICT program administration including planning efforts.

Ongoing evaluations of ICT in education policies and initiatives occur in nearly half the participating economies. Representatives reported that evaluations of an ICT policy or initiative were underway (Australia, Canada, Chile, Japan, Korea, New Zealand, and Singapore). Four of these economies (Australia, Japan, Singapore, and Korea) have established programs to monitor the implementation of their current national ICT in education plans. In almost all cases, ongoing national evaluation efforts are designed to monitor the implementation of policies or programs rather than to estimate their potential impacts on learning. National evaluations tend to focus on collecting data on how ICTs are being used relative to planned use, the intensity of use, teacher and student satisfaction with the technology, and areas of potential improvement.

B. A Survey on ICT Use in Education in the APEC Region

In an effort to understand the ICT development and the level of ICT usages in the APEC region, a group of Korean researchers (Choi et al., 2012) developed a survey questionnaire on ICT use in education in the APEC region and distributed to all APEC member economies via e-mail prior to the Pre-Ministerial Research Symposium. The main purpose of the survey was to help member economies to create a framework for understanding each other and planning collaborative project.

The specific objectives of the survey were to: a) define the overall situation in ICT use in education of all APEC economies; b) identify issues or difficulties that each economy has faced while implementing policies of ICT use in education; c) share each economy's past, current, and future efforts to resolve the issues or difficulties; and d) identify and list the topics or areas of cooperation in the field of education using ICT for the next three years. The questionnaire was composed of five sections in which each section addressed questions in relations to the specific objectives of the survey.

The APEC Economies were given choices to make two types of responses, check the appropriate item and open comments, and attaching supplementary files was also encouraged. A total of eleven economies responded to the survey, and the following results and conclusions were drawn upon the response rate of 52%.

In Section 1, to the question of "Overall Situation in ICT Use in Education," many economies responded that they are on the 'development and application of contents and strategies for ICT use in education' or 'integrating and innovating with ICT within the school curriculum' stage, and half economies among responded economies answered that they are on a mixture stage among the three stages (see Table 1).

Table 1. Overall Situation in ICT Use in Education

Overall situation in ICT use in education	Frequency
Step1. Installing basic Infrastructure: providing and utilizing hardware and software for ICT	4
Step2. Development and application of contents and strategies for ICT use in education	7
Step3. Integrating and innovating with ICT within the school curriculum	8

(Response=9 economies, *multiple responses were allowed)

In Section 2, the current status of establishing a national-level Master Plans for ICT use in education at the governmental level were determined (see Table 2).

Table 2. Master Plans for ICT Use in Education at the Government Level

Economy	ICT Master Plan
Thailand	Enabling future education with ICT
USA	U.S National Education Technology Plan 2010
Hong Kong	Pilot Scheme on e-Learning in Schools with a view to looking into how e-learning should be implemented in different school contexts.
New Zealand	Universal provision of ultra-fast broadband connectivity to schools
Malaysia	Smart school qualification standards
Mexico	Development and use of new technology in the educational system to support the inclusion of students in the knowledge society and expand their life skills
Japan	The Vision of Education Informatization
Peru	ICT infrastructure, Teacher training, ICT related curriculum, Collaboration with Public & Private sectors
Singapore	An Intelligent Nation 2015
Brunei Darussalam	e-Hijrah
Chinese Taipei	-

According to the responses, most of economies have established a master plan or other related plans. It seems the common interest of the economies were to utilize ICT in various social sectors including enterprise, government, private sectors, etc.

In Section 3 and 4, the past, current, and future issues and/or difficulties in implementing policies of ICT use in education and the corresponding past, current, and future efforts to resolve these

issues/difficulties were inquired. 7 out of 11 economies identified "developing an overall ICT policy or plan in the education system' as the major difficulty in past. It was followed by "installment of basic physical infrastructure," "professional development of teachers and technicians" and "supporting innovation in ICT among schools and teachers." As for the current difficulties, "professional development of teachers and technicians," "maintaining facility and system," and "lack of benchmark for adapting ICT in education" were determined as the most common issues. Although not many economies reported future issues of ICT use, "improving ICT access between school and home or between school and society" and "reducing some side effects of ICT such as digital divide and internet addiction" were considered as important future issues. Several open comments suggested "financial allocation" and "teachers' resistance to change" as other important issues to be resolved.

In responses to these issues, past efforts of the responded economies were focused on the "installment of basic physical infrastructure," however, currently all economies are making an effort for most areas of ICT use in education. For the future efforts, it is shown that most economies are not clearly decided yet.

In Section 5 in which the question of "topic or areas of cooperation/collaboration in the next three years" was addressed, generally responded economies for the most part recognized the need for mutual cooperation. Among them, teacher education and eliminating the information gap caused by the utilization of ICT are, especially, in need of cooperative efforts.

Table 3. Areas that each economy wants to support and to be supported

Economy	Areas that the country wants to support	Areas that the country wants to be supported
Thailand	Developing curriculum and instructional plans using ICT in education Lifelong education and professional training through distance/cyber education system	Any efforts and strategies that can lead better educational practice
USA	The US' experience in most areas	International collaboration and professional

		exchanges
Hong Kong	Promoting a safe and sound environment for exchange of information through ICT	Professional development Developing standards & evaluation system Reducing side effects of ICT
New Zealand	Issues related to cyber security	Issues related to cyber security
Malaysia	Ideas about Smart School Initiatives	Any efforts and strategies that can lead better instructional practice
Mexico	Pre-and in-service teacher training on using ICT in education	Pre-and in-service teacher training on using ICT in education
Japan	Japan's experience in most areas	Other countries experience
Peru	Pre-and in-service teacher training on using ICT in education Developing curriculum and instructional plans using ICT in education Professional Development Activities by ICT Experts	Establishing a system to facilitate exchange between teachers and/or students in APEC countries through ICT activities
Singapore	Installing and improving physical infrastructures such as hardware and network	Any efforts and strategies that can lead better educational practice

Upon examining this survey, most of the member economies are expecting various cooperative businesses to become more active in their ICT activities. By sharing experiences and working together, APEC member economies may reduce gaps among the various social sectors within an economy and the APEC region.

C. Group Discussions and Outcomes in the 3rd Pre-Ministerial Symposium in Russia

In a group discussion in the topic of Utilization of ICT in Education, the following four key issues

were identified as major challenges in ICT,

a) Improvement and enhancement of ICT in education
b) Improve the access to ICT resources
c) Improve teachers' skills in application of ICT
d) Establishing collaborative systems to share higher and lifelong education using ICT

In responses to these challenges, the APEC member economies agreed upon following suggestions.

a) Sharing open educational resources (OER) was suggested as an effective educational response, and in order to utilize OER, OER policy are to be developed, OER repository are to be compiled, and technical assistance for teachers are to be provided.
b) Teachers' training was suggested as an appropriate tool for promoting utilization of ICT in education and to be enhanced by Pre-service PCK and teacher Collaboration among APEC member economies.
c) Implementing Policy feasible to share best practices, set index for using ICT in education, compare and implement Master Plans, construct ICT model school, and establish support unit was suggested as a core issue to be discussed in relations to the topic of ICT.

D. Online Learning in the United States

Educational systems are under increasing pressure to reduce costs while maintaining or improving outcomes for students. To improve educational productivity, many school districts and states are turning to online learning.

In the United States, online learning alternatives are proliferating rapidly. Recent estimates suggest that 1.5 million elementary and secondary students participated in some form of online learning in 2010 (Wicks, 2010). The term online learning can be used to refer to a wide range of programs that use the Internet to provide instructional materials and facilitate interactions between teachers and students and in some cases among students as well. Online learning can be fully online, with all

instruction taking place through the Internet, or online elements can be combined with face-to-face interactions in what is known as *blended learning* (Horn & Staker, 2011). A recent review of the literature suggested nine applications of online learning that are seen as possible pathways to improved productivity (Bakia et al., 2012):

a) **Broadening access** in ways that dramatically reduce the cost of providing access to quality educational resources and experiences, particularly for students in remote locations or other situations where challenges such as low student enrollments make the traditional school model impractical;

b) **Engaging students in active learning** with instructional materials and access to a wealth of resources that can facilitate the adoption of research-based principles and best practices from the learning sciences, an application that might improve student outcomes without substantially increasing costs;

c) **Individualizing and differentiating instruction** based on student performance on diagnostic assessments and preferred pace of learning, thereby improving the efficiency with which students move through a learning progression;

d) **Personalizing learning** by building on student interests, which can result in increased student motivation, time on task and ultimately better learning outcomes;

e) **Making better use of teacher and student time** by automating routine tasks and enabling teacher time to focus on high-value activities;

f) **Increasing the rate of student learning** by increasing motivation and helping students grasp concepts and demonstrate competency more efficiently;

g) **Reducing school-based facilities costs** by leveraging home and community spaces in addition to traditional school buildings;

h) **Reducing salary costs** by transferring some educational activities to computers, by increasing teacher-student ratios or by otherwise redesigning processes that allow for more effective use of teacher time; and

i) **Realizing opportunities for economies of scale** through reuse of materials and their large-scale distribution.

E. Utilization of ICT in Russia

With the expansion of ICT utilization, Russia has developed ICT infrastructure to a sound level in which now over 50,000 of all Russian schools have Internet access and almost all Russian universities have started promoting e-learning methods in the classroom. Today, the Federal Center of IT Educational Resources (http://fcior.edu.ru) of Russia's Education and Science Ministry has around 30,000 new-generation modules helping to acquire general and professional education. These resources are open and available for implementation in Russia's system of education and indeed have been used to advantage in some schools and colleges (Osin, 2012).

According to Osin (2012), Russia identifies the core issues of education informatization as "**creation of new-generation educational materials and development of methods of their effective implementation**." A lot of multimedia resources both for comprehensive education and vocational/professional trainings are developed for wider range of practical exercises and classes through virtual reality in order to equip students with practical skills and competences. Russia is currently moving into mobile-based instruction in response to the extensive uses of smart-phones.

IV. Korea's Experience in ICT for Innovation in Education and Cooperation with APEC Economies

A. ICT Master Plan at a National Level

Korean Government has been carrying out ICT use in Education on the basis of *Educational ICT Master Plan* at a national level. It was an ICT utilization master plan devised to include systematic utilization of ICT in the education environment at a national level.

Since 1996, the government of Korea has established and implemented four master plans to incorporate ICT into education.

Under the **initial infrastructure plan (1996-2000),** the government provided one PC per teacher at all primary and secondary schools, and built Internet access in classrooms at all schools across the country. **A physical groundwork for educational ICT was laid in this period**, which enabled each and every school-age student to log on to computers during class and use the Internet for educational purposes.

The **second stage plan (2001-2005)** placed focus on bringing high-speed Internet into classrooms, distributing multimedia contents, and introducing e-learning in the public education sphere. Major e-learning projects included video streaming services on the Educational Broadcasting System and the Cyber Home Learning System. As a consequence, Korean 15-year-olds ranked second, together with the United Kingdom, in an OECD survey that tested the computer usage of 15-year-old students in learning. Korea's results in PISA 2003 also pointed to the fact that **students who regularly use ICT for study attain high achievement levels across all survey domains** (KERIS, 2005). The Educational Broadcasting System and Cyber Home Learning System proved to be particularly effective in curbing private education expenditure and bridging the education gap between cities and rural areas. The Education Network (EDNET), operated by KERIS, started to play an important role in distributing an abundance of multimedia resources to teachers and students. This led to an achievement where **approximately 77% of all schools were carrying out 20% or more of class instruction with the use of ICTs** by the end of 2005. Also, the National Education Information System (NEIS) expanded its service nationwide, helping to **reduce the administrative work load of teachers by 81%.** With NEIS in place, the practice of hand-writing financial accounts records was abolished, and accordingly **the number of accounts documents that teachers must produce was**

cut down from 58 to 11.

The **third stage plan (2006-2010),** under which ICT became more generally used in teaching and learning, provided the means to **develop evidence-based education policies that draw from various educational data**. A representative policy was the introduction of an assessment system that measured the academic achievement level of students. Aimed at minimizing the number of students who lack basic academic ability, the system effectively assisted students' needs through a virtuous circle of assessing, diagnosing and managing academic records. As a result, **the number of students who fall short of basic academic ability levels started to move downward in 2008 and continued to drop for three years in succession**.

The **fourth stage plan(2011-2015)** is designed to foster an **'ecosystem of digital learning.**' The idea is to establish an information-based ecosystem that works in virtuous circles to nurture human resources equipped with creativity and a mature sense of global citizenship. Being implemented with particular force is the 'smart education strategy' announced in 2011, which contains practical measures to counter problems such as **university admission policies that place weight on entrance exam scores**(the university enrolment rate currently reaches 83%), **classroom instruction at schools that are tuned to the academic level of average-achieving students**, and the **limitation of information that can be delivered by teachers and textbooks**. During this period, the government intends to settle in the Admissions Officer System, established in 2008 with aim to switch from the previous quantitative evaluation practices to a qualitative evaluation approach in university admission screening. This is to help recognize and release individual aptitudes and abilities to the fullest. Digital textbooks are being introduced to enable students to access and utilize vast amounts of information in a self-directed manner. Teachers are being provided with more capacity-building training opportunities to change themselves into 'study mentors' who are familiar with using new technologies and skills, rather than simply 'delivering information.' The ultimate aim is to create N-Screen and cloud computing environment where all teachers and students may gain access to safe teaching and learning contents anytime and anywhere they wish.

B. Efforts for Utilization of ICT in Education in Korea

Korea has played a pioneering role within the APEC region in utilizing ICT in its educational system. Since the beginning of ICT in education during the mid '90s, all classrooms in the elementary / secondary schools were provided with computers and Internet, as well as other ICT equipment. Also, various efforts and trials were tested to utilize ICT in education. These trials can be classified into five categories.

First is setting up the hardware-based system. ICT equipment for education, such as, Internet systems, installation of computers, projectors, and over-head projectors were installed. Internet communication networks were set up in all elementary / secondary classrooms nationwide, and projectors and/or large monitors were installed to utilize learning through multimedia.

Second, adequate and effective teachers' training programs were held to promote teachers to utilize these equipments. Not only were these training programs carried on at the central government level, but also at various state and local government levels. Depending on the region, local office of education set standards requiring teachers to have above average knowledge of ICT. Furthermore, in teacher recruitment process, those certified in ICT utilization received incentives.

Third, Korea promoted the expansion of the development and supply of educational materials concerning the utilization of ICT. Along with the construction of ICT hardware, instructional education materials to maximize utilization of ICT were developed and distributed at the national and local level. Such efforts were carried out in several contexts. The government promoted the development of educational materials based on teaching experiences of teachers and implemented various policies for the uses of these materials in the classroom. Additionally, systems that share online materials, EDUNET for example, have been established in order to utilize outstanding ICT educational materials regardless of location. Also, educational broadcasts and Cyber Home Learning Systems enabled students for self-directing learning by connecting to the Internet, regardless of time or location. Furthermore, a digital library system was established by computerizing the school library

for students' to access materials more easily.

Fourth, approach to classroom lessons, where students were encouraged to learn educational knowledge and functions using ICT, were modified to produce talented individuals with originality and creative characteristics. New virtue is created through creative characteristics education helping these individual to reach their maximum potential in life with education. And to achieve this, Korea has modified its educational system to reflect 'individualized education,' 'timely-approach education customized to each needs,' and 'creativity (originality) based education,' all of which are essential to smart-education.

Fifth is the computerization of educational administration. All the schools nationwide, together with the Ministry of Education, are now able to deal with administration, accounting, hiring and promotion of teachers online via Internet using National Education Information System (NEIS).

In order to promote 'Smart Education,' the Korean Government has established and is enforcing strategy with various endeavours mentioned in the above. For this purpose, digital textbooks have been developed alongside traditional paper textbooks. There are several advantages of using digital textbooks, such as utilizing abundant amount of educational resources to support lessons in creative learning activities, online data, social network, and creative classroom lessons utilizing various resources and real-time video lessons. Also, it can overcome the limits of the traditional paper textbooks by customizing to individual teacher's curriculums and improving classroom lesson. Furthermore, it will incubate human capitals with leaderships and creativity, demanded in the knowledge-based society.

Despite the several advantages of ICT in education, there are also the down side of ICT utilized education. Technology, for example, while enhanced and emphasized in education, students are exposed to risks of becoming obsessive with technology and even addicted. Further, overuse of ICT might cause social problems such as lack of social and emotional capacity that can lead to mental depression and violence.

The Korean Government, while emphasizing knowledge acquisition and academic excellence,

recognize the importance of creativity and character education. Social capital, such as honesty, trust, caring and sharing, and cooperation; and emotional capacity such as self confidence, attitudes, and interests; are essential skills in the globalized world. To promote such capacity and character education, school, family, and the society as a whole must be involved. In addition, developing contents of ICT education that can minimize the down side must be prioritized. Also supplementary programs for students who suffer from the overuse of technology must be developed.

C. Collaboration with APEC economies

On the basis of these experiences, the Korean Government has been sharing with both APEC and EDNET various aspects of the findings on ICT utilized education. Through Institute of APEC Collaborative Education (IACE), the Korean Government has established a variety of collaborative system with other APEC member economies. APEC Internet Volunteers program, APEC Learning Community Builders (ALCoB), Future Education Forum, and APEC e-Learning Training Program are the examples of the collaborative projects promoted by the Korean Government. These collaborative projects are expected to be more active, especially since these projects will be pursued with other APEC member economies who are full of experiences when it comes to utilization of ICT in education, and the Korean Government fully expects to contribute to working towards co-development.

V. Suggestions for Future Directions/Proposed

Even in the midst of a global economic crisis, economies continued to invest in ICT strategies to improve their educational systems, although a few reported scaling back efforts. Continued investments in ICT for teaching and learning are coupled with a growing international interest in the collection of ICT in education data for the purpose of learning from the experience of others who are planning for and investing in ICT to improve education.

Opportunities for economies to support ongoing international initiatives in providing meaningful and insightful cross-economy comparisons can inform and improve policies and practices. These opportunities include participating in upcoming data collections and international collaborative learning spaces for government officials and supporting efforts to leverage national collections.

Possible collaborative projects based on the demands of the APEC member economies and Korea's past experience are as follows:

Project 1: ***APEC Open Education Resources on ICT*** would bring together in one electronic portal on the HRD Wiki all EDNET proposed ICT projects and products as a platform to collaborate and share information regarding best practices and lessons learned about the use of ICT in education. The need for an APEC-wide effort to collect, archive, and disseminate information on economy-specific policies and investments in ICT seems evident. Many governments are grappling with similar issues and concerns and the experiences of other member economies are relevant to each other's policies. There is also a growing reservoir of information on ICT indicators and programs that currently resides within individual economies. Over the last decade, many economies have begun to institute their own internal ICT indicator monitoring and collection systems and have conducted numerous evaluations of their ICT in education initiatives. APEC Economies have an opportunity to create a more robust online space on the HRD wiki for sharing this knowledge, along with tools and other resources. An ongoing initiative by the European Schoolnet (http://www.eun.org), the development of its Insight portal (http://insight.eun.org), is one example of such an international effort to facilitate the sharing of information on national experiences with ICT in education.

Project 2: ***National Education ICT Plans*****.** It would be extremely beneficial to all APEC member economies if they will share their experiences developing, revising, and implementing their national-level Master Plans for ICT in education. Making this experience public will contribute to reducing the trial and error efforts being made by member economies which have not gone through the development process for a national Master Plan, yet. In addition, member economies will be able to draw on new ideas and make better conclusions by sharing best practices of their own master

plans with each other. These plans and experiences with their plans would be shared on the HRD Wiki portal.

Project 3: ***ICT Standards and Training Program***. Economies could join together to develop a training project based on common ICT standards that can build the practical ICT abilities of both teachers and students. This joint effort would develop a fixed common standard for ICT education and then prepare coursework and activities based on these standards for both teachers and students from APEC member economies. This will enable them to learn to the new standards and exceed their current levels of practical ICT abilities.

Project 4: ***APEC Educational Information Support Center.*** In order to close the gap between developed and developing economies in their ICT infrastructure, member economies will need to construct a system to share inventories and actual products of already developed educational multimedia. All resources will be open education resources (OERs) and come with a Creative Commons License as is now used on the APEC HRD wiki. To do so, member economies will establish a specific area, tentatively named the 'APEC Educational Information Support Center,' where a specialist for each member economy will be assigned to share information and prepare already developed educational multimedia and documents for applicable use in domestic education.

Project 5: ***Establish a Joint Research Agenda on Emerging Technologies.*** Joint research should be conducted on the diverse educational effects of social media and other new technologies. Experiences from educational applications of new technologies such as Digital textbooks, Smart Learning, Wiki, and similar SNS media of each member economy will be shared and joint research on the prospects of these applications for each member economy will be conducted. In addition, research reviews on how best to implement ICT in education and of how best to support teachers and students in acquiring the skills necessary to teach and learn with technology should be on-going and available on the APEC HRD Wiki.

Project 6: ***Symposium on ICT and 21st Century Skills.*** Plan and implement a joint seminar or symposium on the acquisition of knowledge and skills needed for student ICT usage and the strategies

required for cultivating the necessary creativity and personal character for life in the 21st century. ICT in itself cannot be the objective, but only a means towards the objective. Therefore, an earnest discussion on establishing the APEC community's educational goals, and the role of ICT for the achievement of these goals, is necessary. Probable matters to be discussed include: prevention of school violence and bullying by ICT use, emotional and creativity development of students, and the promotion of individual character.

Project 7: ***Higher Education Programming in ICT.*** There is a need to reinforce a cooperative framework for sharing case studies on the building of an ICT infrastructure and the courses of study for higher and lifelong education. Sharing experiences will not only be of offline universities, but also among cyber colleges, distance learning institutions, and similar e-learning systems, as well. In the long run, it may become possible to review joint establishment and management of cyber colleges by member economies.

Project 8: ***Research on ICT use for Character-building Education.*** Integrating ICT in teaching and learning processes ensures a more convenient acquisition of diverse skills and information required for students in future society. But the benefits of ICT do not cease here. ICT-based education also presents promising means of building sound character in students. It can be a particularly effective tool in preventing damaging incidents(i.e. suicide, violence and bullying) that may occur in the course of school education. On the other hand, it is true that educational ICT can produce adverse effects. That is, when allowed easy access to computers, students can fall victim to Internet and game addiction. The Korean government is keenly aware of the need to address and counter such potential side effects, for which it has developed and is operating ICT-based character-building programs for students. The policy experiences will hopefully open doors to the exploration of collaborative research among APEC member economies geared at minimizing the bad effects of ICT and building upright character in students.

VI. Conclusion

All the proposed collaboration plans cannot be accomplished by a single economy. Only when **all** the APEC member economies pull together to support and cooperate can all the possibilities be realized. First, the developed economies must share their experiences and know-how with the developing economies to reduce trial and error. Also, co-research must be carried out among the APEC member economies to prepare and respond, when necessary, for the fast changing environment of international society.

There may also be a need for an organization of experts from each member economies to achieve the educational responses to the challenges. This organization must be based within a designated member state to integrate and facilitate collaboration activities. Expansion of the Institute of APEC Collaborative Education (IACE), which is leading various educational collaborations with APEC member economies, could be considered as one of alternatives. Another alternative can be an active involvement of Korea Education and Research Information Service (KERIS) in addition to current APEC collaborative effots.

Through mutual support and collaboration among all APEC member economies, it is expected that co-development and economic integration among the APEC community can be achieved.

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Asia-Pacific
Economic Cooperation

2012/AEMM/XXX
Agenda Item:

A Quality Teacher in Every APEC Classroom:

Strengthening Teacher Preparation

Purpose: Consideration
Submitted by: the United States, Chile

5th APEC Education Ministerial Meeting
AEMM 2012 KOREA

5th APEC Education Ministerial Meeting
Gyeongju, Korea
21-23 May, 2012

A Quality Teacher in Every APEC Classroom[16]

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

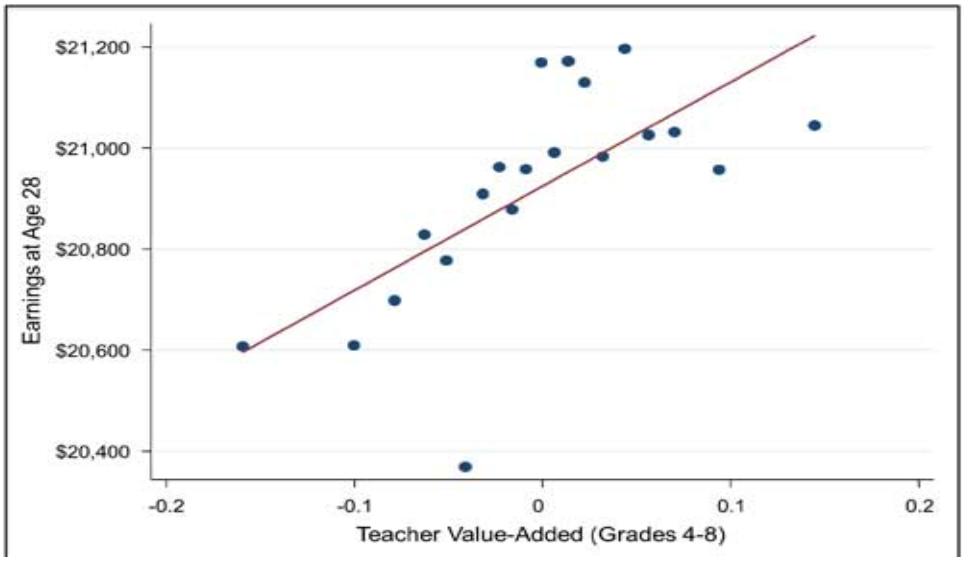
[16]Much of the information in this paper comes from the APEC Education Network project, *Quality of Teacher Preparation in Secondary Math and Science,* sponsored by the United States Department of Education with participation by leading universities from seven Economies: Monash University, Australia; 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; KhonKaen 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.

positive and historical values to counterbalance the pressures of rapid societal change in the 21st Century.

Developing students with these 21stCentury skills requires fundamental changes in instruction and hence teacher preparation. This priority area, teacher quality,identifiesresearch-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

Exhibit 1. A significant Positive Association Occurs Between Having a High Value-Added Teacher (Large Increases in Student Test Scores) for Even One Year and a Student's Annual Income At Age 28. For a Typical Class, the Earnings Gains Are $250,000 Over a Lifetime (Present Value) For Each Year a Low-Value Added Teacher Is Replaced With an Average Value-Added Teacher



school-based factor influencing learning (Goldhaber, et al., 1999; Hanushek, et al., 1998)[17]. 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 lateryears (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 ofstudents 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.

[17]For example, Goldhaber (1999) found that teachers accounted for over 40 percent of the variance in student achievement explained by in-school factors.

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 nationally 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 national accreditation of initial teacher education programs, nationally 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-national 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

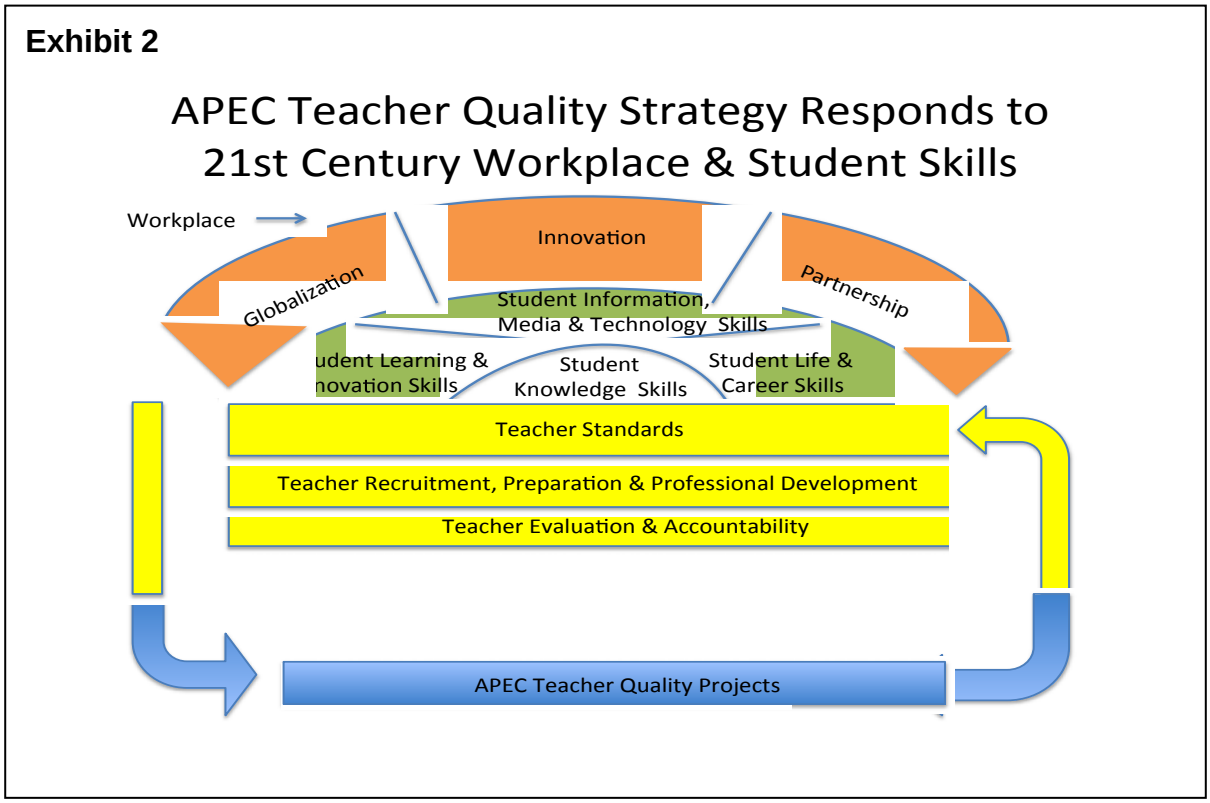
A core premise of the APEC priority on teacher quality is that changes in our world require changes in our teachers. The rapid pace of change in our world requires us to think deeply about what it means to be a teacher. What it means to be a teacher in today's world is much different than it was 50, 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 workforcethat 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.

Exhibit 2



With *global ization*, a compe titive workf orceth at does not rely on low wages for itscom petitiv eness must have high-productivity to support its higher wages. While worker productivitydepends 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 besurprising 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

Exhibit 3.APEC Economy Labour Productivity (Gross Domestic Product Per Hour*

Year	Australia	Canada	Chile	Hong Kong	Japan	Mexico	New Zealand	Peru	Singapore	South Korea	Chinese Taipei	United States
2011	53.39	48.72	16.99	40.41	42.58	17.13	36.15	12.49	43.49	29.03	38.67	62.14
2000	46.09	44.70	13.28	27.72	35.70	15.90	32.69	9.22	35.14	18.69	26.92	52.41
Pct Growth 2000-2011	16%	9%	28%	46%	19%	8%	11%	35%	24%	55%	44%	19%

* The value of Economy output is measured in common EKS$, a common unit

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, Singapore, South Korea and Chinese Taipei are high-scoring Economies on PISA and each has among the highestworker productivity growth between 2000 and 2010(Exhibit 3).[18]

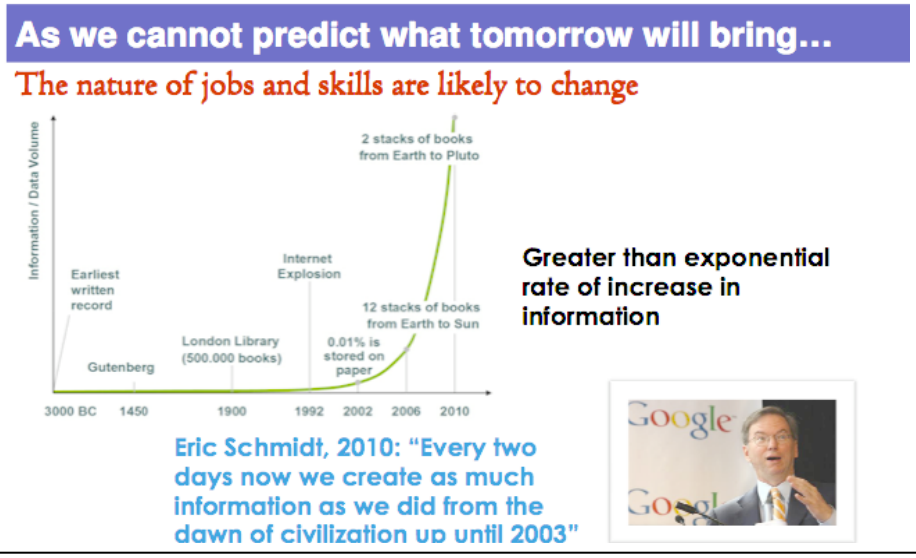
A second possible explanation for the relativehigh U.S. worker productivity is that for some Economies average performance on international assessments,such as PISA,is an inadequate indicator of the ultimate performance of theireducation system in preparing their workforce.In the case of the U.S., the 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 carryout non-routine functions in a digital economy. Examples of non-routine functions are workers' ability to - identify patterns in data, composetext and problem solving (Levy&Murnane, 2005).

As Singapore Education Minister Heng SweeKeat(Center for Strategic Information Studies, 2012) has observed, achallenge 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 learnhow to learn beyond the classroom years*.

[18] 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.

Exhibit 4. Singapore Minister Of Education Heng SweeKeat On How the Pace of Innovation Requires Preparing Students Who Learn How To Learn



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 (StatsAPEC, 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 standardsin different APEC education systems address common teacher-quality objectives or are their significant differences among thestandards?
- How well do the current teacher-standards address the challenges of developing students with 21st Century skills?
- Do the current teacherstandards 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[19] for four English-speaking participants:Australia New Zealand and Singapore and the U.S. Those from Australia, New Zealand and Singapore represent national 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).[20]

Although these four Economies differ considerably in their respective size, centralization, and cultures, nonetheless, thefour 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 responsibilitiesthat 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

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

[20] 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 nationwide standards for teachers to demonstrate that they are Board certified. Students of teachers meeting these standards show above average learning gains in rigorous evaluations.

with different abilities and different backgrounds (Hill et. al., 2005, Shulman, 1987).

- 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 thatfor 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 Kahnstates 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.

Exhibit 5. Comparison of the Standards of the New Zealand, Singapore, and U.S. National Board for Professional Teacher Standards (NGO) Teacher Frameworks

Standard	Australia	NZ	Singapore	U.S.
1. Learner-centered	**Know students and how they learn:** Know their students well, including their diverse linguistic, cultural and religious backgrounds: Know how the experiences that students bring to their classroom affect their continued learning.	**Develop Positive Relationships With Learners and the Members of Learning Community:** Recognize how different values & beliefs may impact on learners; Promote a learning culture which engages diverse learnes effectively	**Learner Centered Values:** Empathy, Belief that all children can learn, Valuing diversity	**Committed to Students and Their Learning:** Believe all students can learn; Understand how students develop and learn; Respect cultural & family differences
2. Knowledge	**Know the content:** Know and understand the fundamental concepts, structure and enquiry processes relevant to the programs they teach.	**Know What To Teach; Know About Learners and How They Learn:** Have content knowledge; Have pedagogical content knowledge: Knowledge about human development & learning, Know how to develop metacognitive strategies for diverse learners	**Knowledge:** Self, pupil, community, pedagogy, curriculum, multicullltural, global awareness	**Know the Subjects They Teach and How to Teach Those Subjects to Students:** Subject mastery, Teach for understanding
3. Skills	**Know how to teach the content:** Plan for & implement effective teaching and learning; Create & maintain supportive & safe learning environments; Assess, provide feedback and report on student learning.	**Use professional knowledge to plan for a safe, high quality teaching and learning environment; Use evidence to promote learning** Sequence a range of learning experiences to promote learning; Demonstrate proficiencey in oral and written language, in numeracy and in ICT; Engage with evidence to reflect and refine practice; Gather, analyze and use assessment information to improve learning	**Skills:** Reflective skills; People management skills; Self-management skills; Communiciation skills, Technological skills	**Responsible for Managing and Monitoring Student Learning** Use a range of instructional techniques including: Keeping students motivated, engaged and focused; Know how to assess progress of individual students as well as the class as a whole; Use multiple methods for measuring student growth and clearly explain student performance to parents
4. On-going improvement	**Engage in professional learning:** Initiate collaborative relationships to expand professional learning opportunities, engage in research, and provide quality opportunities and placements for pre-service teachers.	**Committed members of the profession:** Have understanding of the ethical, professional and legal responsibilities of teachers; Work co-operatively with those who share responsibility for the learning and well-being of learers; Articulate an emerging personal, professional philospohy of teaching and learning	**Teacher Identity Values:** Enquiring nature; Quest for learning; Strive to improve; Passion; Adaptive & resilient; Ethical; Professionalism	**Teachers Think Systematically about Their Practice and Learn from Experience:** Read, question, create and willing to try new things; Critically examine their practice on a regular basis; Expand their repertoire of skills, and incorporate new findings into their practice.
5. Commitment to the Profession & Community	**Engage professionally with colleagues, parents/carers and the community:** Identify, initiate and build on opportunities that engage parents/carers in both the progress of their children's learning and in the educational priorities of the school;Take a leadership role in professional and community networks	**Understand how contextual factors influence teaching and learning:** Understanding personal, social and cultural factors have on teachers and learners; Understanding of education within the biculturral, muticultural, socialpolitical economic and historical contexts of NZ	**Services to the Profession & Community Values:** Collaborative learning and practice; Building apprenticeship & mentorship; Social responsibility; Stewardship	**Members of Learning Communities:** Actvtively know who to seek and build partnerships with community groups and businesses; Work with other professionals on instructional policy, curriculum development and staff development; Work collaboratively with parents to engage them productively in the work of the school

Source:
Australia: The National Professional Standards for Teachers: http://www.teacherstandards.aitsl.edu.au/Standards/Overview
New Zealand Teachers Council *Graduating teacher standards.* http://www.teacherscouncil.govt.nz/te/gts/gts-poster.pdf
Singapore's National Institute of Education:*A teacher education model for the 21st century, http://www.nie.edu.sg/about-nie/teacher-education-21*

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) foundstatistically 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.

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 national 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, Russia, 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 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).

Different factors account for the greater selectivity of some education systems. Data from Korea, Singapore and Hong Kong 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,[21] 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.

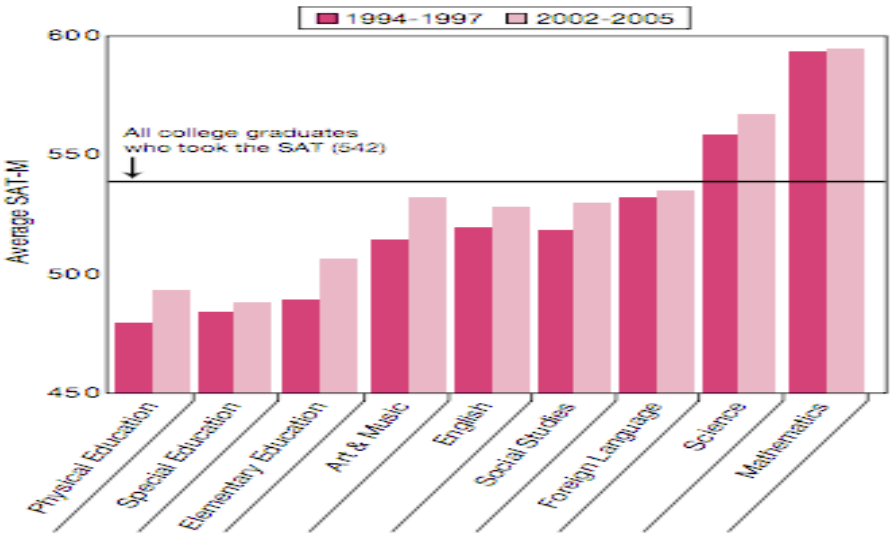
- *Compensate teacher preparation entrants for tuition and living expenses.* All Singapore student teachers are employed and paid a salary while being enrolled in their pre-service program. East China Normal University (ECNU) offers free tuition during their undergraduate studying period, which is applicable 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 6) show that SAT scores of prospective teachers who pass exams in science or mathematics considerably

[21]Digest of Education Statistics: 2010, Table 188.

exceed the SAT score for all college graduates. In contrast,prospective teachers with

Exhibit 6.SAT Math Scores by Licensing Area For Those Teacher Education Students Passing the Widely Used Education Testing Service Praxis Assessment For Licensing



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, andprovides 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 7) 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

Exhibit 7. Teacher Preparation Courses For Secondary Math Majors By Selected Institutions In APEC Economies Participating in the Quality of Teacher Preparation Project

	Required Math or Science Courses for All Majors in the Math or science discipline (e.g. Analytic Geometry, Ordinary Differential Equations, Complex Analysis),	Additional Required Math or Science Courses for Upper Secondary Math or Science Teacher Majors (e.g. Modern Mathematics & Secondary School Mathematics)	Additional Elective Math or Science Courses for Upper Secondary Math or Science Teacher Majors (e.g. Culture & History of Mathematics, Discovery in Mathematics)	General Course (e.g. Foreign language, Social Science, Chinese Modern & Contemporary History),	Teacher Education Course(e.g. Psychology, Pedagogy, Mandarin for Teaching)	Practicum
Pedagogy After Math/Science Degree Major						
NZ - Waikato				22%	56%	22%
NZ - Univ of Otago					100%	
Singapore					73%	27%
Regular Math/Science Degree						
China - East China Normal University	37%	7%		35%	17%	4%
Education Major in Math/Science and Education						
Russia - Yelets State Univ)	22%		31%	21%	26%	
U.S. - Columbus State Univ.	43%		22%	26%		9%
U.S. - Furman Univ.	42%		28%		21%	9%

Source: APEC Project on Quality of Teacher Preparation

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, agraduate program in New Zealand, *emphasizes teacher education courses and practicum. C*onsiderable 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., Russia 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 typicallyinclude practical field experience

Exemplary Practices inLearning How to Teach Math or Science Content

APEC'scase 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, Russia, 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-2 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 advanceMath Education concepts* (China) exposes novice teachers during their first years of teaching to mainly mathematics education, education research, and thesis writing. This reinforcesthe 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 (Russia).*Potential future teachers who are undergraduate students in the math department at Moscow State University develop pedagogy by supervising several gifted students in theschools, 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 improvethe quality of teacher preparation. This section examines two questions about the nature ofevaluating 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 Russia institution takesa very traditional route to assess future teachers through written exams and thesis writing.

- The participating New Zealand Universityis 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.

Exhibit 8. Mode of Assessment of Students Used in Teacher Preparation Courses For Future Secondary Math/Science Teachers: APEC Economies Participating in the *Quality of Teacher Preparation in Secondary Math and Science* Project

	Australia (Monash)	China (East China Normal University)	New Zealand (Waikato)	Singapore (NIE)	Russia (Yelets State Univ)	USA (Columbus State Univ/ Furman Univ)
Paper & Pen Assessment /Test/Exam/ School-based practical assessment	√	√		√	√	√
Thesis		√			√	
Group Presentation, Group work, Oral presentation	√	√		√		√
Class Participation						
Individual Essay or Assignment /Homework	√	√		√		√
Portfolio /e- Portfolio, E-learning Case Analysis	√			√		√
Assessment based on microteaching,	√	√		√		
School-based practical assessment				√		
Problem-Solving/ Project work	√	√		√		√
Evidence-based reflective discussions/ Reflective Journal/Reflective Seminar	√			√		
Lesson observations during practicum/Observation by school coordinating mentor	√	√		√		√
Problem-Based Learning (PBL)				√		
Lesson/Unit Plans, Unit Work Samples	√	√	√	√		√
Performance Evaluation						√
Analysis Papers/ Lab Report/Report	√			√		√

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. TEDS-M Assessment of Middle School Math Teachers Preparation

Math Content Knowledge

Country	Mean	
Chinese Taipei	667	Significantly Above U.S. Public
Russian Federation	594	
Singapore	570	
Poland	540	
Switzerland	531	
Germany	519	
United States-Private	512	
United States-Public	505	
Malaysia	493	
Thailand	479	
Oman	472	
Norway	444	Significantly Below U.S. Public
Phillippines	442	
Botswana	441	
Georgia	424	
Chile	354	

Math Pedagogical Content Knowledge

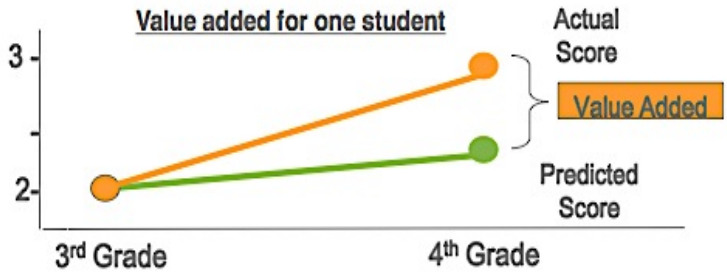
Country	Mean	
Chinese Taipei	649	Significantly Above U.S Public.
Russian Federation	566	
Singapore	553	
Poland	549	
Switzerland	540	
Germany	524	
United States-Private	505	
United States-Public	502	
Thailand	476	
Oman	474	
Malaysia	472	
Norway	463	Significantly Below U.S. Public
Phillippines	450	
Botswana	425	
Chile	394	

Source: Center for Research in Mathematics and Science Education. (2010). *Breaking the Cycle: An International Comparison of U.S. Mathematics Teacher Preparation.* Michigan State University.

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 Taiwan, Russia and Singapore. U.S. scores are statistically below the top-performing group on both math content knowledge and pedagogical content knowledge.

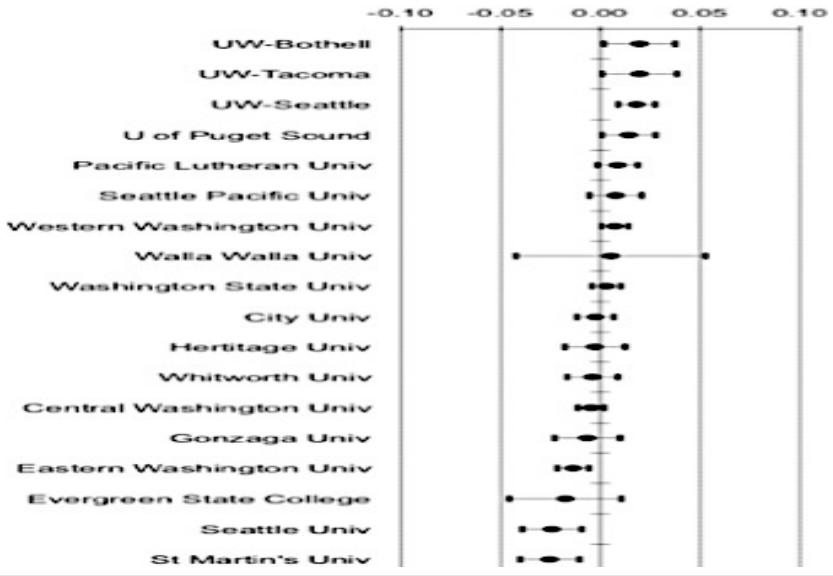
Looking to the possible future of teacher assessment, U.S. research and the U.S. Department of Education are supporting a new line of accountability that argues that the effectiveness of teacher preparation is best measured by taking into account the amount of student learning that takes place in classrooms 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

Exhibit 11. Relative Value-added Effectiveness For Student Math Achievement of Different Teacher Preparation Institutions in Washington State



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 teacher improvement.

Moving To a Comprehensive Teacher Evaluation System

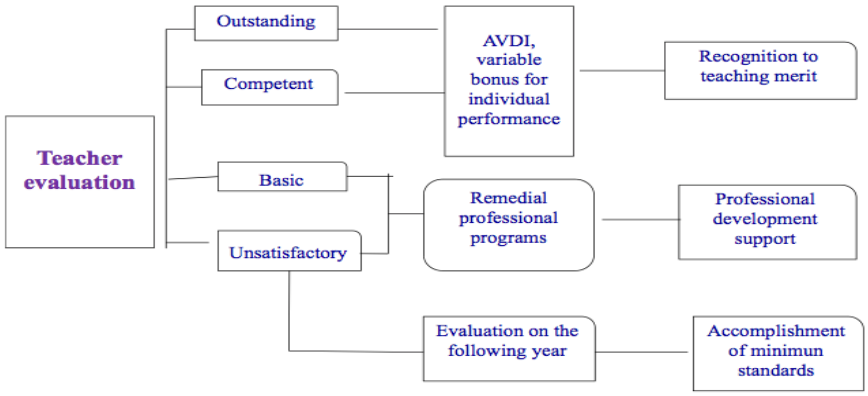
A comprehensive system could use evaluation evidence at three stages to: (1) encourage academically capable students to enter teacher preparation; (2) evaluate potential teachers while in education school prior to entering teaching; and (3) systematically evaluate the quality of current teachers tied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

Exhibit 12. Chilean National Teacher Performance Evaluation System



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.

Exhibit 13.APEC Open Education Resources Web Portal on Teacher Quality

APEC Teacher Quality Open-Education Resources

ECONOMY PROFILES	ECONOMY TEACHER STANDARDS	TEACHER PREPARA-TION	TEACHER IN-SERVICE DEVELOPMENT	TEACHER EVALUATION
Key Questions •What are key workplace and skill requirements? • What are key characteristics of Economy education systems as it applies to teachers (avg. salaries)?	**Key Questions** • 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)	**Key Questions** • What are the teacher preparation institution's objectives? • What is the students' course preparation to meet these objectives?	**Key Questions** •What are characters of effective induction programs? •What are effective professional development strategies	**Key Questions** • What are effective evaluation designs to assess competencies (including assessing teacher knowledge) • What are effective proceudures for evaluating students in terms of test scores & other student outcomes?
TYPE OF INFORMATION ❑ APEC ECONOMY	❑ STATISTICS	❑ INSTITUIONAL SURVEYS	❑ BEST PRACTICES	❑ VIDEOS/ ARTIFACTS

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.

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 Inductionacross 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.

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Appendix 1

Quality of Teacher Preparation Project: International Comparative Research to Identify Unique and Promising Practices in Mathematics and Science Teacher Preparation for APEC Economies

This APECproject stems from the Education Network’ s desire to develop “knowledge societies” for the 21st Century. A key focus of EDNETis meeting the challenge ofdeveloping mathematics and science expertise in all economies' populations, as well as developinghigh quality math and science teachers in all economies' schools.

This multi-year "International Comparative Research to Identify Unique and Promising Practices in Mathematics and Science Teacher Preparation for APEC Economies" project will analyze secondary school mathematics and science teacher preparation in each participating economy to generate informed and detailed hypotheses about how to improve teacher preparation. The ultimate goal is to identify unique and promising teaching practices, as well as approaches to meeting key challenges in each economy using standardized research protocols that facilitate comparative analysis. The primary audiences for the work are policymakers and research institutions in each economy.

This is the first phase of an anticipated larger 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.

Exhibit 14: Quality of Teacher Preparation Project Design (Economy Lead: A. de Kanter, U.S.A)

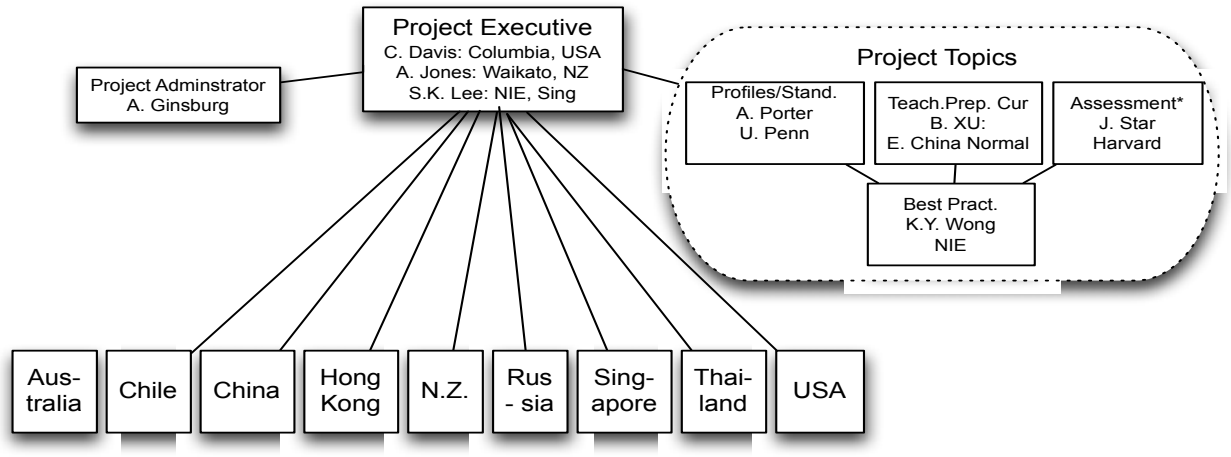

Exhibit 14 describes the project structure and current Economy participants that include representatives from governments and leading educational organizations. A project Executive Committeecoordinatesthe integration of the research from participating economies. Project work is overseen through participation by leading teacher preparation institutions including Australia: Monash University, China: East China

Normal University, New Zealand: Waikato University, Russia: Moscow Institute of Open Education, Singapore: National Institute of Education, Thailand: KoenKaen University, and USA: Columbia, Harvard and Pennsylvania Universities. Each economy funds and conducts research on its own teacher preparation system.

The study will examine four major areas related to preparing high-quality teachers:

1. A compilation of *teacher standards* in participating APEC Economies including identifying common teacher competencies addressed across the standards and assessing how the standards address the new roles of the teacher in a 21st Century ICT-driven classroom (lead USA).

2. Analyses of a sample of leading teacher preparation institutions in participating Economies to assess significant *characteristics of their teacher programs* (lead China). The assessment includes describing:

    - Recruiting and selecting students entering the teacher education program.
    - The essential characteristics of teacher-preparation programs' curriculum. This includes different sequencing in how future teachers learn math/science content knowledge and pedagogical-content knowledge including the practicum.

3. *Best-practice case studies* identifying those characteristics of teacher preparation programs related to high levels of teacher readiness for secondary mathematics and science teaching. Best practice topics currently include: the coordinated teaching of content and pedagogy content knowledge, teaching the gifted in math and science, and connecting teacher education institutions with teachers who are in schools and classrooms.

4. *Evaluation of teacher preparation programs including assessing future teacher content and pedagogical knowledge* in mathematics and science and also exploring evaluation of teacher preparation programs in terms of the learning gains of the students of former teacher candidates who are now teaching.

Initial findings from the first three study components will be available in the third quarter of 2012 and findings from the assessment of the knowledge of future teachers in 2013.

Note this Network of Universities established for the project on teacher preparation represents a potentially valuable long-term resource to work on related EDNET issues addressing the quality of education in other areas, especially mathematics and science.

Appendix 2

Exhibit 15. Initial Case Studies of Exemplary Practices in Teacher Preparation

Economy (authors)	Level	Domain	Unique Features
1. Australia (Deborah Corrigan)	Pre-service, final year course	Chemistry	• Science teachers as learners, to reflect on their own teaching problems and to challenge prior learning experiences using portfolios and learning logs. • Build knowledge bases and skills and examine attitudes and values. • Both chemistry teacher educators and future teachers use the same framework as co-learners.
2. China (Yan Zhu, Yu Zhuang, BinyanXu)	In-service	Math	• Upgrade novice teacher to Math Ed level, with free tuition, 2.5 years. • Curriculum mainly mathematics education, education research, thesis. • First intake Sep 2011, to graduate Nov 2014.
3. New Zealand (Beverley Cooper, Bronwen Cowie)	Induction for provisionally registered teachers (PRT)	All	• Induction and mentoring for first 2 years of teaching. • Guidelines for mentoring were piloted, released in 2011, and are to be implemented in 2012.
4. Russia (PetrSergeev, N.Konstantinov, Ivan Yashchenko, Ivan Vysotskiy)	Pre-service	Maths (Calculus)	• Pre-service teachers (who are good in mathematics) supervise 3-5 gifted students, to understand students' psychology (Pedagogy of Discoveries)
5.Singapore (Tan Kok Siang, Darren Wong)	Pre-service	Chemistry	• Develop competencies in paper-and-pen assessment (P&PA) under collaborative supervision of institute lecturer and high school teachers.

Asia-Pacific
Economic Cooperation

2012/AEMM/XXX
Agenda Item:

Cooperation

Purpose: Consideration
Submitted by: Korea

5th APEC
AEMM
2012 KOREA
Education
Ministerial Meeting

5th APEC Education Ministerial Meeting
Gyeongju, Korea
21-23 May, 2012

COOPERATION

1. Cooperation as a Separate Topic in Agenda Framework

Cooperation is the key to success in the APEC organization. It is noteworthy to separate the topic, cooperation, in the agenda framework at the 5th APEC education ministerial meeting. The new agenda framework recognizes the importance of cooperation in two aspects. First, by discussing cooperation itself separately at the ministerial meeting, we have a great opportunity to review the types of educational cooperation implemented among APEC economies including the feasibility of cooperation at the international levels and the future directions to strengthen the cooperative relationship in the APEC region. Considering that the APEC is an economic cooperative organization for trade liberalization and regional economic integration, cooperation should be more emphasized across the APEC as well as within the EDNET. Therefore, it is meaningful to put 'cooperation' as a separate agenda in the 5th AEMM in order to seek the ways to bolster connection with the AEMM agendas and principal objectives of the APEC as well as APEC Leaders' Meeting. Furthermore, because of the geographic characteristics of APEC, educational cooperation in the APEC creates a paradigm for distance collaboration beneficial for innovation productivity from diverse external resources and work networks through members' various relationships (Kerr, 2004).

Second, the effort of discussing cooperation as an essential topic at the ministerial meeting increases the feasibility of priority areas discussed at the previous meetings. Challenges and experiences in the priority areas identified at the previous meetings solidified the ground for cooperation and prepared us to build a better system for cooperation in education. Additionally, member economies' desires to monitor the process and outcome of the priority areas prove the need of developing a successful structure for educational cooperation in the APEC region. One of the important aspects we have to consider in building this new structure is how two key concepts of cooperation, cultural and intellectual property practices, are different among member economies. Therefore, this new structure

will not only reaffirm our strong commitment for cooperation in the priority areas, and it also creates environment in which member economies prioritize tasks and activities through considering the differences due to cultural and intellectual property practices (Kelly III, 2009).

2. Critical Time for Educational Cooperation

In preparation for the topic of cooperation, it is necessary to understand why this is the critical time point to initiate the framework of cooperation in APEC region. Primarily, APEC faces economic challenges and digital divide among developed and developing economies. Also, as emphasized at APEC Leaders' Meeting, the need for cooperation is strongly required with current global crises such as the global financial problems since 2008 and environmental crisis due to the climate change and many natural disasters. It is widely spread out that cooperation is critical because globalization has fundamentally changed the operating environment and the issues we face in sustainable growth are too big and complicated for one economy to deal with (BITC report, 2012). Going through these challenging global crises in the theme of sustainable growth in the APEC region, constructing a system for educational cooperation that fosters economic growth and regional economic integration becomes even more important.

Besides the critical global issues, the importance of educational cooperation is also found in APEC educational settings. Challenges in educational settings shown in Education Network (EDNET) projects reveal that clear guideline and support mechanism for cooperation must be developed for both bilateral and multilateral cooperation. Also, the lack of strategies for cooperation, resources and research to enhance cooperation, and implementation of effective models for cooperation appeared as primary problems for educational cooperation at the international levels (Kim, 2006).

Given the strong needs for cooperation, it is obvious that we encounter the turning point for cooperation in the APEC region. Using the meaningful tasks and challenges experienced in the last decade, we should put forward to build strategic action plans for cooperation. In details, we should exercise educational cooperation from information exchange to developing outcome products, from

independent struggles against crises to cooperative action for solutions, and from addressing policy without action to implementing policy with clear guiding principles.

3. Key Research in Educational Cooperation

An Analysis of EDNET Projects

To understand the importance of educational cooperation, future directions for cooperation, and expected results of cooperation, EDNET projects conducted from 2001 to 2011 were analyzed in four categories; project period, the number of participating economies, project contents, and cooperation methods. Examining project period showed approximately 85% of the projects were short-term projects less than 5 years and the number of participating economies for each project was mostly less than five economies. In the analysis of project contents, the projects dealt with the use of information technology, professional development of vocational teachers, teaching and learning in mathematics and science, language learning, and higher education quality assurance, which were the main issues discussed at the education ministerial meetings.

In examining the last category, cooperation methods, three stages were used: input, process, and output stages as shown in Figure 1. In the input stage, three cooperation actors were examined: government, educational institution, and business sectors. In the process stage, the actual type of cooperation was identified in the categories of conducting research including seminars and workshops, developing a program or system, and implementing practices. In the output stage, three kinds of cooperation to complete the projects were used. People cooperation focuses on human power exchange among economies. Resource cooperation emphasizes information exchange and institutional cooperation focuses on collaboration among educational institutions such as universities.

Figure 1. Cooperation Methods

The cooperation methods analysis showed that in the input stage, 42% of the projects were conducted by the government alone. Collaboration between government and educational institutions was 54% of the projects. Involvement of the business sectors in the projects was only 2%. In the process stage, it showed approximately similar distribution among research (38%), development (38%) and practice (25%). Finally in the output stage, almost 70% of the projects used resource cooperation emphasizing information exchange rather than people cooperation and institution cooperation that were relatively less implemented in the projects.

Lessons Learned from Key Research

Reviewing EDNET projects showed several significant findings and information we can use to build a successful structure for cooperation. One obvious message from the review is that we need to plan and execute long term projects with more economies participating in the projects. Moreover, various contents and methods of projects should be explored with considering APEC wide impact such as projects for global crisis solutions. For the methods of cooperation, more public-private partnership projects and various cooperation methods should be supported. Only conducting seminars and symposium hardly promises effective models for educational cooperation across economies (Jang, 2006). Finally, support mechanism for educational cooperation should be built to strengthen the cooperative relationship among member economies.

4. Common Concerns and Issues on Cooperation

In the Moscow pre-ministerial symposium in February, 2012, the agenda framework of the 5th APEC Education Ministerial Meeting was presented to participants and meaningful suggestions were collected. At the symposium, several concerns and issues were shared, and that most of them were

similar to general concerns in cooperation at the international level (Ghil, 2007).

The common concerns were:

1) The definition of cooperation and needs for cooperation are unclear.
2) Member economies have different meanings and expectations of cooperation.
3) No system or guideline for cooperation among economies is provided.
4) Learning best practices of cooperation among economies is difficult.

The concerns listed above indicate the difficulties to understand member economies' interests for educational cooperation. According to Lopez and Calapez (2011), in cooperation, the alignment of organizations' interests and allocation of property rights would suffice to motivate people to provide effort . Thus, more in-depth discussion with these concerns required.

Issues discussed with the concerns are as follows:

1) Educational cooperation is critical in APEC region.
2) Understanding different meanings of cooperation and different needs of cooperation in member economies is the first task.
3) Indicating practical areas for cooperation and the level of cooperation is vital.
4) Creating an opportunity to learn and monitor core features of best practices of cooperation is desirable.
5) Proposing to develop a cooperation framework based on the monitoring and learning activities is suggested.
6) Devoting the next four years as the cooperation initiative period is recommended.

Therefore, participating economies at the discussion agreed to devote the next four years as the cooperation initiative period. Specific tasks during the cooperation initiative period cover examining the need of cooperation in APEC region and indicating practical areas for cooperation. Also, appropriate levels of cooperation considering member economies' expectations of cooperation should

be explored. Finally, a lot of opportunities to learn and monitor best practices of cooperation should be created. Although best practices implemented up to this point already provided effective mechanism of success, detailed information is still needed to support new projects.

5. Next Steps for a Successful System for Cooperation

To implement the suggestions, systematic supporting mechanism has to be built. During the initial cooperation period (2013-2016), as the first step of building systematic support mechanism, the Republic of Korea proposes to establish the *Educational Cooperation Task Force* (ECTF) to facilitate and evaluate educational cooperation in APEC region.

The primary purpose of the ECTF is to develop the feasible and sustainable models and strategies for educational cooperation. The ECTF plays two major roles: conducting collaborative research studies and organizing the annual symposium on cooperation. First, it is important to conduct research studies developing cooperation models and strategies for the APEC region. Researchers from all interested economies gather to diagnose the needs and different meanings of educational cooperation among member economies. For example, the research topics could include how we promote social and emotional skills to prevent school violence, that would eventually contribute to the social stability and social growth or how we establish systematic strategies for further active participation in the Open Education Resources (OER). Another main purpose of the collaborative research projects is to identify best practices and success factors for educational cooperation. In addition, researchers will explore effective methods to integrate policy and practice cooperation using a variety of empirical data. A series of additional follow-up studies will be conducted as needed during the initial cooperation period.

Second, we aim to convene researchers on a regular basis to share and discuss their findings and next steps regarding educational cooperation. Thus, the ECTF will organize the annual symposium on educational cooperation to achieve a goal for which effective cooperative models and strategies are stabilized in APEC region. As the host of the 5th APEC Education Ministerial Meeting, the Republic of Korea volunteers to host the first conference for educational cooperation in Seoul in 2013. The

Republic of Korea extends the willingness to support the following annual symposiums and corresponding collaborative research projects for member economies in need of financial support to join in for the next four years.

The ECTF will produce an outcome report that summaries its activities for the four years. The report may tentatively be entitled, *APEC Educational Cooperation Strategies* and will be submitted to the 6th APEC Education Ministerial Meeting through EDNET by 2016. The report will deal with specific issues of the definition of educational cooperation in APEC region, the needs and primary areas of cooperation, appropriate levels of cooperation among member economies, and so on. However, in general, it will include identification of possible ways for expanding educational cooperation for the future prosperity of all APEC member economies, which will consolidate all the findings of the collaborative research and the discussions in the symposiums for the years 2013 to 2016. This report will also provide directions for building a mutually beneficial system of APEC educational cooperation for the maximum benefit of all APEC economies.

The ECTF will also produce an education cooperation portal page on the APEC Knowledge Bank Wiki that links to external resources and to wiki pages describing ECTF related research findings, materials, and resources.

Based on the strategies, the ECTF will provide guidelines and indicators of educational cooperation, which promote and evaluate cooperation activities in the APEC region. The performance and progress of the ECTF will be reviewed at the 6th AEMM, along with determination of further endorsement.

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四、韓國所提「教育合作專案小組」(ECTF，後改名爲「教育合作研究計畫」)之「慶州行動計畫」

5th APEC Education Ministerial Meeting
21-23 May 2012
Gyeongju, Republic of Korea

Gyeongju Action Plan for Educational Cooperation

Envisioning Together for the Future and Hope

Background

1. At the 5th APEC Educational Ministerial Meeting (AEMM) in Gyeongju on 21-23 May 2012, *Cooperation* was highlighted as a separate agenda item for the first time in the history of educational ministerial meetings and discussed extensively by the Ministers to mark a qualitative turning point for the development of educational cooperation in the APEC region. The discussion was backed with a research review of the current and past cooperation efforts in the APEC. The Ministers shared a mutual understanding for the importance of educational cooperation and a common belief that educational cooperation efforts are crucial for accomplishing the common goals of the APEC Growth Strategy as being sustainable, secure, inclusive, innovative, and balanced. Accordingly, we hope that the 5th AEMM will provide a meaningful next step for policy development and demonstrable implementation of educational cooperation among the APEC member economies. Our goal is, after all, to strengthen educational practices in order to provide all students in the region with quality education through cooperation; that is, *envisioning together for their future and hope*.

2. Educational cooperation tends to have different connotations across the APEC member economies reflecting our differences in needs and approaches to cooperation. Nevertheless, the Ministers agreed to establish a systemic support for strengthening educational cooperation in the APEC region. Thus, this Gyeongju Action Plan for APEC's educational cooperation through EDNET intends to: (1) serve as a concrete road map to foster strong and vibrant learning systems across APEC member economies, (2) promote education for all, and, (3) strengthen the role of education in promoting social, individual,

economic and sustainable development.

3. The Gyeongju Action Plan specifies initial steps for implementation during the next four years until the 6th AEMM with the ultimate goal, thereafter, of realizing active, systematic, and effective educational cooperation in the APEC region.

Educational Cooperation Task Force

4. *First, the establishment of Educational Cooperation Task Force (ECTF) is proposed to support EDNET in facilitating and evaluating educational cooperation through a self-funded EDNET project proposed by the Republic of Korea.* Active and effective participation of all APEC economies and stakeholders is fundamental for the success of the ECTF project.

a. The Republic of Korea and any other volunteering member economies will initiate formation of the *Educational Cooperation Task Force*.[22]
b. All interested economies are welcomed to serve on the ECTF on a voluntary basis.[23]
c. All the APEC member economies are encouraged to participate in the cooperation initiatives of the ECTF on a non-binding basis.

5. The primary purpose of the ECTF project will be to develop educational cooperation models and strategies that will be feasible and sustainable for all APEC member economies through conducting a series of collaborative research and sharing their research findings with members on a regular basis via the internet and in specially organized meetings.

Collaborative Research on Educational Cooperation

6. In order to meet its established purpose, the ECTF project will launch a series of collaborative research activities on developing cooperation models and strategies for the APEC region. *The initial collaborative research on this will be carried out in 2013 by the volunteering economies.* The funding for this collaborative research will be provided for member economies which may be in need of financial support to join in. The findings of the research will be shared later with all the APEC member economies, offering relevant knowledge such as various meanings and levels of cooperation, success factors, best practices of promoting educational cooperation, and so forth. The main issues of the collaborative research projects will include:

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[22] We'll request support and seek the concurrence for establishment of this Task Force.

[23] We'll request any interested member economies to express their willingness to serve on this Task Force, so that their names should be mentioned in Item 4.a. of this Action Plan.

a. Recognition of the needs for collaboration (e.g., promoting social-emotional skills to pr event school violence, establishing systematic strategies for active participation in the Open Education Resource, OER, and etc.) and different meaning of educational cooper ation among member economies
b. Identification of best practices and success factors for educational cooperation
c. Development of an educational cooperation model and viable strategies

7. A series of additional follow-up research activities may ensue over the next four years. For example, members may agree on the need for individual case studies, pilot tests of suggested cooperation models, trial applications of suggested cooperation strategies, extending the initial research, and so on.

The Annual Symposiums on Educational Cooperation

8. The researchers need to convene regularly to share and discuss their research findings and to be engaged in on-going dialogues to further develop and refine cooperation models and strategies that will best fit for the APEC member economies. The continuation of these activities among the researchers is vital not only as a means to produce final outcomes but also as an end to itself for creating a process of collaboration.

9. Therefore, another important role of the ECTF project is to organize annual symposiums on educational cooperation in order to provide researchers with a regular, stable platform to meet and share with one another. *The Republic of Korea, as the economy self-funding and initiating the ECTF project, volunteers to host the first symposium on educational cooperation in Seoul in 2013.* The Republic of Korea also expresses her willingness to support the following annual symposiums and corresponding collaborative research projects for the member economies which may be in need of financial support to join in for the next four years.

Outcomes on Educational Cooperation

10. Through the suggested collaborative research and annual symposiums, the ECTF project will develop models for educational cooperation that includes strategies for collaborating among people, sharing resources, and networking institutions in all APEC economies. The ECTF project will produce:

- *An outcome report, tentatively entitled, APEC Educational Cooperation Strategies and submit it to the 6th AEMM through EDNET by 2016.* This report of *APEC Educatio nal Cooperation Strategies* will include identification of possible ways for expanding e ducational cooperation for the future prosperity of all APEC member economies, whic h will consolidate all the findings of the collaborative research and the discussions in

the symposiums for the years 2013 to 2016. The report will also provide directions for building a mutually beneficial system of APEC educational cooperation for the maximum benefit of all APEC economies.

- An education cooperation portal page on the APEC Knowledge Bank Wiki that links to external resources and to wiki pages describing ECTF related research findings, materials, and resources.

11. Based on the strategies, the ECTF project will provide guidelines and indicators of educational cooperation, which promote and evaluate cooperation activities. The performance and progress of the ECTF project will be reviewed at the 6th AEMM, along with determination of further endorsement.

五、第 5 屆 APEC 教育部長會議聯合聲明

5th APEC Education Ministerial Meeting Joint Statement

21-23 May 2012

Gyeongju, Republic of Korea

Introduction

1. We, the Education Ministers and senior officials of Australia; Brunei Darussalam; Canada; Chile; People's Republic of China; Hong Kong, China; Indonesia; Japan; Republic of Korea; Malaysia; Mexico; New Zealand; Papua New Guinea; Peru; the Philippines; the Russian Federation; Singapore; Chinese Taipei; Thailand; the United States; and Viet Nam convened for the 5th Ministerial Meeting in Gyeongju, Republic of Korea on May 21-23, 2012, under the Chairmanship of Ju-Ho Lee, Minister of Education, Science and Technology of the Republic of Korea.

2. We met under the theme of 5th AEMM, *Future Challenges and Educational Responses: Fostering Global, Innovative and Cooperative Education*, which closely correlates with APEC priorities proposed by the Russian Federation in the year of 2012 as far as cooperative education is an integral part fostering regional innovative growth, promoting future skills suitable for the global society, creating innovative instructional delivery systems, and fostering more collaborative policy decisions that provide for our common fulfillment.

3. We acknowledge that the mission of APEC is "to support sustainable economic growth and prosperity in the Asia-Pacific region," and recognize the significance of achieving a dynamic and harmonious Asia-Pacific community by championing free and open trade and investment and promoting regional economic integration, and the importance of providing all students with a quality education enabling them to engage in the globalized economy. With increasing flow of investment, skilled labor, knowledge, and skills among economies, education is critical in facilitating regional economic integration and enhancing prosperity among the APEC member economies.

4. We further recognize that the changing nature of work requires workers to have higher levels of high-quality education and the competencies demanded by the nature of work and the change in nature of education with the integration of technology and introduction of innovative teaching and learning practices. Finally, the changing nature of education drives the need for increased cooperation and collaboration among education providers, businesses, researchers, and other stakeholders, to better meet the needs of all students and learners, as well as the economy.

Development & Progress

5. We acknowledge the development and progress made by the Human Resources Development Working Group (HRDWG) and the Education Network (EDNET) in expanding and extending the education knowledge-base for the APEC region. We recognize the importance of the work carried out by EDNET in building and sharing knowledge through the APEC Human Resource Development (HRD) Knowledge Bank Wiki and the APEC Learning Community Builders (ALCoB) networks in developing the 2008 education priority areas: mathematics and science education, career and technical education (CTE)/technical and vocational education and training (TVET), learning each other's languages, and information and communication technology (ICT) and systemic reform.

6. We recognize the wealth of knowledge accumulated in the priority areas since the 4th APEC Education Ministerial Meeting (AEMM) in Peru in 2008. We reaffirm the importance of developing priority areas to guide the APEC region towards creating learning societies and achieving prosperity for all the people of the member economies. Further, strengthening the competencies and skills of the entire 21st century population with such qualities as critical thinking, problem-solving, communication, and collaboration, technology savvy, and foreign language is critical in this globalized world.

7. We acknowledge the successful Pre-ministerial meeting organized by EDNET in Moscow in February 2012, where researchers and policy-makers exchanged research findings and policy analyses that reflect our member economies' greatest needs. We recognize the progress made by HRDWG and EDNET in promoting the role of education in social, individual, economic and sustainable development, and agree to continue to support research and policy analyses through EDNET.

Globalization and Education

8. The increased flow of human capital and information has expanded the opportunities for regional integration of the APEC member economies. We are aware that people have greater access to information and knowledge, and that they are increasingly interacting with diverse cultures. We acknowledge that education plays a key role in sustainable and inclusive growth in the APEC region. We recognize the importance of the 2012-2016 APEC priority areas of mathematics and science, language and culture, and TVET and higher education quality to equip students with the 21st century competencies they need for their full participation in the globalized and knowledge-based society.

9. In the current state of the globalized society, we acknowledge that increased cultural sensitivity for fostering global competencies and communication skills is essential. In addition, improved teaching and learning of mathematics and science will further develop students' logical thinking and cognitive skills, along with promoting creativity and flexibility. These skills can be a basis for the students to acquire practical knowledge about disaster risks and related competencies and apply them to the real-world problems. We also recognize the importance of preparing a qualified workforce with 21st century skills, promoting cultural understanding, and continuing quality improvement in TVET and higher education.

10. The Ministers reviewed the recommendations proposed by EDNET in the priority areas of mathematics and science education, language and culture education, and TVET and higher education quality. We agree on the importance of further refinement of educational responses in the following directions:

1) Continue to upgrade mathematics and science education capacity across the APEC member economies. Identify the best practices that ensure students are learning the foundation of mathematics and science and applying this learning to real-world issues, such as preserving the environment, reducing damage due to disasters, and achieving green and sustainable growth.

2) Create an open environment for education collaboration in mathematics and science starting with a joint data-base of mathematical problems, assessments, and evaluation methods.

3) Support foreign language education throughout students' academic careers and develops a system to nurture and train highly qualified language education teachers who also reflect cultural diversity.

4) Expand opportunities to participate in TVET programs for students, especially women and girls as well as diverse learners, and strengthen public-private partnership integrating TVET education so that the skills students acquire reflect the actual needs of the global labor market for in-demand occupations within high-growth industry sectors.

5) Improve the quality of higher education by strengthening the teaching force, assuring quality through high quality indicators and best practices facilitating the mobility of students and education providers between and among APEC member economies.

Innovation in Education

11. We daily witness advances in technology and the consequential rapid transformation in ways information is shared. ICT is a tool for social and economic development. We acknowledge the importance of enhancing ICT use in education for innovative and inclusive growth in the APEC region, but recognize that an ICT infrastructure and development divide still exists across the APEC member economies. We also recognize that there is a need to improve teachers' capability to use ICT

effectively so that they can help students acquire the 21st century competencies, and that considerable attention needs to be paid to teacher preparation and training.

12. We recognize the importance of teachers, and teacher quality as the most important factor determining students' success. Developing students with 21st century competencies requires fundamental and innovative changes in instruction and hence teacher preparation and development. We acknowledge that supporting teachers at every stage from recruitment to induction to career development is critical in establishing APEC's education capacity to provide workers that are among the most productive in the world.

13. In review of the recommendations proposed by EDNET in the priority areas of ICT in education and teacher quality, the Ministers direct EDNET to focus on the following educational responses:

1) Share experiences of ICT use in education, including development and implementation of national-level Master Plans for ICT utilization in education and the creation of open education resources (OERs), such as those found on the APEC HRD Wiki. Also, encourage the sharing of information about the development of ICT use in education among the member economies.

2) Strengthen teacher practices in ICT-utilized instruction that provides the most benefits for students' learning in the mathematics, science, language, culture, and TVET subject areas.

3) Increase the number of teachers' participation from the member economies in APEC eLearning courses.

4) Share promising practices on strengthening the teacher development pipeline, from pre-service to in-service stages of a career on issues such as recruitment, preparation, career paths, induction, incentives, assessment, and quality standards.

Educational Cooperation for the Future

14. We recognize the importance of the APEC Leaders' Growth Strategy for prosperity in the Asia-Pacific region and emphasize that education plays a key role as one crucial vehicle for implementing and realizing it. In the context of globalization, the Ministers agree that educational cooperation is an essential driving force for sustainable, secure, inclusive, innovative, and balanced growth of the APEC region.

15. We recognize that educational cooperation must be enhanced among and within the member economies in overcoming our global and regional challenges such as overcoming financial and environmental crises, reducing economic and digital divides, reducing natural and man-made disaster risks, and increasing the feasibility of the recommendations made for the priority areas. The Ministers agree on the need to explore ways of expanding education cooperation among the APEC member economies.

16. We acknowledge that the extent to which the member economies cooperate is vital for strengthening the capacity and future viability of education efforts within the APEC region. The Ministers applaud the growth of university-sponsored projects that bring together consortia of universities such as Mathematics and Science Lesson Study led by Kheon Kaen (Thailand) and Tsukuba (Japan) universities, Foreign Language Lesson Study led by Ming Chuan University (Chinese Taipei), ALCoB co-supported by Pusan National University (Korea), teacher preparation in mathematics and science secondary education quality projects led by National Institute of Education (Singapore), Columbia University (United States), and the University of Waikato (New Zealand), and higher education quality projects led by Monash University (Australia), East China Normal University (China), the University of Hawaii (United States), and Far Eastern Federal University (Russian Federation). The Ministers agree that the direction of future educational cooperation efforts should include both information exchange and other practical forms of cooperation which aligns with the HRD-PPP (Moscow Initiative).

17. We recognize the need for cooperative models and best practices in order to share and learn from each other and elevate the level of educational cooperation. We agree on the need for multi-year projects in EDNET in facilitating and evaluating regional collaborative projects. Future directions for support need to include the development of strategies for collaborating among people, sharing resources, and networking institutions in all the APEC member economies. We expect this educational cooperation will produce synergies when combined with current collaborative mechanisms like the on-going, US-funded APEC Wiki knowledge creation and dissemination efforts and the Korea-sponsored ALCoB activities that already support regional cooperation. Ministers noted the work of officials in exploring a number of proposals for research, information, and knowledge sharing in the field of education services including the proposed initiative by the Russian Federation for the development of higher education cooperation. The Russian Federation informed the Ministers that they will hold a conference on this topic.

18. We welcome Korea's recommendation to enhance practical and sustainable educational cooperation with the title of Education Cooperation Project (ECP), Gyeongju Initiative. Ministers appreciate Korea's initiative on cooperation.

19. After consideration by EDNET, we direct the Education Cooperation Project draft an outcome report, tentatively entitled, APEC Educational Cooperation Strategies and be submitted to the 6th AEMM through EDNET by 2016. This report of APEC Educational Cooperation Strategies should include identification of possible ways for expanding educational cooperation for the future prosperity of all APEC member economies, and should consolidate all the findings of the collaborative research and the discussions in the symposiums for the years 2013 to 2016. The report should also provide directions for building a mutually beneficial system of APEC educational cooperation for the maximum benefit of all APEC economies. In addition, we direct EDNET to build an education cooperation portal page on the APEC Knowledge Bank Wiki that links to external resources and to wiki pages describing ECP related research findings, materials, and resources.

Conclusion

20. We affirm that education efforts are underway by APEC member economies with international education organizations beyond the Asia-Pacific region, such as OECD, EAS, OAS, SEAMEO, the World Bank, and UNESCO, for the strengthening of cooperative research and the sharing of best practices across the global community within APEC guidelines on managing cooperation with non-members. We request EDNET to leverage and strengthen these current relationships and build new partnerships with bilateral and multilateral organizations by promoting activities that correspond with the Ministers' priorities as well as APEC HRDMM.

21. We request that EDNET, report on conclusions reached at the 5th APEC Education Ministerial Meeting at the next APEC Leaders' Meeting in Vladivostok, Russia in September 2012, and provide the Ministers with an Annual Report of Progress towards the goals that we have established.

22. We would like to extend our most sincere appreciation and gratitude to the Republic of Korea, our host economy, for their excellent coordination and preparation of the meeting. We also express our thanks to the APEC Support Fund and Russia for funding the 3rd Pre-Ministerial Symposium on Education Research and Policy, and to China, Korea, Peru, Russia, and the United States, for building the research and policy base for the priority areas adopted by the Ministers. Finally, our sincere appreciation to EDNET, the HRDWG, and the APEC Secretariat for their important contributions to the success of this meeting.