Bhovornsak Somkror (Rajamangala University of Technology Lanna, Thailand)

How Work-Based Learning can be supported by Online Teaching for Multi-Site Industries

Abstract

The Bachelor's degree in agricultural and biological engineering is a good example of a new approach to teaching undergraduate students at the Rajamangala University of Technology Lanna (RMUTL). In this study programme, RMUTL cooperates closely with companies to offer its students a combination of work-based learning (by employing students as trainees in the company) and online teaching (provided by the University). All of the students in this programme work on-site at three partner companies with regular working hours. Additionally, they study a series of assigned lectures online. The subject area in this programme is the agricultural information system. The main objective is to link students' experience of work (practical knowledge) with academic learning topics (theoretical knowledge). Moreover, the concept makes it possible to teach students regardless of the location of the company site. Online courses also support self-reliant learning. Evaluations based on student observations and reflections in class suggest that there are some challenges, but generally reveal positive aspects regarding learning outcomes. Students have given particularly positive feedback on sharing work experiences and different points of view. This group engaged in dialogue and discussion with people at other sites. At the same time, the teacher's role is changing to that of a facilitator who supports the learning process, linking the online course to work processes in the companies.

Keywords: *Work-based learning, Online teaching, multi-site industries*

1 Introduction

Guided by the Ministry of Education in the context of Thailand 4.0 policy, the plan for higher education in Thailand is structured as a three-pronged development strategy. Firstly, improving a standard-based curriculum for teaching, learning processes and assessment methods. Secondly, improving the quality of teachers and backers of the education system, and, finally, improving research for competition (Phalasoon 2017).

Transforming higher education to produce better graduates has been a part of Thai national strategy for the past twenty years. One of the goals of Thai national strategy is to create human capital with the competence to support the industrial sector and the Small Medium Enterprise (SME) sector. Rajamagala University of Technology Lanna (RMUTL) is striving to build human capability in higher-level education for industry. Agricultural and biological engineering is one of many programmes implementing this project with company internships. All students in this project work on-site as trainees and study as undergraduates of RMUTL.

The research project for a new generation of graduates is supported by the Thai national strategy fund, with RMUTL managing the learning plan. A teacher in each subject maintains contact with the companies through the site manager of each project.

The company provides a workplace where learners are integrated into the company's human resources. Learners receive social welfare, a salary, and study fees for RMUTL, as agreed in the MOU between the RMUTL and each company.

The companies involved in this project are: tractor service suppliers (tractor attachments and accessories), forklift tyre manufacturers, and an industrial fan factory. The first is an authorized partner of tractor suppliers in Thailand. This company provides sales and service for tractors through on-site service, as transporting tractors to a service centre is no easy task. The company also manufactures tractor accessories. The second industry is a company which produces rubber for forklifts. Students are assigned to service and maintenance machines on the production line. In the third and final sector, students work in a factory which build industrial fan and ventilation systems. Each company has its own production processes. Each company is located in a different province in central Thailand.

The primary aim of sending students into the workplace is to give them real work experience, with the benefit of compensation which helps to cover tuition fees. The aim of this study is to find out if and how we can apply work-based learning through online channels for different company locations.

2 Work-Based Learning and RMUTL School in Factories

2.1 Work-based learning

"Work-based learning" in Germany was explained as "Learning in the process of work" (Dehnbostel & Schröder 2017, 2). Competences, character, and potential of learners were defined through real work situations in bona fide enterprises. Work-based learning included internships, on-the-job training, and apprenticeships (Dehnbostel & Schröder 2017).

Learning in the workplace in an industry or company can enable learners to use company resources: trainees, tools and work help to develop learner capacity. Learners faced genuine problems in the workplace and were therefore able to respond to real situations (Lester & Costley 2021). Lessons could be in actual working processes, drawing on knowledge and physical presence on site.

Work-based learning concepts show opportunities for long-life learning through a combination of theory, knowledge, and practical work experience. The relationship between academics and enterprise is an important element of this learning model.

2.2 RMUTL Work-Integrated Learning

The early project of work-integrated learning is “school in factory”. This is a public-private partnership with the National Science Technology and Innovation Policy Office or STI together with RMUTL and (a) tyre company, designed to solve a human resource quality problem in the industry. This project played a role in initiating work-integrated learning in RMUTL (Phalasoon 2017).

2.3 Distance teaching and learning

Distance learning or distance education means that teacher and learner are not in the same place as they educate or learn. This often involves online technology (Sherry 1995). Distance learning is not new, but RMUTL work-based learning lends itself to this model.

When a programme pairs with one partner, a lecturer can easily go on-site to teach, but in this case, one section of this programme has students dispersed across three separate locations.

2.4 Online teaching and learning

The number of online learning programmes is rising rapidly today, and this includes TVET education. Online tools for teaching and learning have been available for some time and come in many forms such as applications, blogs, websites, and Content Management System (CMS). Massive Open Online Course (MOOC) platforms have grown in recent years. Many online lessons make use of graphics or videos on YouTube channels, for example the Khan Academy. There are many pay-to-learn platforms such as Udemy, Edx, Coursera, etc.

The impact of the SARS coronavirus (SARS-Cov) (Adnan & Anwar 2020) has accelerated the development of online learning technology over the past year to support distance learning in lockdown in a large number of countries while academic institutions and universities closed their doors. Teaching has evolved from face-to-face situations into communication through online media (Pokhrel & Chhetri 2021).

Online learning is popular among learners as it offers flexibility in terms of time and location. With decent internet coverage, students can choose when to study and arrange their learning plans independently, to some degree at least (Luo et al. 2011).

2.5 Online tools for education

In a normal classroom situation, many tools are needed for everyone to see the same data: a whiteboard, paper for writing and submission of assignments for example. Information is exchanged through conversation. Online tools not only change the toolkit, but also how teacher and learners communicate.

Zoom, Microsoft Teams and CISCO WebEx are just some of the online communication tools available, along with Google Meet and other video conference applications suitable for

distance learning. Any place of work or learning can be connected as if participants were sitting in the same room. Different company programmes come with their own pros and cons.

For work-based learning in TVET, computer vision technology such as virtual reality (VR) and augmented reality (AR) play their part in the education sector. Hands-on practice in TVET education is integral to ensuring that learners get real experience. However, the COVID-19 pandemic situation prevents learners from going on-site. Virtual reality is a tool with a first-person perspective to act in the real world of work. The benefit of virtual reality for education is that it takes learners into a task-based environment and simulates the experience of work (Sharin et al. 2021), complementing distance and online learning.

3 Methodology

3.1 Participants

In this study, 11 students registered in an Innovation and Technology class. I selected the subject in line with agricultural and biological programmes that implement company internships. All students in the programme go on-site to work as trainees. After work, students are taught online by Chiang Mai lecturers.

For the centralized classroom in normal situations, everyone meets in the same location. Payment is on a weekly basis if we schedule learning on weekends. As it is impossible for students to join classes every day after work (from different locations), online teaching has enabled them to learn together simultaneously with Chiang Mai lectures.

3.2 Selected Online Tools

3.2.1 Microsoft Teams

Microsoft Teams is the primary tool for online teaching and is supported by RMUTL. This platform supports the function of learning between teacher and student, especially in the context of workspace support.

The key functions are “meet”, “post”, and “assignment”. “Meet” is a video conference function that allows students and teacher to talk together. “Post” is a short answer question. “Assignment” enables teachers to set assignments, and student upload their responses.

This application help lecturers to invite students and create a team. I created 6.00 pm to 8.00 pm learning sessions every working day. Students can join with mobile phones, computers, or tablets, so long as they have a microphone or headset. Communication works in two ways, shared between teacher and student as they talk. Conversations in the posts tab of Microsoft Teams make it possible to record questions and answers to be dealt with during class, a useful function when time is limited and focus can be maintained in the class. If a student cannot access the open mic or camera, the post function is a good means of reaching the teacher. If students need more time to think or research for an answer in their homework, the assignment

model supports students in uploading files to the system. Teachers can check, offer comments and grade homework.

3.2.2 Line chat application

The line chat application is a second tool for communicating with a student for brief announcements or appointments. Line chat groups can create and invite members without the need for a friend request. Active learning classes require quick feedback from learners. This application is commonly installed on mobile phones in Thailand, so this supports teachers in eliciting responses.

3.3 Teaching approach and assessment method

For work-based learning, we use dialogue as a tool for conversation and ask questions to assess students' comprehension and understanding of the body of knowledge, with particular reference to a "why" question.

3.3.1 Dialogue

Dialogue is a conversational tool for students and teachers to think together about learning topics within a day. The word dialogue infers that participants get involved in the conversation (Peters & Besley 2021). The western form of dialogue is classified into two models: first, the classical era, and second, the modern era. Dialogue can be understood as a conversational process that brings people to talk and listen without judgment.

The two major points of dialogue were deep listening and a power question. Deep listening is listening to the underpinning voice of the speaker, paying attention to body language, eye movement, voice tone, etc.

3.3.2 Asking a question

The topics of conversation in class are based on the subjects being learned and should relate to everyday work situations.

Two types of questions are used to assess students in this class. First, the power question is a precise question that goes deep into the areas which learners have encountered and assimilated during the process of work. The power question might be an open-ended question related to learning topics.

Second, the "why" question. The objective is to find the root cause of problems or understanding. Toyota Academic School practices "why" questions in class with their students and in the TPS - Toyota production system (Webb 2008). This technique helps the teacher begin to elicit reflection from learners. Questions must be accurate and answers must be complete for this process to be effective in determining the root of any problem (Serrat 2017).

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3.3.3 Reflection

Reflection is an important tool to measure what students have learned at work. It can take the form of a journal, portfolio or diary, for example. What they write will help to illustrate the students' experience and feelings.

In this study, we use writing reflection in class and use conversation as a dialogue process. Reflections are summarized at the end of the semester.

3.3.4 Process of learning

At the beginning of a class, the lecturer will open the class on Microsoft Teams with the "meet" function. Once students have joined, the lecturer will ask open-ended questions related to their situation. The objective is to allow students to relax away from the work environment and get back to concentrating in class. Dialogue begins with a prepared learning topic. During the dialogue process, the teacher will ask "why" questions type to gain a better understanding of the student(s). The first answer will come from a volunteer and the process continues until every student has answered. The question is not only posed to ascertain knowledge and understanding but also to gauge feelings related to the learning topics in the working process.

4 Findings and discussion

We use Microsoft Teams as an online classroom tool in dialogue with the video conferencing function. Short questions and answers are supported by posts. The assignment function follows with student submissions.

Students can submit their work through Microsoft Teams. They can explain learning topics related to their activities and works. From my observations, students in different companies come to class at different times, depending upon their work. Sometimes, they work overtime instead of learning, restricting their availability for conversation. Some use Microsoft Teams on the return journey to their office. For assignment and reflection, students send photos of handwritten paper into the online system. Conversation and reflection time takes place offline.

5 Discussion

The evaluation of learning through the dialogue process on Microsoft Teams, together with observation and reflection, would seem to indicate that students have acquired less knowledge than anticipated. They have a general understanding of concepts but are unable to present detailed explanations when faced with "why" questions. The relationship between teacher and

student presents a challenge. Furthermore, it is difficult for students to concentrate after working a full day, then having to focus on a small screen. The third point to note is that understanding work in a company is often hard to mirror or replicate in a learning topic, leading to a divergence in students' learning experiences.

They can comprehend basic concepts but are stumped when asked for more detailed responses to "why" questions. Basic questions include:
"What work are you doing today?"
"What problems occurred in your work?"
"How do you solve that problem?"

Asking "why" is the next step after "what" and "how". We want to know the techniques deployed by the learner to solve more complex problems in a methodical manner.

Microsoft Teams can support each function along with changing teaching techniques. For the purpose of this study, dialogue in a question and answer format is the main process for teachers and learners to interact when learners also spend time in work. With participants based in different locations, Microsoft Teams has proved useful as a video conference tool. When situated in the same place, information can always be read from voices in dialogue. Tone of voice, eye movement and body language of the speaker can be useful signifiers in dialogue and Microsoft Teams can be something of a help in this regard. The record function enables teachers and learners to recap using the playback feature. The post function of Microsoft Teams can support written responses to short questions, identifying respondents and testing opinions.

The challenge of Microsoft teams or similar online video conferencing is how it affects the relationship between teacher and student. Secondly, it is hard for students to concentrate in front of a small screen after a tiring day at work. Thirdly, understanding work in a company is often hard to mirror or replicate in a learning topic, leading to a divergence in students' learning experiences.

In changing the nature of communication from the classroom to multiple online classes, it follows that teaching method also need to change. Learners cannot focus on a small screen for any length of time, and they tend to switch off the camera, which prevents the teacher from observing how they behave during the learning process.

The role of the teacher is undergoing an important shift towards the role of a facilitator. Work-based learning, knowledge and experience are integral elements of a learner's ongoing education, so dialogue represents a process of recollection and gives teachers the opportunity to assess their students' learning development.

In this class, the teacher acts as a facilitator who facilitates learning between learners. Group activity encourages students to share lessons they have learned with one another, whilst learning from others at the same time. The teacher, the dialogue process, and power questions

lead students from tacit or implicit knowledge thought processes into explicit knowledge as they elucidate their experiences.

The role of the facilitator is in accordance with the student-centric learning method. In a general classroom, the role involves guiding the students without providing direct answers to the learner.

With regard to tools, the teacher becomes a manager who prepares learning tools from Microsoft Teams. Teachers will need time to adapt to this. Before class begins, teachers need to post questions, structure files and prepare assignments, then open a meeting room at the scheduled class time.

In online classes, lectures are less well suited to the program as many students switch off their camera and microphone. This prevents the teacher from seeing students, making it hard to know if they are following the class and learning properly. Nevertheless, the lecture format can be useful for knowledge-based material and in setting guidelines before going into the workplace.

6 Recommendations for future research

This study is based on trial classes. All data comes from actions during teaching, observations, reflections in class, and examination questions plus responses. Questioning the quality of work-based learning through online formats such as Microsoft Teams and dialogue can be crucial in working towards results which can strengthen research methodology.

Continuous multi-site teaching in RMUTL work-based learning programmes has expanded with more than 10 different partner companies, but based on the same curriculum. This situation presented a challenge in terms of research and teaching methods via online learning in multiple sites.

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