

The Impact of Work-Based Learning on Graduate's Job Performance: Insights from School-in-Factory (SiF) Project

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Abstract

The School-in-Factory (SiF) is a pilot project for implementing dual technical and vocational education and training in Thailand by using a Work-based Learning approach with the combination of learning and working in the real process of work through the collaboration between the private company and educational institute. This study aims to evaluate the output and outcome of the SiF project by analyzing the program completion rate and the impact of the SiF project on the graduates' job performance in the labour market. The study employed both quantitative and qualitative approaches. The quantitative data is collected from official project records. The qualitative data is collected by using an open-ended. It is found that 85% of the learners from the year 2017-2020 successfully completed the SiF program (100 out of 117 learners). The impact of the SiF program has mostly contributed to the development of subject-oriented competence, that is technical knowledge and skills of the learners. The graduates reported that the SiF program has a positive impact on their performance where knowledge of the work process, ability to adapt to the workplace, and valuable work experience gained during training are the most valued impact. Moreover, from the perspective of the employers, the employees who graduated from the SiF program have shown their competencies in technical proficiency and job professional behaviour, constructive communication and expression, teamwork, job-related problem-solving skills. The results of the study stressed the importance of work-based learning where training at the company and learning at the classroom are combined, like the SiF program, to support learner competency development. The SiF program has shown a strong collaboration with the private company partner in implementing work-based learning in Thailand. Further studies should be conducted to find out the financial benefits of the project.

1. Introduction

1.1 Shortage of Qualified Technical and Vocational Manpower in Thailand

The lack of qualified workers in Thailand is attributed to several factors, including low educational levels, a lack of connection between educational institutes and the labour market demand, and the rapid evolution of technology. The swift pace of the technology change directly influences the structure of the labour market, resulting in increasing mismatches and shortages of technical skills (Alinea, 2022). If the education sector fails to align training programs with the demands of advanced technology, the Thai labour market may face a shortage of skilled workers, and semi-skilled workers could be displaced by robots and automatic systems.

Despite efforts to improve the skilled workforce, progress has been slow due to limitations in skill development. While there has been an increase the educational attention given of Thai workers, a significant portion of the workforce still possesses low educational levels. Specifically, 42.1% have no education or only completed primary education, 34.5% completed secondary education, and only 22% completed higher education. This education disparity contributes to a shortage of skilled workers aligned with objective targets and the dynamic context of the labour market. (Office of the National Economic and Social Development Council, 2021, p.15) The mismatch between labour market demands and workforce quality is partly attributed to the lack of connection between the education system and curricula design, especially in the rapidly changing technological landscape. (Chalamwong & Suebnusorn, 2018, p. 173)

When considering the Global Competitiveness Index (GCI) in terms of skills, there is evidence that the ability to adapt has decreased from a ranking of 66 in 2018 - 2019 to 73 out of 141 countries globally, or 6th in the ASEAN region in 2019-2020. Furthermore, there is a growing trend of children and youth who are not studying or working, leading to the underutilisation and underdevelopment of their potential (Office of the National Economic and Social Development Council, 2021, p.16). The 13th National Economic and Social Development Plan and the operational plan of the 20-year National Development Plan stress the objective of transforming Thailand into a progressive society. These plans emphasise the need to enhance the country's competitiveness by promoting human capital development that is aligned with the requirements of the labour market and the direction of national development. Strategies for human capital development aim at cultivating a highly competent workforce that meets the needs for competitiveness in both existing and emerging branches of the manufacturing sector. Continuous development is emphasised to ensure preparedness for evolving technological changes (Office of the National Economic and Social Development Council, 2021, p. 31).

1.2 Work-based Learning in Thailand

In this section, the term WBL will be generally defined based on international practices, and later the concepts and practices of WBL in Thailand will be discussed. From a very broad perspective, "Work-based Learning means learning for work, learning at work, and learning through work" (Bahl & Dietzen, 2019, p. 14). According to Dehnbostel & Schroeder the term "work-based learning (WBL) is used interchangeably with work-related learning (WRL)". The term/s is rather broad, has many different meanings (Dehnbostel & Schroeder, 2017, p. 5), and thus leads to confusion in the principal concept (Allan, 2015, p., 14). However, "the fundamental aim of Work-based Learning is the acquisition of knowledge, skills, and competencies in the occupational environment" (NA at BIBB, 2017, p. 6). Thus, there is a reference to the "Working environment" which distinguishes WBL/WRL from other types of education (Grollmann, et al., 2021, p., 5). Thus, vocational knowledge is distinct from other types of knowledge because it is structured by work constructed within work contexts and tasks rather than academic disciplines (Grollmann, et al., 2021, p., 6).

Furthermore, Dehnbostel & Schroeder distinguished three variants of work-based/work-related learning based on the criterion of the relationship between place of learning (vocational colleges/Training center) and place of work (in-company training) which are work-oriented learning, work-connected learning, and work-integrated learning.

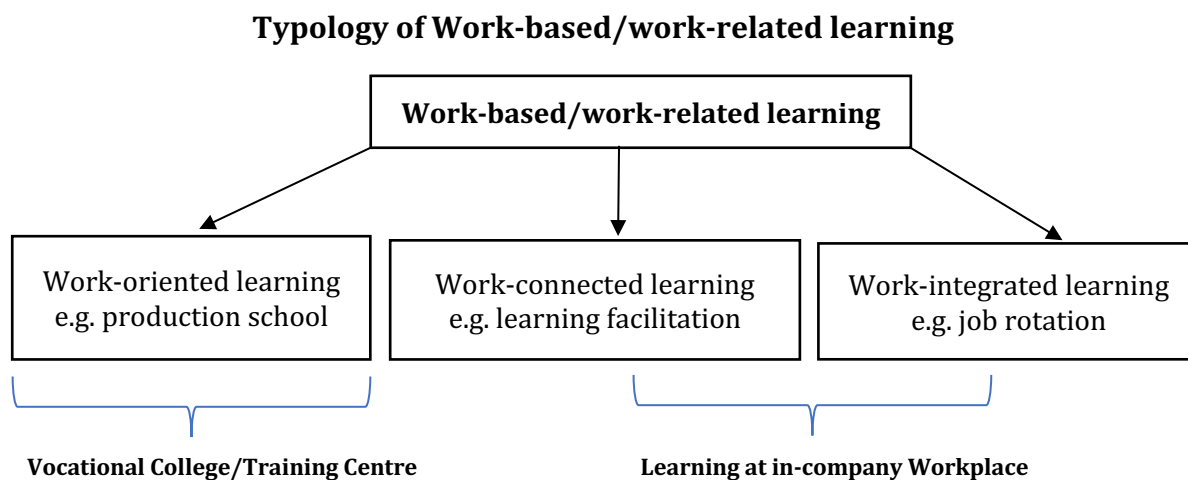


Fig. 1 Typology of work-based/work-related learning (Dehnbostel & Schroeder, 2017)

According to the graphic above, work-oriented, work-connected, and work-integrated learning can be explained in detail below:

- Work-oriented learning (WOL) takes place in formal learning venues such as vocational schools or colleges, training centres or universities. Learning is made up here of simulation of work organization, work tasks and processes. As learning is the primary aim, the disparity between simulated and real workplaces cannot be compensated. Learning is through simulation of work organization, tasks, and processes in institutional settings.

- For Work-connected learning (WCL), the learning venue and workplace are separated, though spatially, and in terms of work organization, they are connected. Learning, in this case, is done through in-company observation and exploration. In practice, e.g., there is a learning area close to the production line, which focuses on educating trainees relevant to a section of the production.

- In Work-integrated learning (WIL), the learning venue and workplace are identical; the actual learning takes place at the workplace or in the work process. Learning is done through active participation in real work activities or through companionship and instruction at the workplace. Examples are Communities of Practices (CoP), work-and learning tasks, traditional apprenticeship and adaptation training” (Dehnbostel & Schroeder, 2017, p. 5). The idea behind separating each typology of WBL/WRL is to assign an appropriate type of learning or training assignments that support the learning process of the learners.

Moreover, the goal of WBL is to acquire the job competencies, which are technical knowledge and skills, social competence, individual competence, and methodological competence. According to the definition of the BIBB (BIBB, 2021, p. 39), technical knowledge and skill are the ability and preparedness to analyse and solve tasks and problems, act in a goal-oriented, efficient, and professional manner, and evaluate the quality of the work processes and the results. Individual competence refers to the ability and preparedness to adapt and be self-initiative, the ability to think about the possibilities to shape one's life, family, and occupation, show self-confidence, self-organisation, dutiful behaviour, and develop moral issues for oneself. Social competence is the capability to shape social contacts, communicate with people to solve conflicts together, sense of empathy, willingness to cooperate and ability to work in a team. Methodical competence is usually integrated among the three competencies. It refers to the ability to apply problem-solving techniques and conduct discussion and learning methods.

In Thailand, the term WBL is broadly defined. Moreover, the terms WBL and WIL are used interchangeably. However, it is recognised that WIL is more popular in academic discussions as well as among practitioners. One of the most cited definitions is proposed by the Cooperative and Work-integrated Education (CWIE). Accordingly, WIL “is the curriculum cooperated by higher education institutions and external organisations to prepare graduates for the world of work completed with the competency to meet the needs of the job market and to develop careers in the present and prepare for future positions” (Cooperative Education Network, 2018).

Furthermore, the Office of Vocational Education Commission (OVEC) has stated the implementation of work-based learning through section 8 of the general provision that “dual education shall be implemented as vocational education which is derived from agreements between vocational colleges, institutes and workplaces, state enterprises or government agencies in the areas of curricula, instruction, assessment and evaluation. Learners shall study partly in vocational colleges or institutes and practice in workplaces, state enterprises or government agencies” (OVEC, 2008, p., 3). However, this faces with a lot of challenges on the implementation level because of less cooperation from the private sector or company partner.

Most of the core element/value or understanding for WBL in Thailand, as appeared in the mentioned definitions and relevant government body, is broadly defined and only mentions the relationship between place of learning and place of training. Thus, this stresses the weak point of WBL in Thailand which is the connection or

collaboration between the place of learning and workplace. However, when looking at the guiding principles of Germany's VET system, the focus is not only on the cooperation between stakeholders for learning and training but also on the learning within the work process, acceptance of national standards, qualified vocational educational and training staff, and institutionalised vocational training research (Federal Ministry of Education and Research, 2017, p., 1)".

On the implementation level, there are two types of WBL practices in Thailand; the adopted and the industrial-led programs (Chalamwong & Suebnusorn, 2018). In the adopted program, educational institute is taking a leading role in organizing the WBL. "The private companies provide educational partners with financial contribution, equipment, staff development, experts, and other resources based on common agreement between participating partners". In contrast, "the industrial-led programs are organized independently by enterprises" (Chalamwong & Suebnusorn, 2018, p., 169). In most cases, the company established its own school/institute to train the learners. The entire teaching and learning are totally done within the company. For example, the founding of the Panyapiwat Institute of Management by the CP All, the retail arm of the Thai conglomerate CP Group, to serve as a feeder of personal for CP's businesses (Panyapiwat Institute of Management, 2018). The adopted and industrial-led programs, according to Ode-sri (2022) are also known as "factory in school" and "school in factory" respectively. Most of the successful WBL implementations are the industrial-led program. However, it is important to note here that in the industrial-led program, as the name suggested, the entire administration and management are run by the industry itself with less or no connection with other educational stakeholders.

Work-based learning (under the so-called "adopted program") has been considered one of the vocational education reform initiatives in Thailand from 2009-2018 (Chalamwong & Suebnusorn, 2018 p., 169). However, the successful implementation depends mainly on the "active relationship between partners with mutual benefits, opportunities of teachers for training in the workplace, and flexible bureaucratic school system" (Choomnoon et al., 2012 as cited in Chalamwong & Suebnusorn, 2018).

According to the category mentioned above, the SiF program is close to the adopted WBL program. The cooperation between learning and training places and pedagogical arrangements under the School-in-Factory program is illustrated in the following section.

1.3 School-in-Factory (SiF) Project at the Michelin Siam Co., Ltd. (LAEM CHABANG)

School-in-Factory, according to the Dual Vocational Education Center; DVEC (2017), is the initial form of vocational training in Thailand which was supported by the German government in 1984. The German government supported the Thai government in public relations and in the expansion of dual education (Mongkhonvanit, 2017, p. 5). Vocational training in the form of a School-in-Factory was implemented to train skilled craftsmen to meet the requirements of the enterprises and to save the government budget (DVEC, 2017, p., 7). The SiF project has achieved its goal of training the learners and later gained popularity. However, in the further development of Thai TVET, the SiF did not gain much recognition among practitioners. There is no official report of how and why the SiF was not popular for training qualified TVET manpower in Thailand. According to Ode-sri (2022), legal restrictions and lack of supporting regulations such as no legal obligation for involved partners (Educational institutes, industry federation & chamber of commerce, and industrial partners) have resulted in no cooperation between TVET colleges and the companies to support the implementation of work-based learning in the form of SiF.

School-in-Factory (SiF) Project at the Michelin Siam Co., Ltd. (LAEM CHABANG) was established in 2012 by the collaboration between the Thai's national policy office, a private company, and the university that is the National Science Technology and Innovation Policy Office (STI), Michelin Siam Co., Ltd., and Rajamangala University of Technology Lanna respectively. (Phalasoorn, 2017; Moonpa, et al., 2021). The university and private company are the two main stakeholders at SiF LAEM CHABANG in implementing the common goals for advancing human resource policies in manufacturing and service industries. Under this common agreement, the university is responsible for collaborating with the private, public, and also education sectors by focusing on educational management, research, resource development, and developing Work-integrated learning (WiL) methodology based on science and technology through participative action research with other partners. The private company supports Work-based learning venue, education fee, and administrators' management, and provide essential training equipment and training activity.

The SiF project teaches and trains the learners in the Industrial Technology program for two years. In this two-year diploma vocational training program, the workplace is the main training location while the university is the learning venue for the learners. Learners are employed as trainees in the company and are also registered students at the university. Since 2013, the SiF project has been successfully producing eight batches of qualified technicians and technologists. As it enters the 10th year of its implementation, this project serves as a model for various educational initiatives for the country and it also gets expanded to other industries. (Moonpa, et al., 2021.)

Moreover, the project aims to promote dual technical and vocational education and training. Although the concept of work-integrated learning in the school-in-factory setting bears similarities to cooperative education programs and employee scholarship initiatives, there is still a need for a system that emphasizes learning through

work to achieve tangible outcomes. Similarly, as recognized in the three handbooks of the STI there are problems in lacking qualified technicians and technologists (and practical engineers) (National Science Technology and Innovation Policy Office: STI, 2018). Therefore, the SiF was introduced to solve the problem by adopting the concepts of dual TVET, Cooperative Education, and scholarship. In addition, there is a strong demand for strengthening the collaboration between academia and industry from both adopted and industrial-led programs of WBL in Thailand.

This research is valuable in terms of informing public policy and projects of a similar nature. The objectives of this article are to share practical experiences (input and process) in implementing the SiF project and to explore the impact of the program through the experiences of the SiF graduates and their employers (output and outcome). As such, the study will analyze the program completion rate and the impact of the SiF project on the graduates' job performance in the labour market. Therefore, the research questions are:

1. What are the completion rates of the learners between academic years 2560-2563 (2017-2020)?
2. What are the impacts of the SiF project on the graduates' job performance in the labour market from the perspectives of the graduates and the employers?

This article refers to the 'Input', 'Process', 'Output', and 'Outcome' or the IPOO model as a general framework (Brown & Svensen, 1988, Heidegger, 2008, & Grollmann, et al., 2021). According to this model, the input covers all the arrangements preceding actual implementation. The process factors are those that are directly related to the intervention and the production of the targeted goals. Looking at evaluating the SiF project which has been implemented for ten years, the study mainly focuses on the output and outcomes of the project. Output, according to the IPOO model is the immediate results in terms of products created such as knowledge, skills and competences imparted to the learners. While "the medium-and long-term effects achieved through the use of the output are referred to as the outcome" (Brown & Svensen, 1988, Heidegger, 2008, & Grollmann, et al., 2021). Thus, the study analysed the completion rate and learners' performance in the labour market from their perspectives as well as from the employers. However, to provide a complete understanding of the pedagogical arrangements of the project, the input and processes are briefly mentioned in the introduction part of this article.

1.3.1 Input

Input is the arrangements preceding actual implementation that is teaching and learning of the school-in-Factory. In this article, input refers to learners, teachers & trainers, company, and Work-based learning places, curricula, timetable, financial resources, and regulation and laws which is explained in detail below.

- Learners: Learners in the SiF program have completed their prior education from both high school and technical and vocational colleges. Their ages range from 18- 19 years. They are mostly from the economically disadvantaged family from the northern part of Thailand. Therefore, these learners have a diverse educational background; vocational education and high school. Thus, these learners required additional training such as basic technical skills before joining the program. During the two-year educational program, these learners have the status of both employees and vocational students.
- Teachers & Trainers: Teachers and trainers in the SiF program consist of three different groups. 1. University lecturers from RMUTL, 2. In-company trainers from Michelin Siam Co., Ltd., and 3. Teaching assistants, research assistants, or facilitators who facilitate the learning process of the learners. In addition, it is also important to mention the technical teachers (from the university) who train the basic technical skills of these learners at the beginning of the SiF program (3 months of technical training before entering the company workplace).
- Company: Michelin Siam Co., Ltd. (LAEM CHABANG: LMC). The focus is only on the LMC site which consists of 2 factories: Michelin Moulding Solution (MMS) and Tire Manufacturing. However, there are more sites of the Michelin Siam Co., Ltd. In Thailand.

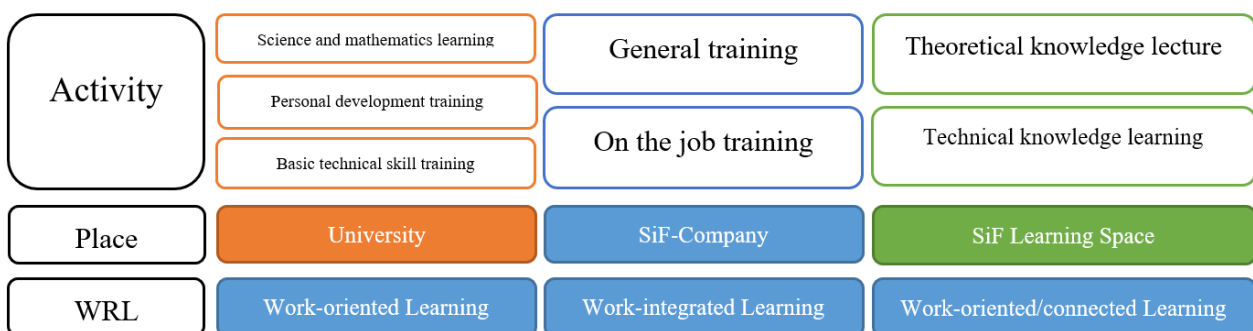


Fig. 2 Work-based learning places

- WBL places: WBL places are divided into three parts. Part I takes place in the initial period after the announcement of the selected learner. During this phase, learners need to build a foundation in science and mathematics, prepare themselves for the program, and develop basic technical skills through hands-on learning. Examples of such activities include technical drawing, bench work, basic sheet metal and welding, basic machine tools, basic electrical and electronics, and gasoline and diesel engines. In this part, RMUTL University provides learning/basic training, while the company supports the operations by providing materials and learning equipment. After completing part I, the learner proceeds to Part II, which involves training at the company to prepare them for the work-based training program. In this phase, the company takes responsibility for providing training in work processes, production tasks, technical aspects of manufacturing, organizational culture, in-company trainer roles, and learning in specific job positions under the supervision of team leaders. Part III involves classroom learning at the dormitory, where theoretical knowledge is delivered through lectures by university teachers. The learning process is enhanced through the integration of work-based learning presentations conducted by the facilitators. Additionally, a management system for student's well-being is established through weekly meetings utilizing the birdhouse methodology and utilizing the company's "SMQDCS" (Safety, Machine, Quality, Delivery, Cost, Standard) tools for management purposes.

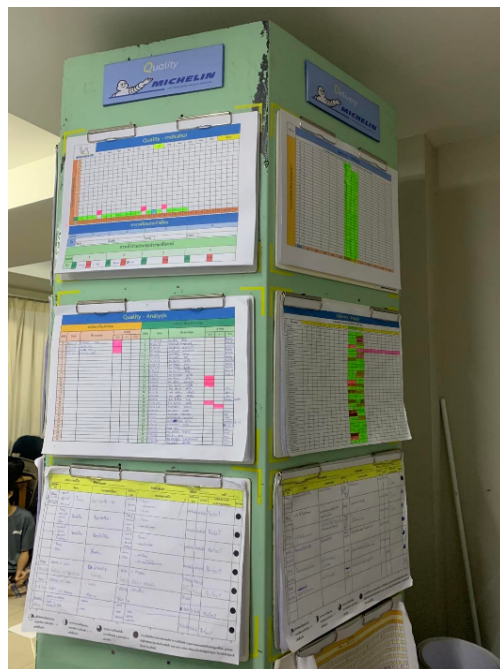


Fig. 3 The adapted concept of the "Birdhouse" process for the SiF LMC (Schlattmann, 2022)

- Curricula: From the academic year 2012 – 2022, the curricula diploma in Industrial Technology (2005) was used by RMUTL. Additionally, in 2021 RMUTL began to use the diploma in mechatronics and robotics which is the curricula developed by OVEC.
- Timetable: According to work-based learning, the time is divided into two periods that is working or on-the-job-learning and learning periods. The daily on-the-job learning period is limited to 8 hours, and learning inside classroom is 3 hours later. It is important to note that during the 8 hours of working, these students also learn something too through on-the-job-learning such as technical skills.
- Financial resources: The company contributes both in cash and in-kind. In cash, the company supports tuition fees, learning materials expenses, salary, travel expenses for students and facilitators, and remuneration for teachers and administrative staff. In-kind, the company provides a learning venue, uniform, personal protective equipment and safety equipment, accident insurance, health insurance, accommodation, and classroom.
- Regulations and laws: There are two main components of regulations and laws related to the SiF project. The first component pertains to working in the workplace and involves the utilization of Labour Protection Act and relevant regulations regarding the training and skill development of the workforce. This includes relevant royal decrees and ministerial announcements that specify the conditions for tax exemption on income earned by the company or corporate partnership. Additionally, there are agreements to be established between trainees and the company. The second component is the

management of education, which follows the regulations of the educational institutions responsible for the learners.

1.3.2 Process

The entire process of the SiF program begins with a joint meeting between the university and the private company to identify the demand from the company and the common objectives of the program. The completed processes can be divided into two main parts; the preparatory phase and working and learning period which is explained in the section below.

- (a) The preparatory phase with the recruiting and preparing processes, after the internal company meeting for planning human resources inside department, the company will collaboratively engage with the university. The recruiting processes involved several steps as shown in Fig. 4. Upon finishing the recruiting process, the university and company jointly facilitate preparation processes, which consist of two main components. First, there is a comprehensive training program designed to enhance fundamental technical skills or specific skills and uncover science-based technical knowledge. This training is conducted by senior teachers, experienced instructors, teaching assistants, or research assistants at the educational institution's workshop following the principles of Work-oriented Learning (WOL) for three months. Furthermore, this training incorporates daily life simulations close to the real-world scenarios like the concept of SiF. Later, the company provides a week-long training session addressing general topics such as company quality culture, safety cardinal rules, manufacturing process, instruments, etc. at the company.

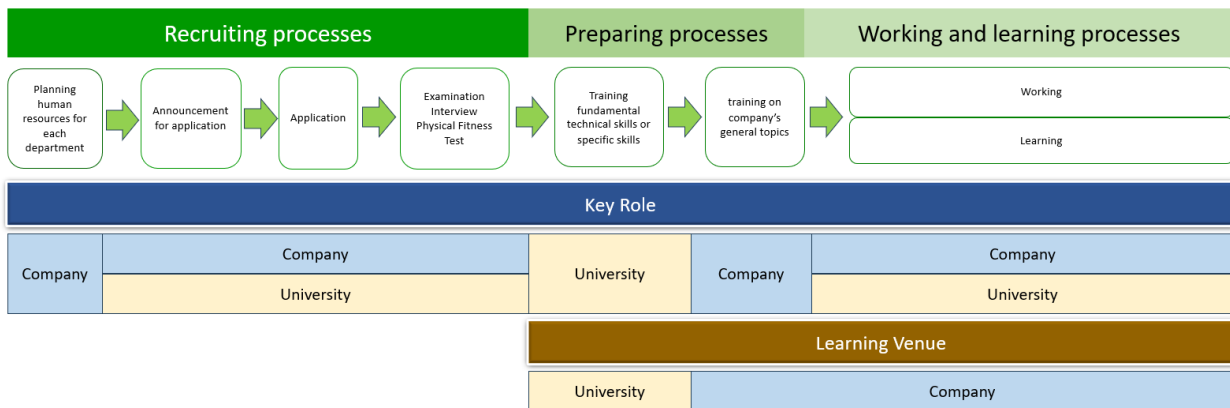


Fig. 4 Process of working and learning in SiF

- (b) The working and learning processes in SiF focuses on the principles of Work-based learning (WBL)/Work-related learning (WRL). The figure below illustrated the combination of WIL, WOL, and WCL in the SiF project. Work-integrated learning (WIL) occurred during working hours. The work procedures and training process of the learners in the company can be divided into two parts:

1. general principle and management tool in factory such as 5S, Safety, Management Development Program (MDP), principles of project management and project charter
2. Job training as shop floor at department in company such as production line, project design, purchasing, digital, maintenance department. Each of the learners is assigned to work at a different section throughout the working period without changing job position. After working hour, lectures that provides technical knowledge or basic principles that are related to work are conducted (Work-oriented learning; WOL) is implemented through lectures, and Work-connected learning (WCL) is done by work presentation as the main method.

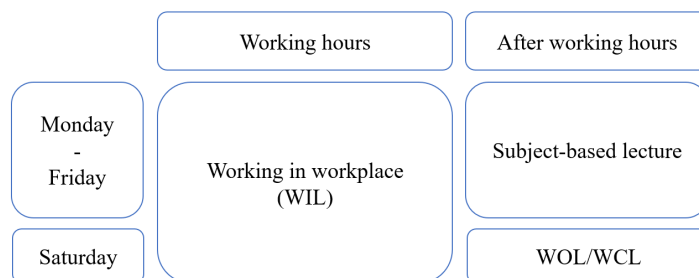


Fig. 5 Time for working and learning processes

For Learning assessment and evaluation, In the initial stage, the development of evaluation or learning assessment, a collaborative effort was made to design and enhance it to align with the standards of educational institutions and the industry. The principles were derived from the Michelin Standard which “SMQDCS” as Safety, Machine, Quality, Delivery, Cost, and Standard where university assess 35% based on classroom learning and exams, while companies evaluate 35% from practical work performance using the company's criteria, and the rest is from monthly presentation (20%) and personal behaviour (10%). (Chaiyong, 2020). Later, in 2022, the evaluation/assessment criteria were adjusted to align with the learning outcomes which focus on the competence level. The scores are divided into knowledge and skills based on the credit proportion of each subject, which is separated into theory learning credit hours and practical learning credit hours.

For ensure quality education management and foster connections between the industry and the education sector, joint meetings are held to present an overview of the project, challenges, lessons, and annual summaries. These meetings happen 1-2 times per year, aiming to enhance understanding and review project progress, and the plan. For urgent matters or specific issues, communication will occur based on a demand to address and resolve problems together with relevant stakeholders only. The following section explains research methodology.

2. Research Methodology

2.1 Research Designs

This research employed a mixed research methods approach because the aims are to 1) evaluate both the processes and the outcomes of the SiF program, 2) explain quantitative results with a qualitative follow-up data collection and analysis, and 3) augment experiments or trials by incorporating the perspectives of individuals (Creswell & Creswell, 2018, p. 341).

The explanatory sequential mixed methods, a two-phase design, is chosen for this study. According to Creswell & Creswell (2018), the main intention of this design is to “have the qualitative data help explain in more detail the initial quantitative results” (p. 347). In the explanatory sequential mixed methods, the initial data collection is quantitative data to find out the completion rate of the learners from the SiF program. The quantitative results are then analysed and used to further plan the qualitative data collection phase. The quantitative results (total number of graduates and their contact information) can then be used to identify the participants (Each participant is then asked to answer the questionnaires by informed consent process) and specify the types of questions for qualitative data collection. In the final stage, the results are interpreted on how qualitative data explains the quantitative results from the initial stage.

2.2 Data Collection Method

To examine the output of the SiF program, the quantitative data is collected by analysing relevant documents, and the qualitative data is collected from the open-ended questionnaires to explore the impacts of WBL or the outcomes of the project. The quantitative data shows the completion rate of the learners while the qualitative data explores the performance in the labour market from the perspectives of the graduates themselves and from the employers.

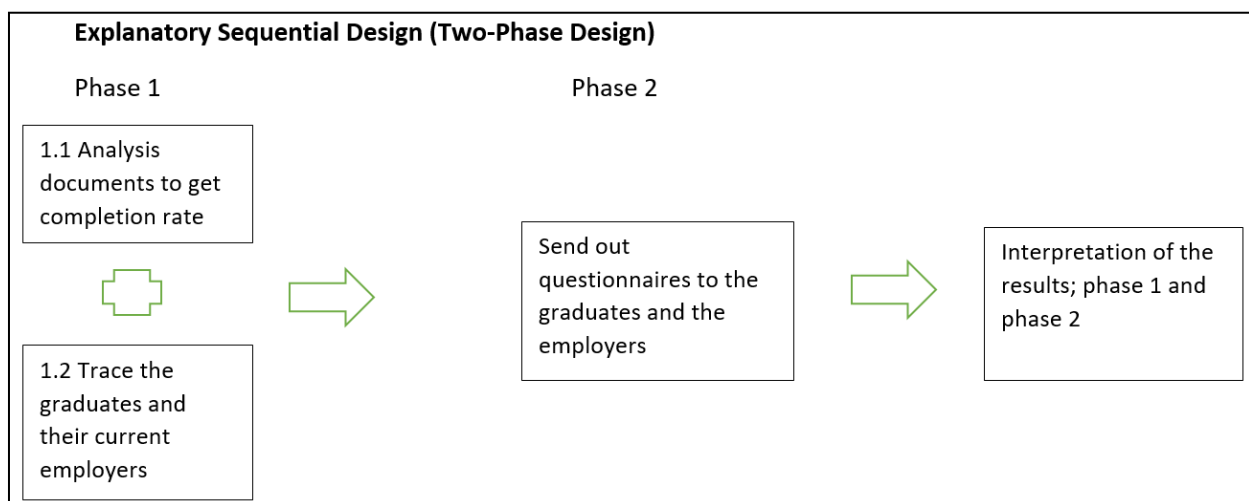


Fig. 6 Data collection procedures (Adapted from Creswell & Creswell, 2018, p., 343)

In the first phase, to find out the completion rate of the SiF program, relevant document analysis is employed. The relevant documents are the official project records from the RMUTL university and from the Michelin Siam

Co., Ltd. which included a Memorandum of Understanding (MOU), training contract, and students' registration report. Results, total number of graduates, from this phase are analysed and lead to the qualitative data collection in the next phase.

In the second phase, to explore the impact of WBL on job performance of the graduates in the labour market, two sets of open-ended questionnaires were created and sent to the graduates and the employers of the SiF program. The first questionnaire was created to find out the impact of WBL on job performance from the graduates. This questionnaire contains eight open-ended questions. The population is identified from the results of the first phase that is results from analysing the relevant documents.

The population is 100 graduates of the SiF program from the academic year 2017-2020. Out of these numbers, the contact was traced with the support from a teacher assistant or facilitators, teacher, and trainer from the company. These 100 graduates were asked to answer the questionnaire. Based on their availability and willingness, 20 responses were received. The second questionnaire was also created to find out the graduates' performance in the labour market from the perspectives of the employers. This questionnaire contains five open-ended questions.

The data is collected from the employers of the graduates from the two companies who mainly employed the SiF graduates. The questionnaire was sent to the representatives of these two private companies who supervise the SiF graduates, and nine responses were received. Due to travel restrictions during the Covid-19 pandemic, the research team was unable to conduct the face-to-face focus group interview with the representatives from the employers and the graduates.

2.3 Data Analysis Procedures

The data analysis procedures of this study are mainly divided into two parts; quantitative and qualitative data. For the completion rate of the learners, statistical analysis was used to find out the percentage of all learners who graduated from the SiF program in each year. Later, for the analysis of the results from questionnaires administered to the graduates and employers, the thematic analysis was employed by referring to the data analysis spiral proposed by Creswell (2007). To identify themes/categories according to the research questions, the following steps were included (Creswell, 2007, p., 148): 1) reducing the data into meaningful segments and name them, 2) combining the code into broader categories, 3) counting the frequency of the theme, and finally 4) displaying findings in graphic. The results of the analysis are shown in the following section.

3. Findings

3.1 Results of the Statistical Analysis

This section illustrates the completion rates of the SiF learners at the Michelin Siam Co., Ltd. (LAEM CHABANG) between the academic year 2017 - 2020. The result is shown in Fig. 7. The overall intake of students from the academic year 2560 - 2563 (2017-2020) is 117 learners, and 100 learners completed the program, which is 85%, and 15% is the dropout rate. The fluctuation in intake levels is contingent upon the specific requirement from the company. The highest intake of learners is in 2019 where 38 learners were accepted while a year later the total intake decreased to only 20.

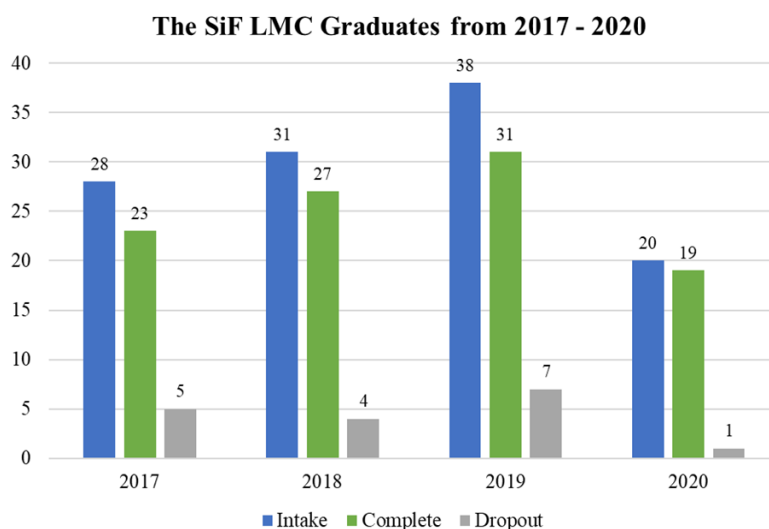


Fig. 7 Number of School-in-Factory Laem Chabang graduates (2017-2020)

From the collected data, it is shown that the highest completion rate is in 2020 with 95% and the lowest completion rate is in 2019 with 81%. In the year 2019, there are the most dropped out students with 19% while there is only 5% in the year 2020.

3.2 Results from the Open-ended Questionnaires

In this section, results of the study are divided into two parts that is the impact of the SiF from the perspectives of the graduates and from the employers which are illustrated below.

3.2.1 Impact of the SiF Project from the Perspectives of the Graduates

The questionnaire was sent to 100 SiF project graduates and 20 responses were received. From the perspective of the graduates, it is found that 70 % of them reported a positive impact of the WBL arrangements from the SiF program on their job performance, 25 % expressed negative responses, and 5 % were not sure. From the responses, it is shown that the most mentioned impact of the SiF project on the graduates' job performance in the labour market from the perspectives of the graduates is 1) knowledge of the work process, 2) ability to easily adapt to the workplace, and 3) valuable work experience gained during training with frequency of 8, 7, and 6 respectively.

For the knowledge of the work process, graduate 1 reported that he/she “understood the overall work process from several departments”. Additionally, graduate 6 further mentioned that he/she “learned specific technical knowledge and skills including mechanical tools, programs and also how to read the work plan in the factory”. However, graduate 11 showed a very critical perspective on this matter by saying that “the knowledge gained during training is not useful for the future work but rather applicable to the future study program”.

Moreover, the graduates also expressed a strong impact of the SiF program on their ability to easily adapt to their new workplaces. Graduate 5 reported that he/she is “easily adapted to the new workplace, and it is also easier for him/her to find a job”. Similarly, graduate 16 also mentioned that he/she “can immediately start working after employment and work together as a team with the new colleagues”. Finally, on the topic of work experience, graduates stressed the importance of work experience gained from the SiF program. Graduate 8 valued the work experience gained while graduate 19 specifically referred to the nice life experience. In addition to this, graduates 9 and 17 reported in a similar manner that “the work experience gained is useful. They can adapt and apply this to the new workplace. It also allows them to work promptly in the new workplaces”.

Nevertheless, some graduates do express different responses. These responses are rather negative experiences toward the SiF program. Graduates 18 and 20 reported that the learning and training of the SiF program has no impact on their job performance. Furthermore, graduates 2 and 14 pointed out their current job has no connection to their training at the SiF. Hence, there is no relevance between their training and work. Lastly, graduate 14 further showed his concern that the knowledge gained from the SiF program is not only not relevant to his work, but it also simply depressed him.

3.2.2 Impact of the SiF Project from the Perception of the Employers

The questionnaire was sent to the companies that employ the SiF graduates, and nine responses were received. Based on the responses from the employers, the impacts of the SiF project on the graduates' job performance in the labour market are 1) technical proficiency and job professional behaviour, 2) constructive communication and expression, 3) teamwork, and 4) job- related problem-solving skills with the frequency of 6, 3, 3, and 1 respectively. For technical proficiency and job professional behaviour, the employers reported that the SiF graduates showed job analytical skills and job professional and efficient manners. The SiF program has equipped these graduates with job readiness. Employer 1 mentioned that “these employees have received practical training, are familiar with the workplace environment, and have acquired basic training skill for their work tasks”. Regarding constructive communication and expression, the graduates showed creative expression, constructive opinion, constructive communication, and ability and willingness to learn at the new workplace. However, employer 4 mentioned that “a good workplace principles were not respected. Some of the employees use their mobile phones during working hours”. Concerning the teamwork of the SiF graduates, the employers mentioned that the graduates show social adaptability skills, and social integration, and act as good team members at the workplace. Lastly, on the job-related problem-solving skills, the employers reported that the graduates could solve the job-related problems. Employer 8 mentioned that “these employees have shown critical thinking ability and problem-solving skills related to their work tasks”.

The results of the qualitative data analysis, according to the four competencies mentioned earlier, can be presented that in 1) subject-oriented competence (Technical knowledge and skills) there are sub-topics such as knowledge of work process/knowledge, technical proficiency, and job professional behaviour, skills and knowledge acquisition, and lastly work experience. For 2) social competence, the sub-topics are the ability to easily adapt to the new workplace and teamwork. While sub-topics for the 3) individual competencies are

constructive communication and expression and workplace readiness. Finally, the sub-topics for the 4) methodical competence are job-related problem-solving skills and enhanced workplace experience.

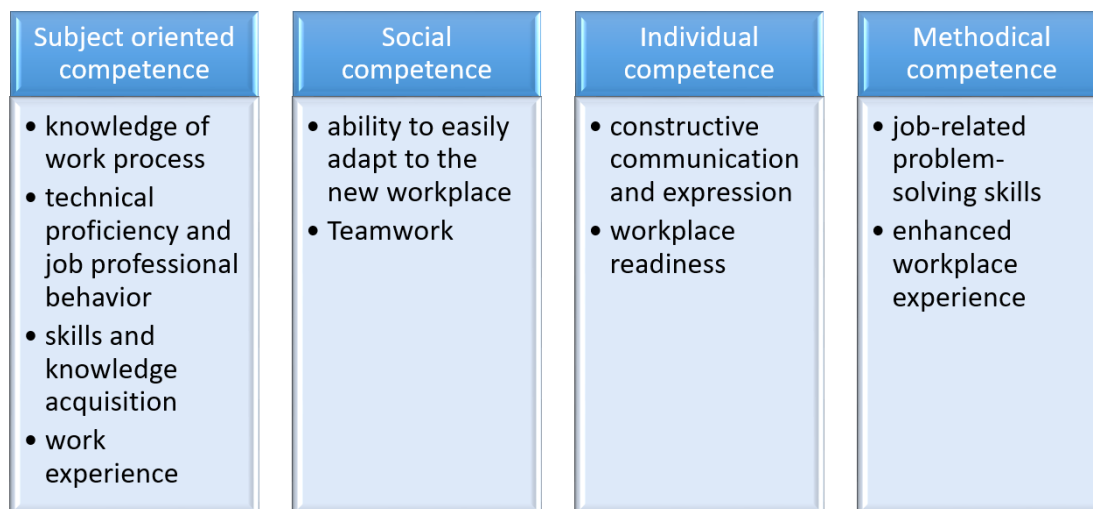


Fig. 8 The impacts of the School-in-Factory program

According to these categories, it is found that the subject-oriented competence that is technical knowledge and skills has the highest influence with the frequency of 24. For social competence, individual competence, and methodical competence are the consecutively less reported competencies with the frequency of 10, 5, and 2 respectively. Therefore, the impact of the SiF program has mostly contributed to the development of subject-oriented competence, that is technical knowledge and skills of the learners.

4. Discussion

This study aimed to evaluate the output and outcome of the SiF project in terms of quality enhancement. According to figure 8, it is implying that the technical knowledge and skills should be trained at the company where the learners are provided with the chance to train and experience the real world of work. When this is not possible, the learning process in the formal learning settings should best present the task and process of work according to the concept of work-oriented learning (WOL). As shown in the results, it is recognized that the combination of training at the workplace and learning in the classroom is highly recommended for TVET.

For the completion rate of the SiF graduates, 85% of the learners have completed the study program. In terms of its success, 85% is a very acceptable completion rate. This rate could be increased. Even though, we personally found that the combination of working and learning is rather stressful for the learners. Nevertheless, the specific reasons why the learners dropped out from the program should be studied. Workplace plays a significant role in promoting the competence development of the learners. We believe that to enhance the quality of the SiF project, it is necessary to rearrange the subject-based curriculum and have a closer look at how to systematically analyse and use the work process and work tasks for learning in formal or classroom settings. More effort should also be put on safety rules awareness inside the company. The question is how can experiential learning or experience from work be counted or recognised in the formal education scheme. Even though, culturally Thai students do not work to finance their education but rather depend on their parents or educational loans from the government. However, this form of learning and training arrangement should be further improved to support the production of qualified TVET manpower in Thailand.

After 10 years of its implementation, it is interesting to see that the SiF has shown its potential in facilitating joint responsibilities among relevant stakeholders in the industry, governmental body, and educational institutes where the company provides training venue, the governmental body provides policy support, and the university provides lecturers and experts. Importantly, the SiF program, as one of the WBL arrangements in Thailand, has promoted learning in the process of work by using the workplace as a place of learning. However, a face-to-face interview that was not possible due to travel restrictions during COVID-19 should be conducted to get a deeper understanding of the perception of the graduates and employers.

5. Conclusion and Implications

To summarise, it is shown that there were 100 learners out of 117 who completed the study program which accounted for 85% of the total number. The impact of the SiF program, as shown in this study, has mostly contributed to the development of subject-oriented competence, which is the technical knowledge and skills of

the learners. Thus, contributing to training competent TVET manpower and further development of WBL. Considering the number of all TVET graduates, this result may seem rather small. However, this has marked the beginning of further expansion of the project and the development of WBL in Thailand. Nevertheless, certain issues should be taken into consideration, such as the number of working and teaching hours and the drop-out rate among students. The focus should be put more on the concept of learning within the work process. Stronger collaboration between the university and company in aligning training and teaching curriculum where the number of study hours could be reduced.

To conclude, since its implementation, there have been a few hundred graduates from the SiF program. Even though the amount of graduates is quite small when compared with the total amount of TVET graduates at the same level in Thailand (approx. 666,000 in 2021) (Information Technology & Communication Center, 2023). Nevertheless, when these graduates enter the labour market, they do not require further training at the company and thus financial and personal investments are saved. Further research on the financial benefits is yet to be required.

Moreover, when one looks closely at the pedagogical arrangement of this program where various stakeholders (such as private companies, educational institutes, and governmental bodies) are involved in this operation, the SiF program has been successful in its implementation and promotion of work-based learning for Thai TVET. Thus, the SiF is enhancing Thailand's TVET system by further developing the "adopted programs" (a term coined by Choomnoon, 2012) by strengthening active relationships between partners with mutual benefits.

The SiF program, according to the guiding principle of the German dual system (BMBF, 2019; Fontdevila, et al., 2022 p., 601), has contribute to 1) the development of joint responsibility of the state, trade and industry, and the social partners, learning within the work process, qualified vocational education and training staff at companies and vocational schools including university. Work tasks and work processes should be analysed and integrated into the teaching curriculum for further development.

One of the missions of the RMUTL universities is to support and promote TVET colleges in Thailand in implementing dual vocational training through the WBL approach. So far, the success of WBL in Thailand still depends on the individual connection and the relationship with the private company for training the trainees/learning inside the company. Therefore, SiF at Laem Chabang is one of the starting points for the development of WBL to be more sustainable by strengthening the cooperation with private partners by training learners inside the company also and training the teaching staff as required by WBL arrangements. The great advantage of the SiF program is that it has been successfully implemented for ten years. The number of students in the project is still quite small. We suggest that similar projects should take place throughout the country. Based on this strong connection between RMUTL and Michelin Siam, the TVET college could be involved as another stakeholder from the educational partners in such a program. The RMUTL research team can assist another institute in implementing the same project as the SiF.

6. Limitations and Further Research Recommendations

The qualitative data collection of this research only included 20 graduates as participants. To gain a broader and better understanding, in future research, it is recommended to include more graduates as well as to conduct the face-to-face interview with graduates and employers. Further research should be conducted to find out the reasons why learners leave the program and to compare the performance of graduates from the SiF project with the graduates from the regular school-based TVET program.

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Conflict of Interest

The authors declare that there is no conflict of interest regarding the publication of the paper.

Author Contribution

*The authors confirm contribution to the paper as follows: **study conception and design:** Niwat Moonpa, Siriphorn Schlattmann; **data collection:** Patcharee Chaiyong; **analysis and interpretation of results:** Siriphorn Schlattmann, Patcharee Chaiyong; **draft manuscript preparation:** Siriphorn Schlattmann, Patcharee Chaiyong. All authors reviewed the results and approved the final version of the manuscript.*

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