

RESEARCH BRIEF

Thai Vocational College Education Monitoring and Evaluation: A Confirmatory Factor Analysis

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Thailand's National Education Plan, 2017–2036, specifies that there are three goals stated for an individualized system for students and education (Saengpassa, 2017; Vimolsiri, 2016). These include individualized databases for management of education, monitoring, and evaluating and reporting of key indicators. Furthermore, under the 2030 Agenda for Sustainable Development, the Thai government has stated its intention to promote vocational study, in particular, dual education with an aim to increase the quality of the workforce across 10 key sectors ("Thailand's voluntary national review," 2017). These same goals are also outlined in the 12th Education Plan (2017–2021).

Additionally, these objectives must be ethical and correct towards people and educational institutions. To assist with the tracking and monitoring of students' progress, a database is to be developed, in which each student is monitored by using their individual 13-digit Thai ID card number. This allows for the easy flow of information important to government offices, such as the Ministry of Education and the Ministry of Foreign Affairs. This is in agreement with UNESCO (United Nations Educational, Scientific and Cultural Organisation), which indicated that schools can use this information to track and manage the students, to help

teachers manage their classes, and to identify students who need counseling or extra teaching (UNESCO, 2011a).

Utilizing this process, the goal is to better assist people, prevent roadblocks, or red-tape. In the future, the new digitally enabled, knowledge worker, envisioned under Thailand 4.0, will help ministries work together and raise the socioeconomic status of the Thai people (Jones & Pimdee, 2017; Thai Embassy, n.d.). Other agencies and departments must work with the Ministry of Education—for example, the Ministry of Health/Public Services, and the Department of Labor, and use geo-informatics—to create a single system better enabled to help manage the country, its resources, and its citizens.

With all these ministries and departments consolidated, services to the public can be increased and hopefully delivered in a more efficient manner. The envisioned system will work together with the Ministry of Education, the educational institutions, and students to help with better coordination and assistance. However, along with wide accessibility, laws will have to be introduced in order to protect the data of both the institutions and the individuals. Currently, this type of system is in the development phase of future implementation.

Numerous studies and reports have also discussed the need for increasing the quality of education, as well as the imperative need for teaching students critical thinking skills (Bassham, Irwin, Nardone, & Wallace, 2013; National Association of Colleges and Employers, 2016; Rujivanarom, 2016; Sulaiman, Rahman, & Dzulkifli, 2008). Additionally, Reeve (2016) also pointed out the importance of 21st century and critical thinking skills needed by Thai students in technical and vocational education and training (TVET). Kraisuth and Panjakajornsak (2017) reported the dire importance of critical thinking skills as well in ASEAN (Association of Southeast Asian Nations) and Thai engineer education.

Furthermore, according to the “2017/2018 Global Education Monitoring Report” (2017), Thailand would also benefit from developing credible and efficient regulations, as well as monitoring mechanisms and adhering to follow-up sanctions, when standards are not met within its education system. Planning for the development of education must be implemented now with trial phases, to make the efficiency of education for students better. All educational institutions must undergo a process of assurance monitoring. To do this, monitoring of their progress requires the collection of data on a daily, monthly, and yearly basis. Adopting a holistic approach from school-level records management to data collection, indicators, analysis, information dissemination, and use at all levels of the education administration, strengthens knowledge and skills at decentralized levels not only in data management but more importantly in the use of data and information in supporting decision-making and communications with stakeholders (UNESCO, 2011a).

Also, monitoring is a process of management, used to measure development and improvement with goals that have been set. After goals are set, they must be achieved in an efficient manner. By collecting data according to the system, the progress of such goals, methods, and performances can be increased. Overall, this is a method of analysis, which can be used for the betterment of society as a whole in the future, and which follows goals set by the United Nations. We, therefore, reviewed theories and related literature concerning the monitoring and evaluation (M&E) process of dual vocational education (DVE) systems. For other studies, DVE is also referred to as Dual

Vocational Training (DVT) in Thailand (Ratchusanti, 2009).

According to a World Bank study, what is normally missing from government systems has been the feedback component with respect to outcomes and consequences of governmental actions (Kusek & Rist, 2004). This is why building an M&E system gives decision makers an additional public sector management tool (Table 1). Also, the OECD (2010) defined monitoring and evaluation as follows:

Monitoring functions continuously and uses a systematic collection of data on specified indicators to provide management/stakeholders with an ongoing development intervention with indications of the extent of progress, achievement of objectives, and allocated funds progress.

Evaluation systematically and objectively assesses an ongoing or completed project, program, or policy. This includes its design, implementation, and results. The aim is to determine the relevance and fulfillment of objectives, development efficiency, effectiveness, impact, and sustainability. An evaluation should provide information that is credible and useful, enabling the incorporation of lessons learned into the decision-making process of both recipients and donors.

Table 1
Complementary Roles of Results-Based Monitoring and Evaluation

Monitoring	Evaluation
Clarifies program objectives	Analyzes why intended results were or were not achieved
Links activities and their resources to objectives	Assesses specific causal contributions of activities to results
Translates objectives into performance indicators and sets targets	Examines implementation process
Routinely collects data on these indicators, compares actual results with targets	Explores unintended results
Reports progress to managers and alerts them to problems	Provides lessons, highlights significant accomplishment or program potential, and offers recommendations for improvement

Source: Kusek and Rist (2004).

Thailand’s Dual Vocational Education (DVE) System

Thailand’s DVE is a model of vocational education where learning and training take place both at the college and a private firm where students go through a training process and receive an allowance from the firm (Tongliemnak, Tharmmapornphilas, & Pumsiri, 2016). The terms of the contract depend on the MOU (Memorandum of Understanding) between the college and the firm. The firms can also use the amount of budget spent on student-related training for tax discount of 200%. In Thailand, the DVE occurs at both the certificate and the diploma levels of education.

TVET in Thailand is provided in three forms (UNESCO, 2011b). These include (1) certificate level, which is equivalent to 10th–12th grade, (2) post-secondary level, which is equivalent to a 2-year associate degree or diploma, and (3) a bachelor’s degree level (Tongliemnak et al., 2016). As of September 2014, there were 654,083 enrolled vocational students in 421 public and 412 private TVET colleges, the majority of which (437,269), were TVET students enrolled in the Vocational Certificate (3-year) program. Another 215,548 were enrolled in the 2-year Vocational Diploma program, while only 1,266 (0.2%), and were enrolled in the Bachelor’s

degree program. Figure 1 also shows the breakout of the number of students enrolled by type of vocational institution in Thailand.

Furthermore, the Thai Ministry of Education, through the Office of the Vocational Education Commission (OVEC), has outlined the following five main points for the management of DVE vocational institutions in Thailand. These guidelines are as follows:

1. *Schools* within the DVE management system shall be composed of the administrators, teachers, administrative support personnel, and the educational process. Administrators are responsible for the management of policies in the academic sector, while teachers and other educational personnel are responsible for document administration. The DVE system is also stated that it must be managed in accordance with the law, ministry guidelines, and DVE standards for training management.
2. The *establishment* means the management of vocational education and the DVE system. This consists of the many branches of management for checks and balances of business practices. The establishment must support resources and make sure the environment is safe. The

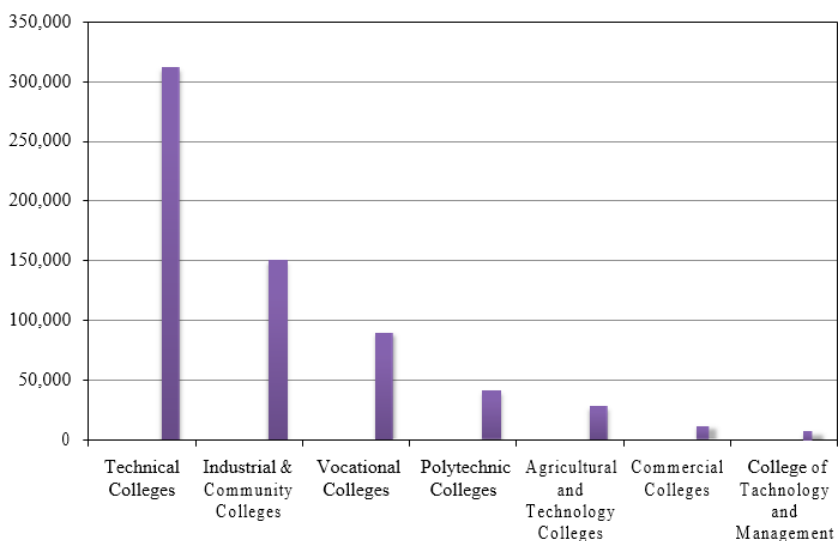


Figure 1. Thai students enrolled in vocational institutions (7 largest types).

Source: Tongliemnak et al. (2016).

supervisor performs the task of coordinating with schools and teachers who practice teaching and vocational skills with their students.

3. The student should be at the center of the DVE process. Teachers need to take responsibility for the students' good mental and physical health and make sure each student is in good standing. Also, schools need to administer practice/written tests and practice interviews to help students achieve successful employment after they leave their vocational college. Teachers and all other educational personnel must cooperate in the development of their students. Additionally, all school officials must maintain good morals and ethics towards their students and colleagues, and work in a collaborative environment. Consistency must be maintained under the framework of vocational education standards and a framework of professional qualifications.
4. Teaching styles and learning in various environments refers to the DVE system. Courses must be organized. Lesson plans must be based on academic sessions used by the school. These plans must be consistent with all the guidelines outlined by the various authorities and offices.
5. Monitoring and evaluation of DVE management consist of the management of teaching and learning. Also, the measurement and evaluation of student achievement information and monitoring, are both important factors for the betterment of the academic sector. Furthermore, the outcome of the process should be the gainful employment of each student after graduation which is very important for the well-being of the student.

Therefore, for this study, we summarized the main concepts as schools, the establishment, the students, the teaching and learning process, and the monitoring and evaluation of management in the dual vocational education systems.

Our research objective is to better understand how Thai vocational colleges should develop and

implement educational quality monitoring tools. To do this, we will undertake a confirmatory factor analysis of five identified dimensions including the school, the establishment's management ability, the students, the teaching and learning process, and finally, monitoring and evaluation of dual vocational education systems. Having identified the importance of this process through the World Bank (Kusek & Rist, 2004), UNESCO (2011a), and the United States' "No Child Left Behind" (Means, Gallagher, & Padilla, 2007) programs and studies, we hope to show how these metrics may be used to improve Thailand's vocational education system and be used as a guide for the future development of a country-wide Education Management Information System (UNESCO, 2011a).

Methods

Population and Sample

The population was 718 academic directors and heads of Thai vocational colleges, as well as 50 representatives from local enterprises. This consisted of 167 directors of vocational colleges, 167 deputy directors of academic affairs of vocational institutes, 167 heads of vocational education of vocational colleges, 167 heads of departments of vocational colleges (Tongliemnak et al., 2016), and 50 representatives from local enterprises.

Using multi-stage random sampling, a sample of 83 directors of vocational colleges, 83 deputy-directors of academic affairs of vocational colleges, 83 heads of vocational education of vocational colleges, and 83 department heads of vocational colleges was obtained (Phusalux, Buatama, & Fongsuwan, 2015; Sisan, 2017). Additionally, 50 representatives from local enterprises were also obtained by using purposive sampling. In total, there were 382 audited and verified questionnaires obtained.

The Questionnaires

The questionnaires covering the five factors used a 5-level, Likert type agreement scale which was designed to measure concept definition and practice. The scale ranged from "1" which meant "rarely agree," to "5" which indicated "definitely agree." This was

then sent to five experts in order to check the content validity, which was analyzed by using the Item Objective Congruence (IOC; Rovinelli & Hambleton, 1977). In this process, scores lower than 0.5 were revised or eliminated, while item scores higher than 0.5 were retained. From this process, the IOC scores ranged from 0.60–1.00.

The questionnaire details were improved and corrected as per the advice of the experts. After that, a pilot study of the questionnaire was conducted with 30 individuals who were not part of the sample group, but who were also directors, deputy directors, principals, and department heads of Thai vocational colleges. From this process, the questionnaires were calculated for reliability by use of Cronbach's Alpha Coefficient which was determined to be 0.997, which is highly reliable (Cronbach, 1951; Tavakol & Dennick, 2011).

Subsequent to the try-out period and questionnaire review, 382 finalized questionnaires were sent to individuals identified for the study. From this, 365 were returned, representing a success rate of 95.54% (Phusalux et al., 2015; Sisan, 2017).

Data analysis

The analysis of the data entailed a 3-step process. It is outlined as follows:

1. The analysis of the five variables was conducted with the use of SPSS Version 21. Descriptive statistics used mean (\bar{x}) and standard deviation (σ or S.D.).
2. The Kaiser-Meyer-Olkin (KMO) test was also used in factor analysis to test how well the data is suited. For reference, Kaiser put the following values on the results as (Hutcheson & Sofroniou, 1999):

0.00 to 0.49 = unacceptable.
 0.50 to 0.59 = miserable/very bad.
 0.60 to 0.69 = mediocre/not so good.
 0.70 to 0.79 = middling/OK.
 0.80 to 0.89 = meritorious/very good.
 0.90 to 1.00 = marvelous/excellent.

3. Another SPSS test which is recommended and often used in conjunction with KMO is *Bartlett's Test of Sphericity*, which is a measure of sampling adequacy. KMO was also run against the sample group.

Results

Table 1 presents the results from questionnaire's section concerning the respondent's and their college's general characteristics. Due to the sampling process, there was a new even distribution of the five positions obtained near 20%. However, technical colleges represented the majority of colleges at 70.96% (259 informants). This was followed by vocational colleges at 26.30% (10 informants), and commercial colleges at 2.74%. Most informants from the survey were from the North East (100 or 27.40%), 79 informants were from the North (70 informants or 21.64%), 70 informants were from the Central Region (19.18%), 60 informants were from the Bangkok metropolitan area and provinces just east of Bangkok, and finally, the smallest group with 56 informants was from the South, or 15.30%.

Confirmatory Factor Analysis (CFA) Results

Table 2 shows the results of the preliminary analysis of the confirmatory factor analysis (CFA). For reporting and applying evaluation results for development consideration of the appropriateness of the data was performed using Bartlett's Test of Sphericity and was found to have a KMO value > 0.91 (marvelous/excellent), and a value of Bartlett's Test of Sphericity was statistically significant at the 0.05 level (Hutcheson & Sofroniou, 1999). The decision regarding the number of factors to retain was based on the Guttman-Kaiser eigenvalue greater-than-one rule (K1 rule). For the study, confirmation was achieved when applied to the structural congruence, as the initial eigenvalues were greater than 1 (Fabrigar, Wegener, MacCallum, & Strahan, 1999).

Table 3 shows that all the variables had statistically significant relationships at a level of 0.01. The highest correlation was found between the students (f1) and the

teaching and learning (f3; 0.856), followed by teaching and learning (f3) and monitoring and evaluation of dual vocational education systems (f5; 0.855).

Table 1
The Respondents' General Characteristics and Institutional Information

Variables		Quantity	%
Respondent's Position	Academic Director	72	19.73
	Deputy Director of Academic Affairs	73	20.00
	Heads of Vocational Education	73	20.00
	Heads of Department	74	20.27
	Representative of Local Enterprise	73	20.00
Total		365	100.00
College Type	Technical College	259	70.96
	Vocational College	96	26.30
	Commercial College	10	2.74
Total		365	100.00
College Location	Central Region	70	19.18
	North	79	21.64
	South	56	15.34
	North East	100	27.40
	Bangkok metro. area and eastern provinces	60	16.44
Total		365	100.00

Table 2
KMO Measure of Sampling Adequacy and Bartlett's Test of Sphericity

Variable	KMO	Bartlett's Test of Sphericity	Sig.
Reporting and applying evaluation results for development.	0.91	1932.64	0.00

Table 3
Correlation Coefficients of Reporting Variables and Their Results

Variables	f1	f2	f3	f4	f5
School (f1)	1.000				
The establishment (f2)	.808**	1.000			
Students f3	.812**	.804**	1.000		
Teaching and learning (f4)	.791**	.794**	.856**	1.000	
Monitoring and evaluation of dual vocational education systems (f5)	.791**	.764**	.832**	.855**	1.000

Note. ** p < .01.

Table 4 shows the CFA results. Also, from the analysis, the results were shown to be consistent with the empirical data. Confirmation of this comes from statistical analysis done at the 0.05 level in which χ^2 / df was shown to be = 1.10, which is less than the suggested cutoff of 2 (Marsh, Hau, & Wen, 2004). Additionally, $\chi^2 = 3.31$ and the p -value = 0.35. The goodness of fit index (GFI) was determined to be 1.00, while the adjusted goodness of fit index (AGFI) was calculated at 0.98. Both confirm a good fitting model as they both exceed 0.90 (Byrne, 1994). Also, the root mean square error of approximation (RMSEA) was 0.02.

In conclusion, the CFA results indicate that the model’s development is in harmony with the evidence. When considering the weight of the standard components, it was found that the results of the analysis were confirmed by the components. The standard weights of all variables were statistically significant at .05, as shown in Figure 2.

Discussion

The results indicated that the five variables (ranked in importance) were the Thai DVE system monitoring and evaluation of the students (f3 = 0.93), teaching and learning (f4 = 0.92), monitoring and evaluation

Table 4
CFA Results

Variables	Standard weight
School (f1)	0.87*
The establishment (f2)	0.86*
Students (f3)	0.93*
Teaching and learning (f4)	0.92*
Monitoring and evaluation of dual vocational education system (f5)	0.89*

Note. * $p < .05$, $\chi^2 = 3.31$, $df = 3$, $\chi^2 / df = 1.10$, p -value = 0.35, GFI = 1.00, AGFI = 0.98, RMSEA = 0.02.

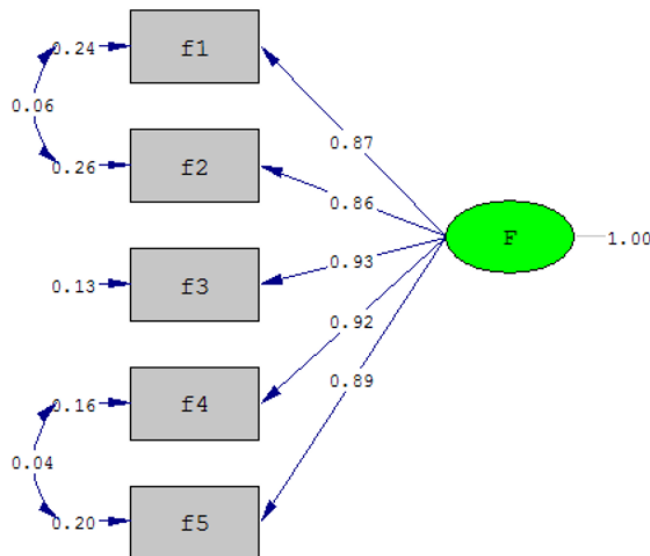


Figure 2. CFA results for Thai DVE monitoring and evaluation.

Note. Chi-square = 3.31, $df = 3$, p -value = 0.346, RMSEA = 0.017.

of dual vocational education system ($f_5 = 0.89$), the school ($f_1 = 0.87$), and finally, the establishment ($f_2 = 0.86$) management's skill.

Students

Concerning the importance placed on the students in monitoring and evaluation, support for this comes from around the world. In America, the "No Child Left Behind" program places great emphasis on the student (Means et al., 2007), with competency-based education placing a primary emphasis on student outcomes (Kymes, 2004). The qualifications of the teachers are secondary to this.

Teaching and Learning

The Thai DVE teaching and learning process was shown to be second only in importance that vocational institutions should place on their students. This is consistent with a study by Faraday, Overton, and Cooper (2011), in which it was reported that in UK vocational education development, the delivery of vocational education and training was variable in quality. Too much teaching and learning was mediocre and more emphasis was required on meeting individuals' needs through more suitable teaching methods. Furthermore, teaching and learning is a highly complex process and effective practice results from a complex interaction of factors. There is little evidence that vocational teaching and learning was fundamentally different from any other type of teaching and learning except in one respect—that of context.

Also, teaching relationships have been identified both in the literature and by teachers as crucially important (Faraday et al., 2011). The tutor–learner relationships are identified as the most important link in the vocational education learning process. Furthermore, the features of effective teacher relationships that were identified from the UK vocational education study observations, included getting to know learners—knowing which learners need more attention, good rapport including listening, high expectations, building trust, humor, relaxed atmosphere, mutual respect, and finally, behavior management in which all students have the chance to learn.

Monitoring and Evaluation

Salvador and Canencia (2015) reported in the Philippines that monitoring and evaluation play a vital role in measuring the cause and effect of achieving a quality education. It determines the performance of both administrators and teachers in the delivery of knowledge and skills to their students. Moreover, monitoring and evaluation must come up with skills indicators that measure the skills transfer to ensure performance development of students that can compete globally.

However, recent analysis from the "2017/2018 Global Education Monitoring Report" (2017) reported that Thailand uses student evaluations to feed into evaluations of teachers, which are subject to bias. The validity of student evaluations rests on the assumption that students understand, observe, and recognize good teaching, and report it truthfully. A comprehensive international review of the evidence since 2000 cautioned that student evaluations can be subject to bias. Their reliability and validity depended on the evaluation tool used, how it was developed, how it was administered, and its degree of detail.

Finally, according to the World Bank, good government is key to an inclusive economic development and accountability key to good government. Thus, the need for M&E programs and systems designed to identify what works and what doesn't in policy design and implementation (Lopez-Acevedo, 2013). They help us build "evidence-based policy."

Schools

In an order dated 12 February 2016, it was announced that there would be a merger of all public and private vocational colleges in Thailand; the purpose is to facilitate education reform and help with more effective administration. When the order was signed, it was announced that there were 886 public and private vocational colleges in Thailand, with 976,615 enrolled students in lower and higher vocational degrees (Ministry of Education, 2016). To merge them together, the Office of the Private Education Commission (OPEC) was ordered to transfer 4.339 billion Baht (US\$139 million) to OVEC. From this, 4.324 billion Baht will be used to support private

vocational colleges and 14.5 million Baht will be used for central administration, including the setting up of a center for the promotion of vocational education, where 27 personnel from OPEC will work.

It was also made clear by the Thai Ministry of Education that private vocational colleges were expected to help themselves, as the Thai government will only give knowledge-based support. So, both public and private colleges have to consider their strengths and weaknesses before presenting them to formulate a joint-development plan, especially for solving teacher shortages, improving the image of vocational colleges, and developing the colleges for excellence (Ministry of Education, 2016).

Establishment's Management Skills

Booncherdchoo and Booncherdchoo (2017) detailed why quality education administrators must conform to society's needs, as well as the importance of competent and efficient education managers. This is consistent with Parco-Tropicales and de Guzman (2014), which stated that in the Philippines, secondary school principals with high charismatic qualities had a higher capability for wise leadership. Also, transformational and visionary leadership appeared to have the most impact on wise leadership development amongst the same surveyed group. In Thailand, Lonlua (2011) reported that a successful educational administration is from a visionary administrator, with an ability to formulate strategies. Vision and strategy are, therefore, the most important attributes that a leader can have in achieving an organization's success.

This is also consistent with Yordsala, Tesaputa, and Sri-Ampai (2014), which also discussed Thai school administrator leadership qualities. According to their research, visionary leaders have to have a precise vision as guidelines for staff to work in a given direction, including the capacity for innovation that leads future changes. Additionally, school leaders have to have competency in defining their vision, so that it is clearly understood by others. They should express their vision verbally and have the competency in applying their different explanations.

Conclusion

M&E of the DVE process has been determined to be a critical part of a process to achieve Thailand's goals for a new knowledge-based economy worker. Studies from around the world have shown that monitoring and evaluation, along with information systems and technologies, when used together, can achieve a higher educational standard. Vocational institutions, however, must be effectively managed and led from the inside, not from the central educational bureaucracy. This requires administrative leaders with vision and strategic planning. Vocational education in Thailand must also eliminate the negative stigma that has dogged it for way too many years. An effective marketing campaign needs to be developed to show both the potential student/worker and their parents the tremendous advantages of the DVE system.

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