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Learning management strategies for in-service training of vocational instructors in Lao PDR - Using collaborative learning and a professional learning community approach in authentic situations: a case of automotive technology

Abstract

Most vocational teachers in Lao PDR lack practical and industrial experience, experience in applying new instructional and training strategies, and opportunities for continuing professional development in collaboration with enterprises. The overall aim of the research was to develop a learning management strategy (LMS) model to enhance and evaluate the professional competencies of vocational teachers. The objective of the study was to develop an LMS using a professional learning community approach and collaborative learning in authentic situations. Based on an analysis of the context of TVET teacher development, the LMS was developed and implemented in training 24 purposively selected TVET teachers participating in continuing professional development. The study employed a one-group, pre-test-posttest design. Data were collected from questionnaires, interviews, lesson plans, competency assessment manuals using both pre- and posttests, logbooks, observations, and focus group discussions. Quantitative data included pre- and posttest scores and the results of the competency assessment. The posttest mean scores on both technical and pedagogical competencies were significantly higher than the pretest scores ($p < 0.01$). Further findings of the study are discussed, and recommendations are made for the further development of Vocational Teacher Education in Laos.

1 Introduction

1.1 TVET sector in Lao PDR in brief

In Lao PDR the aim of TVET is to help learners acquire occupational knowledge, abilities, work discipline, skills, and attitudes needed for employment in response to demand in the growing Lao society and the ASEAN Economic Community (AEC) (MOES 2014, 2). TVET in Laos is presently in the process of transformation and consolidation. The Ministry of Education and Sports (MOES) has made significant efforts to increase equitable access, to improve the training quality, and to strengthen management. Challenges still remain, for example the labor market relevance and the social acceptance of the TVET system for both users and providers. Vocational teachers and instructors lack practice and industrial experience, and experiences in applying new instructional and training strategies. They lack continuing professional development in new training approaches, e.g. integrated vocational training,

competency-based training, and training in collaboration with enterprises (UNESCO 2013, 2-5). These challenges have motivated the authors to contribute to the reform process in vocational teacher education through in-service training of vocational instructors to enhance their professional competencies.

The present paper is a summary report of a research project within the scope of ADB-financed STVETP 2010-2015 in Lao PDR, and under a scholarship from the Royal Thai Government. The research team consists of two researchers from Lao PDR and two from Udon Thani Rajabhat University. The aim has been to develop a learning management strategy (LMS) for enhancing both the technical and the pedagogical competencies of vocational teachers in Lao PDR. The objectives were to develop an LMS involving a professional learning community (PLC) and collaborative learning in authentic situations for enhancing professional competencies of vocational teachers, and to evaluate the competencies of vocational teachers who participated in the training program.

1.2 Conceptual framework on professional development of vocational instructors in Lao PDR

1.2.1 Context

Lao PDR is preparing to introduce a very diversified vocational education and training system. According to the new TVET Law (National Assembly 2013), the system includes formal, non-formal, and integrated vocational education and training. The approach can include school based- and dual cooperative training, and can be competency-based. This wide range of training approaches requires the preparation of well-prepared vocational teachers, trainers, and instructors. This study is intended to contribute to the discussion on improving professional development of vocational teachers and instructors in Laos.

1.2.2 Theoretical background

The study began with a literature review focused on student-centered learning and students' needs and interests. It is based on constructivist theories of learning. Constructivists argue that learning is an active and constructive process, self-directed and based on situations. Two major constructivist theories are involved in this research. The first is Piagetian cognitive constructivism, focusing on assimilation and accommodation (Ornstein & Hunkins 2006, 120-121; Santrock 2006, 39-41; Khammanee 2012, 91). The second is Vygotskian sociocultural constructivism and other works from the sociocultural perspective (Rogoff 1990; Wertsch 1991; Dillenbourg et al. 1996). With Piaget, a teacher is seen as a facilitator and a guide to provide support for learners to explore their world and discover knowledge. A teacher should play multiple roles, not only as a teacher but also as a social worker, psychologist, mediator, communicator, team worker, knowledge networker, and expert (Spoettl 2009, 17). With Vygotsky (1978), knowledge is situated and collaborative, embedded among people and their living environments, which include objects, tools, books, and communication. Sociocultural constructivists believe that knowing can best be advanced through inter-

action with others in collaborative learning activities. Cognitive development is also determined by the social milieu that provides a kind of cultural curriculum for the development of cognitive processes. Learners acquire experts' knowledge by being guided by accepted experts, and they contribute actively to solving increasingly complex tasks step-by-step (Gessler 2009, 1613). Learners can learn independently, but their learning can be enhanced and extended by interacting with significant others, such as with their parents, teachers, siblings, and peers (Moore 2012, 5; Chai et al. 2011, 13-14; Orlich et al. 2010, 31-32).

Like the collaborative learning theory, the concept of PLCs is deeply rooted in Vygotskian theory, such as Zone of Proximal Development (ZPD) and Scaffolding (Vygotsky 1978). The essence of a PLC is collaborating and improving learning. The ZPD and collaborative learning theory suggest that a wider range of skills can be developed with peer collaboration by sharing knowledge and experiences with others, rather than learning in isolation. Based on the works of Dewey and Meiklejohn in the 1920s, the concept of learning community was developed, emphasizing Dewey's student-centered learning and active learning models embedded in the professional learning communities (Price, 2005, 4). Senge viewed the workplace as a learning organization, with employees actively participating in a shared vision and culture to support collaboration and to work together in identifying and resolving problems (Senge 1990; Feger & Arruda 2008, 3). From this perspective, in-service training for TVET instructors can easily be seen as a PLC. The facilitators or master trainers who conduct the integrated cohort from various courses as a common unit actively steer the learning process of respective trainees' groups through sharing of vision, mission, knowledge, emotion, values, or common beliefs. By applying this approach, facilitators or master trainers can create and improve the learning environment and work together more effectively. Trainees and master trainers or facilitators work together in a learning environment characterized by solidarity, helping each other as peers, thinking critically, analytically and creatively together, and making decision together.

Aristotle said: "What we learn to do, we can learn by doing" (Moore 2012, 319). Authentic learning plays an important role in vocational teachers' training. Authentic learning, rooted in the concept of learning by doing, involves creating learning environments that move beyond merely allowing students to play a role. In project-based or problem-based courses, students engage in a type of multidisciplinary problem solving and critical thinking. Students learn how to investigate problems, rather than textbook formulas or rationales (Windham 2007, 3). Generally, learning by doing is an effective and active approach. The social network and virtual reality technologies have become widely diffused in our daily life, which enables interested target groups to acquire learning experiences in authentic situations, starting from the experimental exercises to problem solving in the real world. Numerous educational psychologists argue that authentic learning involves higher-order processes through solving problems by placing a word or expression in the proper context (Glatthorn 1999 cited in Kocyyigit & Zembat 2013, 1-2).

Authentic learning, in the context of instructor training, can be organized in different forms, e.g.:

- Workplace learning (Hager 1997; ILO 2008; Munby et al. 2009, 1765-1767; CEDEFOP, 2011);
- In-company training (Tippelt & Amoros, 2003; Dehnbostel 2009, 1699-1710);
- Action based-learning in TVET (Buenning 2007, Hoeffner 2009, 1699-1710);
- Work-based learning (Avis 2009, 1725-1737); and
- Dual cooperative learning (Loose 2008; BMBF 2009; BIBB 2012), where learners connect their prior learning experiences with a new environment in order to solve problem through practicing real tasks and creating real products.

Learning is situated in social circumstances and is authentic, in terms of the application of knowledge (Billett, 1994, 1). One of the crucial TVET principles is therefore to link the theoretical part gained in classroom instruction to the practical part gained in the workplace. Likewise, in developing abilities, the learners are the most important factors, especially when organizing authentic learning situations (Keammanee 2012, 133-137; Suthirath 2011, 5).

1.2.3 Conceptual framework

Based on these objectives and findings, the process of developing a LMS was structured into four major elements: (1) The development context; (2) Relevant conceptual and pedagogical approaches; (3) LMS content; and (4) Outcome of LMS. In the final stage the LMS consists of six major elements further described in Section 3: introduction, principles, objectives, training contents, training process, and strategy evaluation, as illustrated in Figure 1.

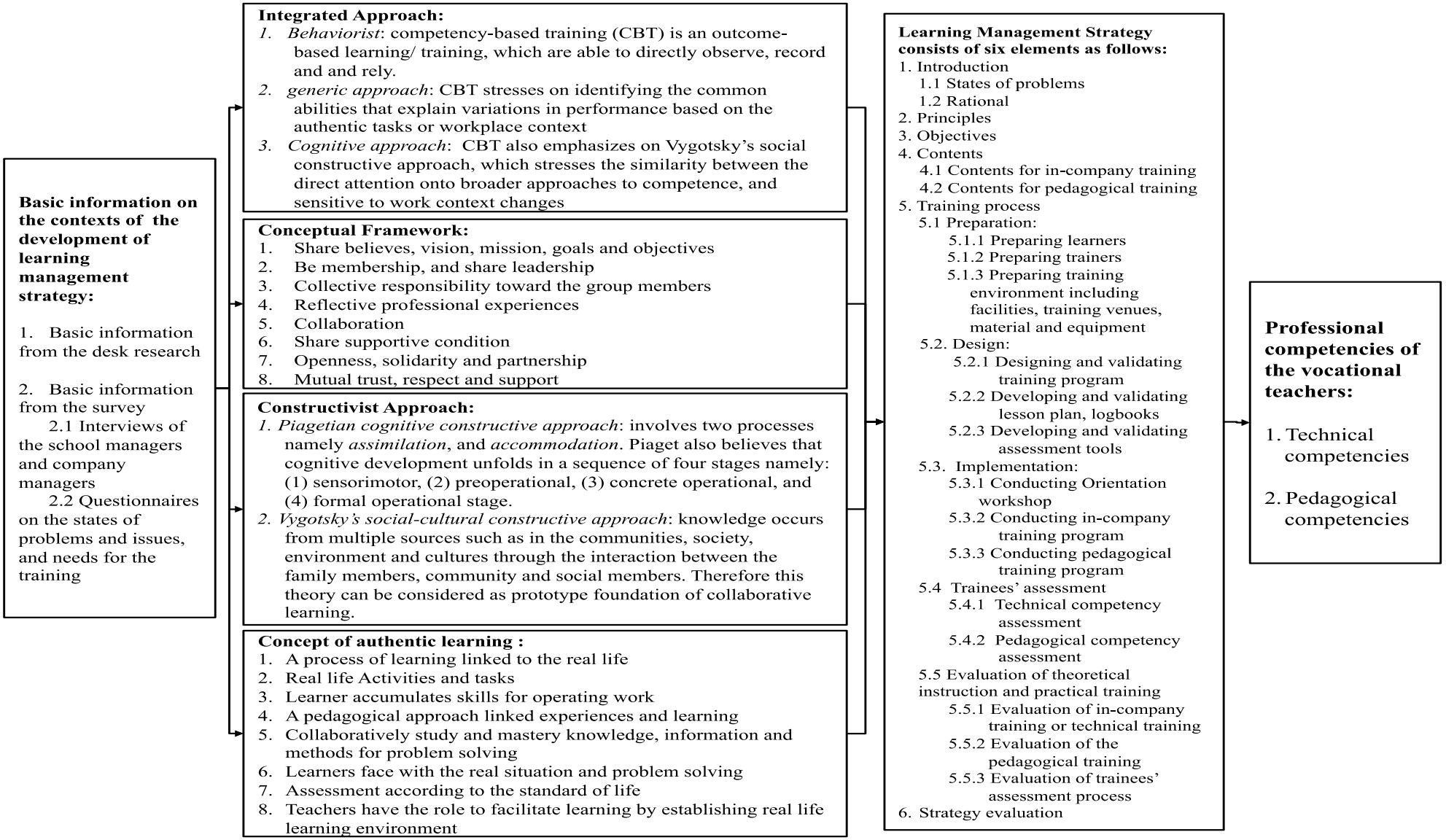

Figure 1: Conceptual Framework of the Development of LMS Using PLC's Approach and Collaborative Learning in Authentic Learning Situations

2 Research design

2.1 Objectives, research questions, and hypotheses

The objectives of the study were as follows:

(1) To develop an LMS using professional learning community approach and collaborative learning and in authentic situations for enhancing technical and pedagogical competencies of vocational teachers in Lao PDR, and

(2) To study and compare the technical and pedagogical competencies of vocational teachers in Lao PDR, who attended the in-service training using the LMS developed.

Two main research questions were formulated:

(1) What are the necessary elements of an LMS using a professional learning community approach and collaborative learning in authentic situations for enhancing professional competencies of vocational teachers in Lao PDR?

(2) How can the resulting LMS enhance the technical and pedagogical competencies?

The research hypotheses of this study were:

(1) Vocational teachers who have participated in the training via the LMS developed in this study achieved higher technical competencies than before the training; and

(2) Vocational teachers who have participated in training via the LMS developed in this study achieved higher pedagogical and methodological competencies than before the training.

2.2 Research methodology

2.2.1 Scope of the study

The population consisted of vocational teachers in the automotive technology department from 12 TVET schools and colleges from different regions of the country. Twenty-four purposively selected teachers of the automotive sections from these 12 TVET schools and colleges made up the sample. The independent variables were the defining characteristics of the LMS developed. The dependent variables were the posttest technical and pedagogical competencies of the teachers, with the pretest scores used for control.

2.2.2 Research instruments, data collection, and analysis

The research material included the following:

- Interviews with school managers and company managers;
- Questionnaires distributed to 100 vocational instructors from the 12 vocational schools and colleges;
- Observations in the training institutions and company workplace;

- Training plans, including lesson plans for a 16-week training program (4-week in-company training, the 10-week pedagogical training, and 2-week competency assessment);
- Assessment manual, including pretests and posttests for technical and pedagogical competency, and
- The participants' logbooks for monitoring of the trainees during the on-the-job training in the companies as well as in the respective schools and colleges.

The data collections were drawn from the pretest and posttest scores for technical and pedagogical competencies, interviews, questionnaires, information noted in the logbooks, and the focus group discussions among experts, facilitators, and the sampled teachers.

3 Research results on development and implementation of learning management strategy in Vocational Teacher Education

3.1 Results from the elements of learning management strategy

When the development phase of the research was completed and implementation could begin, the LMS comprised of six elements: Introduction, Principles, Objectives, Content, Teaching and learning processes, and Strategy evaluation.

Introduction. The Introduction consisted of the problem statement, conceptual and theoretical framework of the competency-based training, and descriptions of professional learning communities, collaborative learning, authentic learning situations, and assessment.

Principles. The Principles on which the LMS was based emerged from the principles of competency-based training, collaborative learning, professional learning communities, and authentic learning and assessment. As a result, there were nine common principles:

(1) Design outcome-based training programs that stress the needs of the trainees, and on the activities and tasks related to the real working condition and standards of the enterprises;

(2) Organize learning that links theory and practice by combining part-time classroom theoretical instruction with both practice in the respective vocational schools and colleges and on-the-job or in-company training;

(3) Provide opportunity for principals and teachers to share beliefs, vision, goals, and values, and to share leadership and support for facilitating effective and efficient teaching and learning;

(4) Provide opportunities for teachers or trainers and trainees to share ideas, experiences, best practices, and lessons learned;

(5) Establish suitable environment for the trainees to learn and work together, to share collective responsibilities, and to make common decision;

(6) Employ diverse methods and strategies of PLCs, collaborative learning, and authentic learning and assessment that provide opportunities for trainees to co-construct and apply their knowledge, skills and attitudes, to learn together, to work together, and to achieve common success;

(7) Organize training in small groups of 4-6 persons so the trainees can collaboratively and collectively master knowledge, information, and methods for problem solving;

(8) Emphasize authentic assessment to find out whether the trainees can collectively do the project and assigned job properly; and

(9) Teachers and students reflect and give feedback to each other during and after completed activities to improve learning outcomes.

Objectives. The objective of the implementation of the LMS was to enhance professional competencies of vocational instructors, which were demonstrated in technical competencies, and pedagogical competencies.

Content. The content of the training programs were based on: (a) The national skills standards; (b) The curriculum for vocational training of automotive technicians; (c) The national standard of the vocational teacher education; (d) The training needs analysis from the survey on the opinions of the population and sample. The contents of the training programs were divided in in-company training and pedagogical training, as depicted in the Table 1.

Table 1: **Content of in-company training and pedagogical training**

In-company training	**Pedagogical training**
• Fundamentals of the service, • Working safety, • 5S activities ISO 14001, • Inquiry of data from the electronic sources, • Tools and measuring instruments, • Car electricity, • Power transfer, • Engines, and periodical maintenance, • Check after 40.000, 80.000, and 120.000 km.	• Problems and challenges of TVET, • Vocational pedagogy • Technical didactics on automotive, • Approach and innovative of participatory instruction, • Design and development of competency-based learning modules (modular curricula based on skills/competency standards) • Design, adaptation and production of instructional materials and media, • Implementation of a modular training program or a delivery of CBT-instruction, • Assessment of individual achievement of competences.

Process and phases of the LMS. The process of organizing the LMS was divided into five phases:

(1) Preparation, including planning and budgeting, selection of participants, hiring master trainers or facilitators, and selection of training venues, including training centers for classroom training and companies for on-the-job training;

(2) Design, including design and development of training plans, lesson plans, teachers' manuals, participants' manual, and competency assessment manual;

(3) Implementation, phase of the developed learning management strategy was undertaken in both classroom instruction and on the job training for the in-company training, and the pedagogical training,

(4) Assessment, focused mainly on participants' knowledge test and authentic performance tests, and

(5) Evaluation, to assess the effectiveness of the instruction at the end of the day or of the modules, through sharing and reflection among the participants and master trainers or facilitators.

Strategy evaluation. The evaluation of the LMS was conducted in the following steps:

(1) Summaries of the study and the comparison of participants' achievement before and after the training courses, and

(2) Focus group discussions on the five phases listed above to assess which resulted in positive effects, problems and difficulties, lessons learned, and recommendations for improvement.

Preparation of the evaluation report. After finishing the design of the LMS, a focus discussion was held, and a revised draft was submitted to seven TVET experts for evaluating the relevance and appropriateness using a questionnaire designed for the purpose. The results are shown in Table 2.

Table 2: **Results of the relevance and appropriateness evaluation of the developed learning management strategy**

	Level of relevance and appropriateness		
Elements	**$\bar{X}$**	**S.D.**	**Result Interpretation**
1. Introduction	4.69	0.43	Very high
2. Principles	4.71	0.45	Very high
3. Objective	4.90	0.25	Very high
4. Contents	4.82	0.41	Very high
5. Process of learning and training	4.80	0.42	Very high
5.1 Preparation	4.86	0.38	Very high
5.2 Design	4.86	0.38	Very high
5.3 Implementation	4.71	0.49	Very high
5.4 Assessment	4.71	0.49	Very high
5.5 Evaluation of the learning and training processes	4.86	0.38	Very high
6. Strategy Evaluation	4.68	0.47	Very high
Total average mean scores	**4.77**	**0.41**	**Very high**

As shown in Table 2, the seven experts gave the very high scores for level of the relevance and appropriateness, with an average mean score of $\overline{X}$= 4.77 and S.D. = 0.41 on a 5-point scale.

3.2 Quantitative comparative results from evaluation before and after operation in vocational teacher education

The results of the quantitative analysis were based on the competency assessments of the 24 participants, as shown in Tables 3 and 4. As these Tables show, the LMS participants received posttest mean scores for both technical and pedagogical competencies that were significantly higher than their pretest scores ($p < 0.01$).

Table 3: **Results of the comparison between the pretest and the posttest mean score of Technical Competencies**

Tests	Total score	$\overline{X}$ (n=24)	S.D. (n=24)	t-value
1. Pretest	100	28.75	4.88	36.72*
2. Posttest	100	78.38	5.56	

**p < 0.01*

Table 4: **Results of the comparison between the pretest and the posttest mean score of pedagogical competencies**

Tests	Total score	$\overline{X}$ (n=24)	S.D. (n=24)	t-value
1. Pretest	100	39.25	4.64	32.07*
2. Posttest	100	78.25	3.70	

**p < 0.01*

These results mentioned above show that after the implementation of the 4-week in-company training, the 10-week pedagogical training, and 2-week competency assessment respectively, the LMS had a positive impact on the enhancement of both the technical and pedagogical competencies of the vocational teachers. It was also found that the teachers and trainers, college administrators, industrial managers or trainers, and DVT students were all satisfied with the LMS. In conclusion, the LMS is shown to be an effective approach for organizing further training and for upgrading technical and pedagogical competencies of Lao vocational teachers in the automotive technology trade.

3.3 Interpretation of the research results and reflection of theoretical basis

3.3.1 Main findings on the developed LMS

The approach to the development of the LMS in this study is consistent with the views of Certo and Peter (1991, 13-36) and Dessler (2009, 11-13) on development of strategic man-

agement plans, and in particular Beauchamp (1981, 66-67) on LMS development. The main features of the LMS used here are competency-based training of vocational instructors, professional learning communities, collaborative learning, and authentic learning and assessment.

Of particular significance is the linkage of the theoretical knowledge gained in the classroom with the practical training learned both in the real workplaces and in the schools. The LMS developed here is thus consistent with:

(1) The concepts of the German Dual Training (BMBF 2009);

(2) Lankard (1995, 63-67 in Sutroong 2004, 48), who argued that learners acquire knowledge and understanding by considering the interaction between classroom learning and its implication in the authentic situation;

(3) Chinajitphan (2010, abstract), who developed a model of dual vocational training (DVT) on teaching and learning management in Thailand;

(4) Vygotsky's sociocultural constructivist theory (Vygotsky 1978);

(5) Cheetham (1999, 114), who argues that a mentor performs many functions, such as coach, counselor, role model, sounding board, adviser, confidant, etc.;

(6) Moore (2012, 7-8), who emphasizes student control, minimization of lectures, multiple ways of knowing, learning and assessment in authentic situations, learning in groups, learning as a search for meaning, and co-construction in a variety of contexts;

(7) Chai et al. (2011, 13-14), who argue that Vygotsky's sociocultural theory of learning is an important basis for collaborative learning in formal and non-formal modes, both inside and outside the school.

3.3.2 Discussion on the results of the implementation of the developed learning management strategy

Technical Competencies by using PLC's approach and Collaborative Learning. The results shown in Table 3 above are consistent with Goetsch and Davis (2006, 392-393), who argue that effective training depends on the preparation of participants, trainers, facilities, and well lesson plans. Attention needs to be given to the purpose, objectives, training aids, methods and strategies, and the tools for assignment, assessment, and evaluation.

In this study the participants achieved a high performance because the LMS included both theoretical learning, practical exercises, and on-the-job training in the companies. The latter provided opportunities for participants to acquire more skills and industry experiences by performing authentic exercises. In addition, the participants experienced regularly daily routines, e.g., organizing morning talks, performing 5S activities[1], and wrapping up of the day throughout 16-week training. Such processes of learning and training have led participants to change

[1] [Japanese]. *Seiri* (Clearing, Sorting, Tidiness), *Seiton* (Organizing, Orderliness), *Seiso* (Cleaning, Cleanliness), *Seiketsu* (Standardizing), *Shitsuke* (Discipline, Commitment). (Slogan used in TVET instruction).

their ways of working with their students in their respective schools. These routines were consistent with Thorndike's Law of Exercise, which indicates that the frequent exercises with clear understanding provide long learning retention (Ornstein & Hunkins 2009, 108; Khammanee 2012, 56). They are also consistent with Tippelt and Amoros (2003, 8) who argue that participants fulfill vocational training objectives by employing various methods for acquiring practical skills, putting into practice in the workplace the acquired technical, methodological, social, and individual skills.

Pedagogical competencies by using PLC's approach and Collaborative Learning. The results in Table 4 are consistent with Dillenbourg et al. (1996, 1) and Johnson and Johnson (1987 in Manning & Bucher 2007, 205) who argue that collaborative learning helps students, teachers, administrators, and community members work together for common goals.

The results are also in agreement with Hord (1997, 14-24), who concluded that the use of PLCs has an impact on both teachers and students. For teaching staff, participation in PLCs tends to reduce teachers' isolation, increase commitment, and lead to shared responsibility for the total development of, and collective responsibility for, students' success. For students the consequence of teachers participating in PLCs is associated with decreased dropout rates, reduced absenteeism, increased learning, higher academic gains in math, science, history, reading, and smaller achievement gaps between students from different backgrounds. Students tend to be less isolated when faced with complex tasks. They are more confident in dealing with new and unfamiliar strategies.

Integration of technical and pedagogical competencies in authentic instruction situations. The participants were assessed in both theory and practice. It was found that participants were able to integrate technical competencies gained from in-company training and pedagogical competencies acquired from the pedagogical training program and provide instruction in both theoretical and practical parts. These findings are consistent with Williams (2009, 6), who argues that in the workplace, collaboration is the ability to build cooperative relationships with colleagues and customers and being able to work with diverse teams to negotiate and manage conflicts.

Herrington (2006, 3-4) reports that authentic contexts and tasks enable students to readily return to any element of the site if desired, and provide the opportunity for learners to compare themselves with experts and other learners in varying stages of accomplishment.

Lamb, Kabes, & Engstrom (2011, 510) conducted a study on the impact of a learning community model Masters of Education program. They found that the professional learning and growth of teachers can be maximized through programs of study that include peer collaboration, empowerment, and transformational learning.

Sakonkiat (2003, in abstract), found that through industrial workplace learning, people can acquire a wide range of skills, including management, workplace learning, coaching, control planning, problem solving, flexible working, lifelong learning, use of learning media, work unit cooperation, and team working.

Authentic assessment. Throughout the course, the LMS involved project-based and problem-based methods, discussion, reflection, feedback, and authentic performance assessment. As a result, the participants could learn better by operating their project works in groups. They were able to properly provide short instruction, demonstrations, students' exercises, and assessment of students' performance and to evaluate training sessions. Moore (2012, 412) argues that an authentic assessment is a procedure by which the students demonstrate their ability to perform a particular task in the real-life situation.

In conclusion, after organizing the in-company training and pedagogical training, the LMS had positive effects for the enhancement of the professional competencies, which were demonstrated in both technical competencies and pedagogical competencies of vocational teachers in Lao PDR. This LMS model can be adopted and applied in the similar training programs of other trade areas.

4 Conclusions, recommendation and desiderata

4.1 Recommendation for this research

In focus group discussions at the end of the training program for both in-company and pedagogical training, participants and facilitators recommend that due to the complexity of the training program, there must be more time for the technical training. A 6- or 8-week program was suggested. During the in-company training, there were only few in-company trainers with pedagogical qualification. It is therefore suggested that there are urgent needs to train in-company instructors for the on-the-job-training. In addition, due to different background of the trainees, some lacking knowledge and experience in participatory approaches of learning, the study suggests that there should be sufficient time for group work, project work, presentation, and discussion. Finally, the research suggests that development of LMS should be in a block system instead of having it on a daily basis. In a block system, the classroom training could be conducted during a period of one or two weeks, and thereafter the participants can continue their internship in the companies for 2-3 weeks. This is similar to the pedagogical training.

4.2 Desiderata for future research projects

Based on the result of the study, it is recommended that further research should be conducted on the potential of the PLC approach and collaborative learning to enhance social and individual competencies, both technical and pedagogical. In the current status of TVET development in Laos, there is also the need for the development of an LMS for pre-service training of technical teachers by using the same learning approaches to enhance employable skills. In addition the working disciplines of the TVET graduates should be focused on in order to improve their ability to adapt themselves to the changing world of work. Research should also focus on development of an LMS for enhancing the working disciplines of the TVET graduates so they can adapt themselves to the changes in science and technologies and new

employment conditions. Finally, further research should emphasize the development of LMS in greening vocational training for sustainable development.

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