Chapter 14

Infrastructure and Pedagogy Innovation—A Differentiating Factor in TVET

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The Institute of Technical Education (ITE) is the principal provider of technical education in Singapore. Established as a postsecondary institution under the Ministry of Education (MOE), ITE is responsible for the development of national-level certification and skills standards for the training of youths and working adults to enhance the global competitiveness of the Singapore workforce.

As a public-funded technical and vocational education and training (TVET) institution, ITE plays an important role in developing the knowledge and skills of the workforce to secure the future for Singapore. It aims to achieve this by creating a robust TVET system to prepare students for jobs in growing sectors of the economy. This forms the key driving force behind ITE's training system.

This article highlights ITE's recent innovations in TVET infrastructure and pedagogy to support the implementation of industry-relevant TVET curricula. Specifically, the development of Authentic Learning Environment and Discipline-Specific Pedagogies uniquely characterize ITE's TVET system, and these have attracted the keen interest of many countries globally.

Issues and Challenges Faced by TVET Development

Despite its key role in supporting the socioeconomic development of a nation, in many countries TVET is still the weakest component of the national education system. Many governments regard TVET as low-value and relatively unpopular compared

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to other areas of education, failing to allocate adequate resources and render public support to ensure the relevance, quality, and attractiveness of their TVET programs. Consequently, in many countries TVET is somewhat disconnected from the skilled workforce needs of the economy, often disdained by parents and society. This is notwithstanding the difficulties faced by a sizable proportion of graduates of other education institutions in finding a job as compared with the job opportunities open to TVET graduates.

The often relatively low quality of TVET and its failure to attract a sufficient number of youths to enroll for skills training have long-term implications for a country's competitiveness. This will weaken a country's ability to attract or create new economic investments leading to sufficient jobs for its people. Singapore, being a small nation without any natural resources, has long since its independence recognized the importance of having a skilled workforce to support and grow its economy. In tandem with its economic development strategies, the Singapore Government has invested heavily over the past 5 decades to develop and transform the TVET system, enhancing its public image from one traditionally viewed by many to cater for school dropouts, to one that is now regarded as the jewel of its national education system. In fact, many countries now look upon the Singapore TVET system as a model for their own TVET reform movement.

So what are the strategies adopted by Singapore in the transformation of its TVET system?

Infrastructure and Pedagogic Innovation as a Differentiating Factor in TVET

The TVET system of ITE is geared to develop work-ready, world-ready, and future-ready graduates for the skilled manpower needs of the economy; and Singapore ITE has focused on five key factors to build a high performing TVET system for a world-class workforce:

- Industry-relevant and responsive curriculum,
- Learner-centric and discipline-specific pedagogies,
- Credible and reliable assessment and certification system,
- Engaging and authentic learning environment, and
- Passionate and competent staff.

The learning environment (and hence infrastructure development) and pedagogy innovation in the enhancement of the TVET quality and image are the two most visible components that will readily influence the perception of the community, in particular parents and potential students, of the overall quality, value, and attractiveness of the TVET programs. A modern, well-equipped campus carefully set up and filled with meaningful, engaging learning activities will go a long way to attract parents to enroll their children in TVET programs.

TVET Infrastructure Innovation

TVET infrastructure innovation takes place at two levels, namely, the design of the TVET campuses and the setup of training facilities within these campuses. The traditional approach in developing TVET campuses is premised on functional needs, focusing on the number and size of training workshops/laboratories to conduct the TVET courses in a typical school setting.

ITE chose to rethink and boldly transform its previous 10 smaller campuses into three mega TVET campuses; guided by an overarching aim to create a fun and engaging learning environment, an education wonderland for TVET learning. ITE's Workplace@Campus is conceived as a home away from home for students, a conducive place to spark the creativity of students, academic staff, and external training partners—drawing them to collaborate and cocreate relevant TVET learning programs to meet the skilled labor needs of the economy.

Prior considerations in the campus design included the training philosophy of ITE, its desired education outcomes, student management and development strategies, learning and teaching workflow, interfacing with the community, and partnership with industry. These are to address adequately the functional needs of the campus.

In tandem with its training philosophy and desired education outcomes, the design of the ITE campuses has evolved over the years and adopted a number of breakthrough concepts along the way:

- *From traditional school environment to comprehensive mega campus design.* Each mega campus presented the look and feel of a postsecondary/tertiary learning environment with vast opportunities for cross-disciplinary learning and real-world project work within the mega campus itself, projecting a positive public image for TVET.
- *From “single-purpose” training facilities to “integrated” learning space.* Rapid changes due to technology advancement and economic restructuring necessitate a flexible approach in the demarcation of learning space, and, where feasible, an extended application of the “shared-facility” concept. Such consideration will mitigate the unavoidable cost escalation arising from the need to accommodate new courses and the curtailing/phasing out of obsolete courses, and will improve space utilization.
- *From conventional workshops and laboratories to authentic learning facilities.* These closely model actual workplace settings where students learn to perform tasks in an environment mirroring what professionals do in the real world of work. Here they also pick up soft skills to function effectively as skilled workers in a specific profession, in preparation for internships and work-study programs. The facilities also double up to meet the shortage of internship places during an economic downturn, providing students with learning experiences beyond the traditional boundaries, and empowering them to explore job redesign and job enlargement at the workplace subsequently.

- *From technology training to “Hands-on, Minds-on & Hearts-on”™ education.* ITE campuses also come equipped with modern student amenities and recreational facilities for the holistic development of their students, raising their self-confidence through exploring and exercising their unique talents and interests as well as promoting friendship and networking with other students from both within and outside their course of study.
- *From a “closed” learning environment to an “open” campus design.* Coupled with a strategic location of key learning facilities, each campus effectively operates a 365-day open house concept for the general public to tour the grounds and gain a more accurate and positive impression of TVET.

Innovative training facilities and pedagogies adopted at ITE campuses have stirred the interest and imagination of students and employers.

Authentic learning does not happen naturally. It takes strong teamwork—from the careful crafting of industry-relevant curricula closely involving industry partners to the painstaking build-up of a conducive and authentic environment with best-in-class facilities, and, ultimately, to immersing students in real-work practices on and beyond the campus. The setup of innovative, authentic learning facilities is only the start; the next step is to equip our teachers with the capability to bring out the best learning outcome.

TVET Pedagogy Innovation

ITE offers some 100 full-time courses in six broad areas, viz., engineering, business and services, info-communication technology, media and design, hospitality, and applied and health sciences. Its teachers have been industry practitioners, all trained in competency-based pedagogy, imbued with the ITE “Hands-on, Minds-on, Hearts-on”™ philosophy, and regularly required to update themselves through industry engagement and/or attachment.

There is limited research done by the TVET community globally on the effectiveness of applying different pedagogic strategies such as project-based learning or task-based learning for specific trade disciplines. As such, ITE has embarked on a pedagogic innovation project to research appropriate strategies that will accentuate active, student-centric learning leading to the capability to perform competently and independently in one’s chosen profession.

Discipline-Specific Pedagogies (DSP) is a recent breakthrough in ITE to bring the traditional skills learning process closer to professional practices in industry. DSP here is defined as that set of teaching strategies that enable students to acquire the relevant knowledge, skills, and values specific to the contexts, content, and practices of their chosen professions.

Implicit in the pedagogic innovation is teacher quality, mentoring, and learning by, and within, the teaching fraternity. Small core teams of DSP champions in each ITE school apply a set of guiding principles to contextualize appropriate pedagogies

that will make the learning and acquisition of particular attributes of a discipline most apt and effective. The innovative aspect of DSP focuses on how to strengthen the nexus between job skills content (*what to teach*) and pedagogy (*how to teach*) to achieve the intended learning outcomes.

Adopting DSP as the signature pedagogy for ITE education has many aims. First, it will help the teachers to distinguish the more effective pedagogies amidst a wide array that work for the learning of a particular trade/discipline. Second, it will lead to improved instructional design and assessment/evaluation processes. Third, carefully curated DSP resources piloted successfully by DSP pioneers and champions in their schools will be cascaded to relevant groups of teachers across ITE colleges, thereby assuring the quality of curriculum delivery based on a tried and tested set of pedagogies for the respective trade disciplines. Last and most importantly, DSP integrates the acquisition of technical skills (*learning to do*) with the learning of values, work dispositions, and professional ethics (*learning to be*), the latter being soft skills that are increasingly crucial for the future economy.

Figure 14.1 depicts the ITE education and pedagogic framework summarizing the key aspects of the innovative DSP:

Feedback gathered from teachers, students, and employers during and after the DSP pilot phase revealed the following learning points and benefits:

Figure 14.1 ITE education and pedagogic model

- Teachers saw their students gain a deeper understanding of the subject content when pedagogic activities were related to workplace realities and requirements.
- The students considered themselves as becoming more confident and work-ready to function effectively in their respective professions.
- Employers viewed their interns/trainees as better equipped with workplace life skills such as problem solving, communication, collaboration with others, and critical thinking.

Moving Forward

Clearly, Singapore TVET education has come a long way from its humble beginnings of basic infrastructure and predominantly teacher-led instruction to its modern and comprehensive mega-campuses that thrive as authentic learning hubs of excellence. What are the key enablers that have led to its remarkable transformation?

Once TVET's role in nation building was recognized, there has been strong and sustained national leadership support. Singapore has not spared its resources to uplift the quality of its people. Education makes up the second highest expenditure of its gross domestic product,¹ and of this amount, 16% is allocated to the postsecondary TVET sector² alone. This works out to an investment of \$12,500 a year to train each ITE student.

Next, careful execution of TVET policies requires a strategic and coordinated planning approach for alignment at all levels—from the national, agency, and sector down to the industry level. This entails the commitment and involvement of multiple stakeholders—key public agencies including public-funded postsecondary education institutions, private employers, and trade associations/unions—to collaborate and co-create the future economy of Singapore, industry by industry and sector by sector. As a result of this systematic and coordinated approach, ITE has managed in just 2 years to bring in nearly 3,000 employers as co-training partners, and several hundred active industry partnerships for its own staff capability development and industry updates.

Finally and most importantly, besides TVET infrastructure, passionate teachers are needed to drive the transformation in TVET teaching and learning. Inspired by their early successes in DSP, these pioneers and champions in ITE have started forming professional learning circles (PLCs) to share with their peers. The recent introduction of work-study diploma programs with curriculum built around realistic work situations gives added impetus for teachers to rethink and redesign their delivery based on DSP principles to meet the aspirations of both students and the skilled workforce needs of the economy.

¹Ministry of Finance 2019. Analysis of revenue and expenditure—Financial Year 2019.

²Ministry of Education 2019. FY 2018 Expenditure Estimates. The TVET proportion includes funding of all public postsecondary institutions, viz., ITE and five polytechnics, SSG, and a few private institutions such as Lasalle College of the Arts and Nanyang Academy of Fine Arts, excluding the universities.

Conclusion

ITE has put in place basic building blocks in its TVET model. This article has elaborated on two of these, viz., infrastructure innovation and pedagogy innovation. New demands and challenges will nonetheless arise, posed by rapid technological advances; and undoubtedly, our TVET model will evolve over time. Future learning may be more efficiently done by leveraging new technologies; conventional front-loading of content may have to give way to just-in-time, just-enough, and just-for-me (personalized) learning, the latter made possible by exploiting learning analytics.

The rapid and unrelenting pace of change taking place means that TVET organizations may need to reassess their *modus operandi*—be bold to disrupt traditional TVET or else risk themselves being disrupted. Indeed, closer collaboration of TVET institutions with industry partners would be a better way forward to complement both workplace learning and work-based learning in developing work-ready, world-ready, and future-ready graduates.

Links to the presentation materials: <https://events.development.asia/materials/20160919/ite-education-services>. <https://events.development.asia/materials/20190827/institute-technical-education-ite>.

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