# Roles of the 3rd Strand of the 'Triple Helix' in Promoting Work-Integrated Learning in Thailand

*Kitipong Promwong and Siriporn Pittayasophon*
*The National Science Technology and Innovation Policy Office, Bangkok*

**Subtheme:** Government and public policy in Triple Helix era
**Keywords:** work-integrated learning, education, government-university-industry link

**Abstract**
In shifting from 'cheap-labor' comparative advantage regime to 'technology and innovation-intensive' competitive advantage regime, Thailand encounters problems related to, *inter alia*, science and technology (S&T) manpower. Shortage of S&T manpower significantly slows down the transformation. The lack of S&T human resources is observed not only in terms of quantity but also in terms of quality. The major problem concerning manpower quality is the gap regarding knowledge, skills and attributes of personnel – between which industry required and which educational sector produced. Work-integrated learning (WIL) has shown potential to increase quality of graduates to meet demand of the industry as it can equip students with authentic and hands-on experience before entering (knowledgeable) labor market. Nevertheless, adoption of WIL, especially in an environment lacking strong tradition of linkages between government, educational and industrial sectors, is not easy. The grounds of the difficulty relate to a number of factors. These include divert culture, attitude and styles of working between each sector as well as the lack of strong motives from both university and industry sector. In this regard, policy and support from the government, which is identified in this paper as the '3rd strand' of the triple helix (TH), becomes imperative. Flexible and accountable governance, administration and management systems are also central to implementation of WIL. The paper is organized into four parts. Part 1 presents an overview of the transition of the Thai economy during the past three decades in relation to the need of new approach for effective supply of S&T manpower. Part 2 provides brief review on current status of WIL in Thailand. Part 3 analyses factors affecting successful implementation of WIL by particularly looking into the role of the government from the viewpoint of TH. Part 4 concludes the paper by making a remark on key points of concern and the basic challenge Thailand to successfully employ the concept of TH in effectively implementing WIL approach.

## 1. Introduction

The Thai economy is export-dependent. Currently exports of goods and services equivalent to about 70 percent of GDP. While exports play important role in the growth of the economy, it is observed that for the most part of the last three decades or so, export growth was substantially based on cheap, labor-intensive products and services[1].

However, it has been proven by the experiences of numerous more developed countries, and even Thailand itself, that competitive advantages which derive from such sources would not last long in the face rapid changes in terms of global trade environment and technology. In the case of Thailand, the occurrence of economic slowdown during the mid 1990s, followed by the national economic crisis in 1997 and stagnation of growth since 1999 tends to suggest that competitive advantage due to cheap labor cannot be sustained in the long term.

[1] For example, in 2007 the economy relied heavily on resilient export growth (at a 17.3% annual rate), particularly in the automobile, petrochemicals, and electronics sectors which primarily are OEM and labor-intensive.

**Figure 1:** Thailand's GDP growth


The Thai Government was not unaware of this. Indeed, the current national economic and social development plans reflected the government's awareness of the problem. The plans consequently sought ways for maintaining the competitive advantage position of Thailand in the world market by adopting strategies gear towards a more knowledge and innovation-based approach[2].

In shifting from 'cheap-labor' comparative advantage regime to 'technology and innovation-intensive' competitive advantage regime, Thailand encounters problems related to, *inter alia*, science and technology (S&T) manpower. Shortage of S&T manpower significantly slows down the transformation. The lack of S&T human resources is observed not only in terms of quantity but also in terms of quality.

The study of the National Economic and Social Development Board or NESDB (2005) finds disparity between demand and supply of science and technology (S&T) manpower especially in terms of quality in almost every industrial sector surveyed. The mismatch reflected in various aspects. These include significant gap regarding knowledge, skills and attributes of personnel between which firms required and which educational institutes produced (as a result of e.g. imbalance between practical and theoretical modes of learning as well as between knowledge deepening and knowledge broadening learning approaches). The study went to suggest that to overcome such demand and supply disparity of manpower quality there would be need for every college and university to established in-depth cooperation with industrial enterprises.

Work-integrated learning (WIL) is a key approach the Ministry of Education attempts to adopt at all levels of education in Thailand especially in vocational and higher education in order to fill the quality gap of human resources. Recently the Office of Education Council or OEC (2009) published a report on *Guideline for Development of WIL Program* aiming at assisting colleges and universities to implement WIL approach more effectively.

[2] These include, for example, investment in human resources, promotion of R&D in industrial sector and encouragement of closer cooperation between the public and private sectors.

Successful implementation of WIL requires, among other things, an effective collaboration among key players in the system. Institutionally, there are at least three parties which are most important. These encompass the educational institute (a college or university), the industrial partner (usually an industrial enterprise) and government agencies (policy and supporting organization). These, indeed, are the fundamental components of the so-called 'triple helix' (TH). This paper discusses importance of the roles government which is identified as the 3$^{th}$ strand of TH model in promoting WIL and analyzes conditions and factors related to the government's roles which are critical to success of implementation of WIL with a particular reference the experience of Thailand.

## 2. Current Implementation of WIL in Thailand

In 2009 higher-education new enrolments in the field of science and technology were about 123,000 students (32% of total number of higher-education new enrolments). These students are the key driving force of S&T development for Thailand. However, it is currently observed that considerable number of new graduates appear to be underperformed in industry's point of view. The survey of the Ministry of Labor in 2007 reports that skill competency of employers (both skilled workers and technical specialists) working in industry in Bangkok area is significantly far behind the level expected by industrial firms (Table 1). This affects productivity and innovative capacity of the industry one way or another.

**Table 1:** Competency level of personnel working in Bangkok area (score: 0-5)

| Competency | Skilled workers | | specialist | |
|---|---|---|---|---|
| | actual | expected | actual | expected |
| Ability to analyze and get problems solved | 3.14 | 3.74 | 3.55 | 4.10 |
| Capability in Computer | 2.87 | 3.42 | 3.12 | 3.69 |
| Capability to communicate in second language | 2.68 | 3.32 | 2.97 | 3.61 |
| Capability to work as team | 3.38 | 3.95 | 3.75 | 4.23 |
| Operating capability | 3.55 | 4.09 | 3.93 | 4.44 |
| Management capability | 3.51 | 4.08 | 4.08 | 4.55 |

*Source: Ministry of Labor*

An important cause related to the quality shortfall of S&T personnel is believed to be a result of the educational system which cannot catch up with changes at the industrial front. In such system there is no mechanism to effectively link universities with industry, which effectively allows information, knowledge and skill exchange between the two parties.

Moreover, in this system teaching and learning are conducted in class room which is isolated from what really exercises in the workplace. Faculties and students have no sufficient exposure to real industrial activities. Students produced in this mode of learning have never had opportunity to really apply academic principles and theories they have learned into practice in the workplace. As a consequence, there exists a huge gap between the demand and supply in terms of the quality of S&T personnel.

According to Bloom's taxonomy of learning domains, three domains of educational activities are identified, comprising of *knowledge*[3], *skills*[4], and *attitude*[5] (Bloom, 1956; Krathwohl, Bloom, Masia, 1973; Simpson, 1972). Only the first – i.e. knowledge – can be obtained from class-room based education. The other two domains of learning can be well developed through the so-called 'learning by doing' approach. The higher education system in Thailand appears to emphasize on the former, but less touch on the latter. As a result, the competency as listed in Table 1 can hardly be developed in order to meet expectation of the industry.

The policy question is that how such quality gap can be reduced. Work-Integrated Learning (WIL) has been introduced as one of the answers to the question. WIL refers to educational approaches which integrate theoretical learning with its application in the real workplace. WIL can be organized in various ways but all have the same fundamental concept which is to support students to have opportunity to have real working experience in the real workplace before entering employment market.

WIL approach is not new to Thailand. A number of WIL programs have been carried out by education institutions in various forms (Table 2). Some examples of the programs are briefly illustrated in the Appendix. Although WIL can be conducted in different manners, the same basic principle is applied. In general, a WIL program is organized in a way which an educational institution and an industrial-sector partner (usually a company) jointly develop and operate the curriculum aiming at enriching students with authentic industrial experience in the real workplace. Figure 2 illustrates basic concept and components of a WIL model.

According to the Office of Higher Education Commission (HEC), in 2007 there were 88 higher educational institutions (HIEs) (about 50% of the total number of HIEs in Thailand) conducted cooperative education. There were about 5,800 industrial firms participated. At a lower level (vocational education), according to the Office of Vocational Education Commission (VEC), during 2005 – 2007 there were 181 vocational colleges (about 25% of the total number of vocational colleges in Thailand) conducted the so-called 'dual vocational training' programs. About 26,500 students (4% of total number of vocational students) received such training and about 500 firms participated in the programs.

The number of universities conducting WIL was, however, on the decline (OEC, 2009). It is believed that such falling off relates to deterioration of government's support. This point is further discussed in Part 3.

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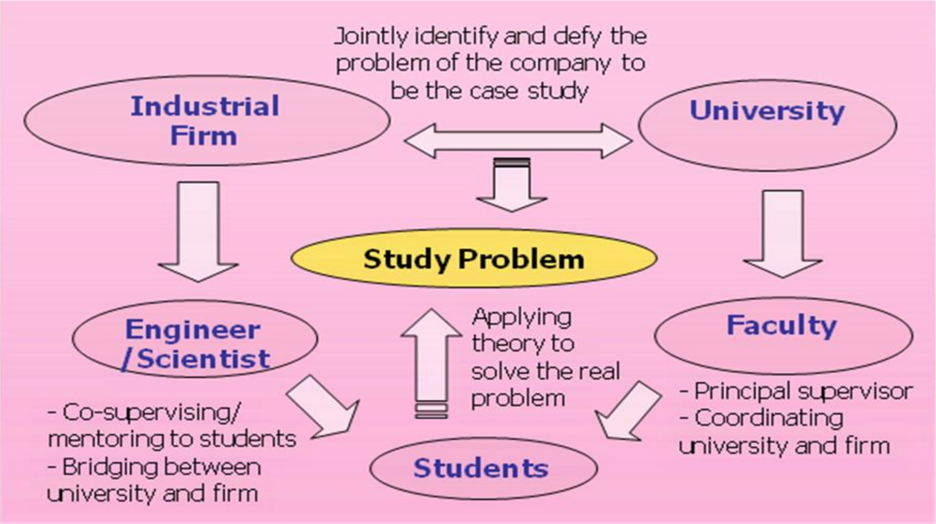
[3] It is the recall or recognition of specific content e.g. facts, figures, procedural patterns, and concepts.
[4] Examples include physical movement, coordination, and use of the motor-skill areas.
[5] This refers to the manner in which one deals with things emotionally, e.g. feelings, values, satisfaction, motivations, inspiration and mind-set, etc.

**Table 2:** Different Types of WIL implemented in Thailand

| Type | Key Characteristics | Examples |
|---|---|---|
| 1.Pre – Course Experience | Requiring farm-work experience as a pre-requisite to enter higher education course | Admission to certain university courses related to agriculture |
| 2. Sandwich Course | Having working period (usually 3-4 months) in between the lecture-based teaching semesters in each academic year until graduation | Engineering course of King Mongkut University of Technology North Bangkok |
| 3. Cooperative Education | Requiring at least one semester of industrial internship (usually during the 3rd or 4th year) of a Bachelor degree course | Undergraduate courses of Suranaree Technology University and some certain courses in other universities |
| 4. Cognitive Apprenticeship or Job Shadowing | Apprenticeship emphasizing understanding and absorption of corporate value and culture of particular professionals | Apprenticeship of e.g. lawyer, attorney, governance official, etc. |
| 5. Joint Industry – University Course | Curriculum jointly developed and finance by university and industrial sector who is user of graduates | Certain engineering courses and business administration courses |
| 6. New Traineeship or Apprenticeship | Traineeship or apprenticeship programs provided for new graduates before entering employment market | Veterinary Medicine, Agriculture |
| 7. Placement or Practicum | Specific skill development by training in real workplace | Doctor of Medicine, Nurse, Teacher |
| 8. Field Work | Short-period observation in real workplace | Social work, Geography |
| 9. Post –course Internship | Real work experience enrichment following completion of theoretical learning | Doctor of Medicine, Attorney |

*Source: Yamnoon (2004)*

**Figure 2:** Basic concept and components of a WIL model



### 3. Factors Affecting Success of WIL and the Role of Government: An analysis from Triple Helix Perspective

OEC (2009) suggests that success and effectiveness of a WIL program will be increasing when engaging parties including educational institutions, industry sector and students fully perceive significant benefits of it. Examples of the benefits are illustrated in Table 3.

To educational institutions, WIL may have positive impact in various aspects. First, the institutions can earn good image and reputation from which the students' quality satisfies expectation of employers. Second, the faculties have better opportunity to create link or collaborate with the industrial partners. Third, working with industry helps enhance knowledge and perspectives of academic staff. It is observed that universities which are not aware of such benefits tend to give up WIL program when the government stops providing direct financial assistance. On the contrary, those realizing these benefits continue to expand the WIL program regardless whether the financial assistance from government are available or not. The evidence is obvious in the case of private universities where no government financial assistance is available but the WIL program continues to grow.

With regard to advantages of industry (as user of graduates), the most important one may be related to opportunity to recruit quality personnel. A WIL program, in a sense, can serve as effective recruitment process of the participated firms. Most WIL programs last from 4 – 12 months, a considerable length of time allowing the firm to get to know students more deeply. This is enormously helps reduce risk of employing persons unfit to the positions. The firm also has chance to be the first to approach bright students to become its employees. There is evidence, indeed, that many firms enjoy this benefit. Other benefits of WIL to participated industrial firms may include, for examples, public image of the firm e.g.in terms of CSR (corporate social responsibility), tax privilege[6], advantages resulted from having linkages with universities (e.g. excess to faculties, research facilities, technical services, etc.) and opportunity to get involved in university curriculum development and so on. Moreover, there is possibility – albeit occasional – that students' project can really helps solve the firm's technical problems, hence saves significant cost of production as well as adds value to products or services. In fact, there exists, a number of students' projects under WIL programs create value for the firms ranging from 1 – 200 million *baht*[7].

Regarding benefits to students, examples may include that WIL helps increase their capacity to learn and develop their professional career; helps them to understand working system and culture in a real organization; helps them in adapting themselves into new environment more rapidly; helps enhance opportunity to progress in their occupation and to get higher salary (compared with those who do not take WIL).

The above hypothesis of OEC is, indeed, based on the principle that organization of education in WIL approach will bring about a win-win benefit to all parties involved, namely, the industrial firm and the educational institution partner as well as the students and academic staff.

Therefore, under such principle a considerable number of WIL programs occurring in certain fields are expected. However, in reality, not many programs are observed. One explanation may be that an assumption of the 'win-win' situation is inapplicable with the current educational and industrial context. The study of OEC (2009) reports quite a few numbers of factors hindering natural expansion of WIL.

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[6] The government provides a 200% cooperate tax reduction on the firm's expenditures directly spent on cooperative education.

[7] Information from the National Center for Genetic Engineering and Biotechnology (BIOTEC) – http://www.biotec.or.th

**Table 3:** Benefits of Work-Integrated Learning

| | Education institution | Firm | Students |
|---|---|---|---|
| Benefits | - Constant updates of information from the industrial front | - Opportunity to recruit best students with work experience related to the industry | - Opportunity to apply theories learned in class room in the real workplace |
| | - Higher possibility of joint projects with the industry | - Corporate public image (e.g. from CSR) | - Accumulative profile especially industry work experience |
| | - Faculties' exposure to industrial knowledge | - Education promotion privileges e.g. tax incentives | - Development of skills and attributes e.g. leadership, communication, management, etc. |
| | - Resources supported from industry | - Direct benefit resulted from WIL projects e.g. cost saving, product development | |
| | - Curriculum development with contribution from industry | - Connection with academic staff of the university | |
| | | - Higher possibility to further collaborate with university | |

On the industry side, firms still lack of understanding on the principle of WIL and as a result are not well aware of its benefits to them. Most of the firms treat a WIL program as their CSR (corporate social responsibility). To this extent, many feel that WIL program can be burden for them as it requires considerable effort of the firm to support students both in kind – e.g. that it has to assign senior engineers to supervise the students as a co-supervisor which will very much time-consuming – and in cash (e.g. students' daily allowance, cost of materials and equipment for student project, etc.).

On the university side, as WIL program also requires extra effort and time of faculties to closely oversee students especially when they are stationed at the training site. To the faculties' point of view, this creates considerable additional workload on top of their already-hard routine work. Moreover, most of the universities do not give significant score for such a hard and extra work of the faculties in the account of their academic career promotion. To this point, an incentive for the faculties in putting effort upon a WIL program becomes marginal comparing to other academic activities such as research or even teaching in an old fashion.

It is apparent that in a developing country like Thailand where there is weak tradition of university-industry link and also lack of awareness of the industrial sector on importance of science, technology and innovation as a key driving force for competitiveness as noted by Intarakumnerd and Virasa (2006) that: "Its National Innovation System (NIS) is weak and fragmented. The recently-conducted R&D and Innovation Survey of 1000 firms (including the top 200 largest manufacturing firms) clearly demonstrates that Thai firms pay too little attention to deepening technological capabilities. Not many firms have the capability to innovate, and R&D in firms is rare" (p.7).

Under such a circumstance, a primitive model of WIL which constitutes of players from the university and the industrial partner alone seems insufficient to make high impact on S&T manpower development and to be sustained in the long run. The finding of OEC (2009) strongly supports this argument. It is observed that more than half of universities which do not have strong tradition of linkage with the industry gave up the WIL program after the government's funding was stopped. This is contrast to the case of those having strong linkage with the industry. Although government's funding was ended, such universities had continued the WIL program using their own fund. But numbers of universities in this category are very few in Thailand.

Without involvement from the government it is unlikely that WIL approach can be widely implemented to a scale that creates significant impact on S&T manpower development at the national level. A more effective WIL model, therefore, needs another key actor, the government, in addition to the education institution and the industrial partner. This is, indeed, fundamental concept of triple helix (TH). The government as the 3rd strand of TH helps bridge the gap appeared in the basic model of WIL where key players in both the university and the industry sectors are unaware of the true benefits associated with a WIL program.

Involvement of the government can be both direct and indirect. To take the former first, the direct roles of the government range from providing financial assistance and incentives (e.g. tax incentives); imposing university assessment criteria in ways which consider effort of faculties contributed to WIL as key performance indicator of career promotion; setting up measures to encourage, create awareness and support relevant organizations in adopting WIL approach like, for example, supporting establishment of consortium of WIL practitioners to exchange best practice, and so on.

As for the indirect involvement, the government can create conditions influencing development of WIL in various ways. One example is to influence education and research funding agencies to recognize competence of applicants not just only in academic dimension (e.g. publications) but also in industry dimension (e.g. collaborative works with industry, industrial innovations, etc.). Government can also indirectly influence development of WIL through certain policies e.g. investment promotion policy favorable to companies having linkage with universities.

However in considering the roles of government, there are related issues specific to the Thai context which need to be bore in mind.

The first is the problem of discontinuity of policy. Thailand seems to be lacking of policy system, process and tradition which can assure carrying out of a specific policy in long-term fashion in the mist of so rapid changes at the political front. This is one of key factors largely restrain capacity of the government to play appropriately proactive roles in TH.

The second relates to administration and management systems in the government sector. Issues on flexibility, accountability and governance are of crucial concern in the context of most developing countries including Thailand. Regarding flexibility, in Thailand there are hindrances of policy implantation resulted from inflexible process within the government sector. To take an example, a 200% corporate tax reduction on expenditure a company spent on cooperative education has been implemented for years. But it is found that not many companies applied for. The reason, the application, claiming and reimbursement processes are too complicated and consume too much time and effort to be considered as 'worth-doing' in the private sector's point of view. The issue of flexibility, indeed, relates to the issue of accountability and governance. The lack of culture and mindset honoring integrity reflected in unaccountable practices and bad governance in doing business leads to distrust between the government and the private sectors. As a consequence, complicated procedures are usually adopted in public services as to prevent the corruption. This has side effect in terms of inefficiency mentioned above.

Issues related to the administration and management systems also concern the limited 'horizontal' integration and collaboration within the S&T policy system. Bell (2003) notes that "the vertically integrated 'slices' of S&T formulation, implementation and performance within ministerial structures appear to operate largely independently of each other. … On the other hand, there appear to have been few cross-cutting activities undertaken jointly between different ministries" (p.34). This has direct consequence on effectiveness of coordination among organizations within the government sector *per se*.

Moreover, there exists, 'shadow process' in the Thai policy system. The 'shadow process' limits effectiveness of 'top-down' policy planning and implementation. In principle, cross-cutting policy developed at the cabinet level supposes to be elaborated and articulated downwards to and within the ministries via a sequence of implementation plans. But this does not work as intended. As Bell (2003) points out, "this process, affected through a series of committees and subcommittees does indeed operate, but it seems clear that it does not impinge significantly in practice on what ministries actually do. Instead, it appears to constitute a 'shadow process' that runs in parallel with the internal ministerial process that builds up 'policy' by aggregating detailed proposals from lower level in the structure, and incorporating ideas brought in to the ministry by successive Ministers" (p.30).

## 4. Conclusion

In a developing country like Thailand where there is no strong tradition of university-industry link (UIL), adoption of a UIL program such as work-integrated learning (WIL) needs government's support. The government can play important roles ranging from providing direct assistance and incentives to indirect influence through certain policies as to motivate the target parties to have effective collaboration in order to achieve specific social objectives. However, as within the government sector itself there are constraints, particularly which relates to systems and processes of administration and management (a common problem of most developing countries including Thailand), failure to recognize such a limitation can lead to ineffective implementation. In order to attain an effective triple helix model, development of flexible but accountable administration systems and processes, good governance and culture of integrity seems to be a basic challenge for developing countries including Thailand.

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**Appendix:** Brief note on examples of the WIL programs in Thailand

| | Examples of WIL Programs | | | | |
|---|---|---|---|---|---|
| | **Science based Technology Vocational College: SBTVC (Chonburi)** | **Practice School (Chemical Engineering Practice School (ChEPS), King Mongkut's University of Technology Thonburi)** | **Early Recruitment Program (Western Digital (Thailand) Co., Ltd.)** | **Cooperative Education (Faculty of Engineering, Rajamangala University of Technology Thanyaburi)** | **The Royal Golden Jubilee PhD-Industry Program (Thailand Research Fund)** |
| **Year of establishment** | 2008 | 1997 | ~ 2008 | 2002 | 1996 |
| **Philosophy** | • SBTVC program provide students with academic background (physic, math, biology, chemistry) and high technology skills by project-based teaching and learning methodology. | • Practice engineering school program provides real work and research experience at industrial sites to students at the level of Master degree. | • Early recruitment program seeks out the right people for Western Digital. | • Cooperative education prepares the engineers to possess the practical professional engineering skills needed by industries. | |
| **Objective** | • To increase number of qualified vocational students. SBTS incubates talented vocational students in inventing technology by encouraging them to develop ability and creativity in order to become technological innovators or technologists. | • To produce high quality professional chemical engineers who are well-versed in both technical and English skills, well-equipped with industrial problem-solving experiences, and ingrained with social consciousness and morality. | • To recruit qualified engineers (knowledge and skill meet needs of Western Digital) who are capable to work once they graduate.<br>• To get research projects on hard disk drive from scholarship students. | • To produce practicable engineers<br>• To give opportunities to students to practice their engineering skills from industries rather than the universities' laboratories. | • To produce Ph.D. researchers and research for industries |
| **Key Success Factors** | • University – In this case, university professors jointly teach science and math subjects with vocational | • Company – Commitment of the company at every level to the practice school, starting with providing | • Company – 1) This project was initiated because of company demand. 2) Company plays an active role. | • Company - Companies assign persons in charge of taking care of, to give advice and to evaluate the students. | |

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| | teachers and provide project-based learning training to SBTS program. It will build up analytical and problem-solving skills of vocational students by applying science and mathematics knowledge. Also, it is an approach to develop knowledge and skill of vocational teachers.<br>• Government agency (Central and local administration) – 1) This program receives funding from National Science Technology and Innovation Policy Office, Vocational Education Commission and Sub-district Administrative Organization 2) The students attend training on site of Thai-German Institute.<br>• Teacher – Function of teachers is not only | free housing accommodations, office space, computing facilities, and Internet access. Senior management is first approached, which sets a top-down policy on sponsoring ChEPS. Plant managers, engineers, shift operators, and technicians are also consulted, since they have to interact with the students. A team of engineers is then formed to work closely with students.<br>• Government agency – 1) ChEPS receives funding from government agencies 2) Laboratories of government agencies are practice stations for students. | • University – Strong support from universities. | | |

| | Examples of WIL Programs | | | | |
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| | teaching but also mentoring students. The mentor will provide consistent support, guidance, and concrete help to students who may be going through difficulty or challenging situation in which they need extra support. | | | | |
| **Success Story** | N/A | • About half of the graduates currently work for large chemical, petrochemical, and refinery companies. A sizable number also work for small-to-medium enterprises (SMEs), e.g. those in the sugar and food industries. Finally, about 15% of ChEPS alumni went on to pursue PhD degrees. | N/A | • 1,200 companies participating in this program<br>• 80% of total firms satisfied with this program<br>• Some students are offered employment before graduation | N/A |
| **Level of Education** | Vocational certificate in Industrial Technician | Master degree in Chemical Engineering | Bachelor degree in Engineering (except Civil Engineering) | Bachelor degree in Engineering | Doctoral degree |
| **Curriculum** | • Basic subject 62 credits<br>• Vocational subject 64 | 1st Year<br>• Coursework (Lecture, Problem-based | • Enroll the subjects as identified by faculty and Western Digital | • Internship 6 credit-course (18 weeks) | N/A |

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| | credits (include doing invention project 11 credits)<br>• Electives 6 credits<br>• Activities for student development 360 hours | learning, Mentoring)<br>2nd Year<br>• Practice and Research (Practice at sites and Research on campus) | (must get grade ≥ C in these subjects)<br>• Attend training on site (Western Digital) during school holidays.<br>• Do senior projects on hard disk drive. | | |
| **Qualification of Candidate** | • Study in/Graduate with Matthayom 3 (Grade 9)<br>• Like to learn, practice and explore new things<br>• Have good ability to understand concept of science and technology<br>• Have works/experiences in projects and inventions in the primary and junior high schools | • 18-25 qualified students will be selected.<br>• GPA > 2.70 | • 2nd year engineering students with GPA ≥ 2.35 (except Civil Engineering) | • Academic records and behavior report are criteria for consideration. | • Bachelor or master graduates<br>• Age not over 40 years<br>• Desirable academic records<br>• Have research publications published in journals or conferences or have industrial research<br>• Preference will be given to those who have outstanding research (consider from published papers, patents, commercialization of research, awards) |

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| | | | | | • Thai nationality<br>• Be able to study full-time |
| **Opportunity** | • Provide ~30 scholarship per year<br>• Scholarship cover full tuition fee.<br>• Free accommodations for all students<br>• Free monthly allowance for poor students<br>• Laptops for all students | The tuition fees are 200,000 baht per year. ChEPS offers scholarships to qualified students who are enrolled in our program. Three kinds of scholarships are available, namely Full, Half, and Soft-Loan as follows:<br><br>1. Full Scholarships - The full tuition fee is waived.<br><br>2. Half Scholarship - Half the tuition fee is waived, while the remaining 100,000 baht per year is the Soft-Loan scheme.<br><br>3. Soft-Loan - Students are required to pay back the 400,000 baht (two-year) upon graduation in monthly installments amounting to 10% of their salaries with free interest. | • Provide 40 scholarship per year<br>• Scholarship cover full tuition fee.<br>• Scholarship students will receive salary (8,000 baht/month)<br>• Scholarship students will get job offers with Western Digital after graduation. | • Get job offers before graduation | • Provide 30 scholarship per year (RGJ scholarship students can also receive RGJ (industry)) |

<table>
<tr><th rowspan="2"></th><th colspan="5">Examples of WIL Programs</th></tr>
<tr><th>Science based Technology Vocational College: SBTVC (Chonburi)</th><th>Practice School (Chemical Engineering Practice School (ChEPS), King Mongkut's University of Technology Thonburi)</th><th>Early Recruitment Program (Western Digital (Thailand) Co., Ltd.)</th><th>Cooperative Education (Faculty of Engineering, Rajamangala University of Technology Thanyaburi)</th><th>The Royal Golden Jubilee PhD-Industry Program (Thailand Research Fund)</th></tr>
<tr><td>Organization</td>
<td>Main Organization<br>• Science Based Technology Vocational College (Chonburi) (Implementation Level)<br><br>Funding Organization<br>• Vocational Education Commission (Policy Level)<br>• National Science Technology and Innovation Policy Office, Ministry of Science and Technology<br><br>Practice Station<br>• Thai German Institute<br><br>Partners<br>• Amatanakorn Industrial Park<br>• King Mongkut's University of Technology Thonburi<br>• King Mongkut's Institute of Technology Ladkrabang<br>• Chulalongkorn</td>
<td>Main Organization<br>• King Mongkut's University of Technology Thonburi (KMUTT)<br><br>Funding Organization<br>• Energy Planning and Policy Office<br>• National Science and Technology Development Agency (NSTDA)<br>• Petroleum Institute of Thailand (PTIT)<br>• Suksapattana Foundation<br><br>Practice Station<br>• National Science and Technology Development Agency (NSTDA)<br>• Petroleum Institute of Thailand (PTIT)<br>• Suksapattana Foundation<br><br>Partners</td>
<td>Main Organization<br>• Western Digital (Thailand) Co., Ltd.<br><br>Funding Organization<br>• Western Digital (Thailand) Co., Ltd.<br><br>Practice Station<br>• Western Digital (Thailand) Co., Ltd.<br><br>Partners<br>• Faculty of Engineering, Khon Khean University<br>• Faculty of Engineeing, King Mongkut's University of Technology Thonburi</td>
<td>Main Organization<br>• Rajamangala University of Technology Thanyaburi</td>
<td>Main Organization<br>• Thailand Research Fund</td></tr>
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| | University<br>• Ministry of Industry<br>• Thai German Institute<br>• Rajamangala University of Technology Thanyaburi<br>• Burapha University<br>• Suranaree University of Technology | • Thai Siam Cement Group<br>• Thai Oil Public Co.,Ltd.<br>• Aromatics (Thailand) Co.,Ltd.<br>• Bangkok Synthetic Co.,Ltd.<br>• BST Elastomers Co.,Ltd.<br>• Massachusetts Institute of Technology<br>• ExxonMobil Limited | | | |
| **Source** | Science Based Technology Vocational College (Chonburi) | • http://www.che.eng.kmutt.ac.th/cheps<br>• H.M. Ku, S. Thonglek, & S. Bhumiratana (2005). A graduate-level chemical engineering practice model in Thailand: 4th Asia-Pacific Forum on Engineering and Technology Education  2005 UICEE Bangkok, Thailand, 26-29 September 2005 | • http://www.eng.kmutt.ac.th/home/?report=download&f=31.pdf | • http://www.sci.rmutt.ac.th/coop/Proceduce&step_coop/CooperativeEducation.html | • http://rgj.trf.or.th/eng/rgje11.asp |