

Policy Issues and Recommendations on:

- *Investing in education*
- *Investing in R&D*
- *Revisiting manner of teaching in the 21st century, especially for certain disciplines like engineering education*
- *Adopting an innovative perspective for instruction and research.*

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Education and Human Capital Development to Strengthen R & D Capacity in ASEAN

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This *Policy Brief* raises some policy issues regarding the capacity of the ASEAN region's education system in producing knowledge capital as it looks into the opportunities and challenges faced by the sector. This is critical for ASEAN to enable it to attain its quest to be a base for innovation. Among the issues that ASEAN has to confront in achieving this goal relate to the development of financing schemes for various types of education, improvement in the level of investments in research and development, and revisit of the way teaching is conducted in the 21st century, especially in certain disciplines crucial to engendering innovation for growth and development.

Introduction

The promotion of innovation and creativity in a highly competitive and interconnected global setting is one of the strategies being put forward in the ASEAN to sustain its previous growth performance and to deepen its links within the region in the future. Towards this end, the role of education as well as research and development will definitely influence how innovation and creativity will take shape in the region (Tullao, 2012). This *Brief* examines the capacity of the ASEAN region's education system in producing knowledge capital as it looks into the opportunities and challenges faced by the sector.

Role of Human Capital in Economic Growth

In understanding the role of human capital in economic growth, we traced the evolution of growth theory. Solow (1957) attributed growth to changes in factor inputs and technical change. Technical change, in turn, is composed of economic speedups, education, and total factor productivity which Denison (1962) coined as factor residuals. Since education and training enhance productivity, human capital became a central theme in explaining economic growth (Becker, 1964; Mincer, 1974). However, Romer (1986) provided a fresh outlook on the role of education by stressing that growth is driven by the accumulation of knowledge. Thus, higher levels of education create knowledge capital which enhances the capacity of the economy to

perform research and development (R&D) and usher in further growth.

Research and Development Capacity in ASEAN

Innovations and technological improvements in a country are premised on its R&D capacity which in turn is influenced by the quality of human capital in the labour force. A crucial backbone of the R&D infrastructure of any economy is shaped by its innovation system. Although a number of countries in the ASEAN have clear and well-articulated innovation systems, said systems, however, are characterized by limited government support and weak linkages among research institutes, laboratories and industries as reflected in the low R&D expenditure per GDP, limited number of researchers per million people and low production of scientific documents, with the marked exception of Singapore and to a less extent, Malaysia (Table I).

In contrast, the innovation systems of China, Japan, South Korea and India are characterized by tightly linked sub-systems, strong government commitment, substantial R&D investment, and highly developed educational institutions, including heavy investments in human capital.

Strengthening Human Capital for Innovation in ASEAN: Emerging Engineering Education for the 21st Century

The role of engineers and other scientists is crucial in the creation of innovative products and services. As such, the types of engineers needed in the 21st century should fit the demands of tight global competition, the need to innovate, the changing learning styles of the youth and the demand for human resources in a highly globalized environment.

Thus, graduates of engineering programs need not only be technically competent but should also have an understanding of today's environmental and social contexts because innovations and inventions revolve around these settings. Aside from technical capability, they should develop their communication and people skills and spot emerging opportunities in order to innovate and remain competitive in a globalizing work environment (Wnek, 2013).

Central to the development of engineering education in the ASEAN is the ASEAN University Network (AUN)–Southeast Asia Engineering Education Development Network (SEED-Net). This

Table I. Indicators of R&D in ASEAN+4

Country	R&D Expenditures as Percent of GDP	R&D Researchers per Million People	Cumulative Documents in SCImago Journal (1996-2007)
Brunei Darussalam	0.037 (2004)	286(2004)	1,064
Cambodia	0.050 (2002)	17 (2002)	1,296
Indonesia	0.048 (2001)	198 (2001)	16,139
Lao PDR	0.036 (2002)	16 (2002)	853
Malaysia	0.635 (2006)	365 (2006)	75,530
Myanmar	0.162 (2002)	18 (2002)	906
Philippines	0.110 (2007)	78 (2007)	11,326
Singapore	2.372 (2007)	5955 (2007)	126,881
Thailand	0.214 (2007)	315 (2007)	69,637
Viet Nam	0.193 (2002)	116 (2002)	13,172
China	1.396 (2007)	1077 (2007)	2,248,278
India	0.758 (2007)	110 (2000)	634,472
Japan	3.444 (2007)	5409 (2007)	1,604,017
South Korea	3.210 (2007)	4672 (2007)	497,681

Sources: World Bank (2012) & SCImago Journal & Country Rank. Available at www.scimagojr.com

network is a collaborative undertaking among ASEAN's 19 leading higher education institutions with the support of 11 leading Japanese universities through the Japan International Cooperation Agency (JICA).

Strengthening Human Capital for Innovation in ASEAN: Other Regional Initiatives towards the Development of Higher Education

Besides the AUN and SEED-Net mentioned above, there are other initiatives that contribute towards the development of higher education in the region. These include the ASEAN Framework Agreement on Services (AFAS), the Asia Professional Education Network (APEN) and the South East Asian Ministers of Education Organization (SEAMEO). The AUN, as stated earlier, is a group of the leading public and private universities in the region with the aim of improving the quality of instruction and strengthening collaborative research initiatives in various disciplines, including engineering education. The AFAS, on the other hand, is a regional accord that can assist in the development of higher education by facilitating trade in educational services through various supply modes.

Meanwhile, the APEN was established to enhance the nexus of collaboration among organizations and has created dialogues amongst policymakers, training entities and educational institutions. Lastly, the SEAMEO has contributed in enhancing regional understanding, cooperation and unity of purpose through the development of regional centres of excellence, promotion of R&D in education, science and culture and improvement of R&D dissemination.

Some Key Policy Issues

What are some of the challenges and issues that confront ASEAN in its quest to be a base for innovation? The following lists some of them, with

implications and suggestions for policy and decision making within the region:

How to invest in education. Given the private returns and social value attached to various types of education and the limited public resources to finance education, there is a need to have an optimal level of investment in education. Three issues need to be addressed related to this question. First, what is the appropriate mix of allocating public funds for various types of education? Second, what are the financing schemes for various types of education that will respond to efficiency and equity concerns? Third, what institutional requirements are needed to be pursued in graduate education and research to motivate cooperation among key researchers within the region?

How to invest in research and development. There are several avenues in investing in R&D to make ASEAN a base for innovation and creativity. Allowing the entry of foreign scientists and highly skilled professionals is one of them. An alternative option is to promote regional cooperation in building R&D infrastructure for the ASEAN and for individual economies. Crucial in building this R&D infrastructure is a substantial increase in government and private sectors' R&D expenditures in each country given their current low levels. Additionally, there should be a mechanism for cooperation and complementation among universities, research institutes, private and public sectors to raise the standards of research in each country and in the region.

Balancing technical competence and people skills: a new perspective in engineering education. There is a need to revisit the way we teach in the 21st century. We have to understand how students learn given their diverse interests and the rapid developments in technology. In this light, the objective of engineering education is not only to provide technical competence to students but to make them understand real problems as well as contribute to their solutions. This is how they

become agents of innovation. The teaching of engineering along disciplinary thrusts should give way to the formation of teams of students working together on a specific problem and solving it using the principles of engineering with their professors.

Innovation perspective: a new wave for instruction and research for the 21st century.

Applied research, specifically research for commercialization, is essential in addressing current societal problems. For R&D to be relevant, innovation should be a primary thrust for research. This innovation perspective can re-shape engineering education so that engineers may contribute in solving key societal problems and create value added. This innovation perspective may require multi-disciplinary governance structure in universities which is a departure from the current disciplinary structure.

Regional cooperation and private-public partnership. Given the state of R&D in the ASEAN, regional cooperation may be required for developing the R&D infrastructure. Private-public partnership, on the other hand, is meant to address the limited resources of the government and the numerous distortions in the market. The assignment of roles in the private-public partnership will be determined by private returns, social benefits and positive externalities. For the private sector to participate in such partnership, there should be an appropriate environment, incentive system and regulatory framework present.

Concluding Remarks

As noted earlier, there are challenges to be hurdled in making the ASEAN region a base for innovation and creativity. An adaptive and innovative ASEAN is important in having a sustained robust growth and dynamism in the region, which is central to the elimination of poverty, growth of the middle class, and the attendant further growth and transformation of the region. ■

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