

Enhancing pre-service teachers in learning management competency by TPACK framework study and professional requirement

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ABSTRACT

Increasing attention has been placed in recent years to the improvement of learning management competency of pre-service teachers, yet many institutions where the teacher education programs offered have not been provided the effective guidelines. The purposes of this study were to examine the ability of the teaching practice and to propose the enhancement approach on learning management competency of pre-service teacher based on technological pedagogical content knowledge (TPACK) framework. Sample of the study included 385 pre-service teachers studying the fifth-year program at Faculty of Education, Ubon Ratchathani Rajabhat University, Thailand. A learning management competency questionnaire and semi-structured interview were administered to inquire the ability on learning management competency of pre-service teachers during the teaching practice at school. Statistics used for data analysis included frequency distribution, average, standard deviation, and content analysis. Results indicated that pre-service teachers expressed their teaching practices considered each aspect of teaching quality, results ranged from the highest to lowest level were the ability on learner-centered management ($\bar{X}=3.00$, S.D.=0.77), the knowledge on teaching design ($\bar{X}=2.96$, S.D.=0.72), the assessment and evaluation methods ($\bar{X}=2.95$, S.D.=0.74), and the integration of technology ($\bar{X}=2.70$, S.D.=0.78), respectively. Recommendations and suggestions were further discussed regarding the enhancement approaches proposed on improving learning management competency of pre-service teachers.

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1. INTRODUCTION

Modern society focused on the quality of learning, as well as learning should be tailored by professional teachers. The quality of the teachers is a key factor in the transformation of learners' learning. Teachers need to be transformative in many ways. Whether it is teaching management or operations that require knowledge and capability in the appropriate application of technology and educational innovation [1]. The development of new innovations to convey learners or gather knowledge resources suitable for learners that they can learn by themselves. Teachers must be professional with knowledge of content science, knowledge of the subjects, and able to educate the learners. Teachers must be able to be technologically competent using a variety of learning tools [2]. Whether it is the internet, social media or the use of communication technology, and employ teaching strategies in which effective exchange of knowledge [3].

The disruptive society as in the current, education is not needed only innovation and higher-ordered thinking to young generation, but the sharp thinking for living with others and new technologies are more required [4], [5]. The uncertainty and difficult to predictable in movement of development. Teachers are key person to help students learn and prepare themselves to face with future. However, the concept of pedagogical and content knowledge seems to be mixed it up with educational technology or new learning environment. Disruptive education is more complex and need the integrated approach, teachers should develop themselves with a focus on being able to design learning, administer learning, and evaluate learning outcomes [6]. Learning management is consistent with the characteristics of the learner and the changing world as well as the application of technology. These situations combine learning with the concept of learning psychology such as behaviorism, cognitivism and associative thinking, concept design of learning. It is a process that provides the environment and other contexts with should be accomplished in learning successful.

To achieve learning and communication through a network where students are free and able to control their own learning with different technologies. According to the concept of preparing 21st century learners by helping students learn in balance both knowledge, skills and the desirable qualities. It contributes to independent learning based on interests in the personal learning area and evolves into building one's own knowledge through available technologies. Teachers can choose from a wide variety of technologies that have become the basis for teaching and learning management [7]. Pre-service teachers are young generation or next wave of change agent in education, they have to learn how to be a good teacher, ready to work with school community, and shape our future in the better way.

In the 21st century learning environment, teaching and learning may be differenced, it aims to promote the core competencies of the learner, learners should be promoted necessary learning skills, and also teachers should provide instruction for learners to learn course content along with other content in the form of content integration. Specifically, content-related technology is called for suitable integration. It is consistent with Koehler, Mishra, and Cain technological pedagogical content knowledge (TPACK) framework [8] developed from Shulman's concept [9], which defines PCK as "a specific and cognitive type of knowledge. In addition to content, knowledge is the integration of various dimensions of knowledge to increase the teaching potential in that content" Mishra and Koehler [10] proposed the TPCK concept as a concept of integrating Technology with Pedagogy with additional content and knowledge to enable the learner to have a well-rounded learning experience. Later, Koehler, Mishra, and Cain [8] added the abbreviation from TPCK to TPACK, by inserting the letter A to show the connection between the three parts of knowledge.

TPACK is an integrated approach which technology, pedagogy, and specific content are relevant to educational management [11]–[18]. We cannot deny information technology and communication that is important to live and learn. Information technology has become an increasingly important thing of our schools, students can live beyond school activities, and it help them to meet the wider learning experiences. They can understand different culture through the complex concepts or encourage learning collaboration. The new age of growing learning environments recommended teachers invite educational technology practice in diversity process and methods. It helps teachers in self-efficacy and design lessons in current of technology development and young generation [19], [20]. Mishra and Koehler [10] proposed TPACK framework which centers on innovative innovation for enhancing nature of learning in this era. TPACK let teachers recognize the important of learning media and necessary technology for education. It consisted of innovative information, academic information, and substance information, offers a profitable approach to numerous of the situations that instructors confront in actualizing instructive innovation in their classrooms. TPACK system traces how substance instructed through the suitable content and necessary technology. This range is critical since the learning innovation being actualized that must communicate the substance and bolster instructional method improving students' learning involvement.

The novice teachers and in-service teachers should be reskilling and upskills in technological, pedagogical, and content knowledge to new learning environments. TPACK framework is particularly used for professional development and allow teachers do with their teaching and learning competencies as well. It is best utilized to taught and direct understudies toward distant learning in the better way. Teachers have to had more understanding of subject matter with three sorts of information, technology knowledge, pedagogy knowledge, and content knowledge. Instructional experiences and effective implementation of technology in the classroom requires acknowledgment of the dynamic, transactional relationship among content, pedagogy, and suitable technological choices. Leading educational technology need understanding and analyzing for teachers to create and tailor lesson into classroom as it in balance.

This research was part of the development of the pre-service teacher capacity-building program based on the TPACK framework. It aimed to study learning management competency based on TPACK framework of pre-service teachers. Finding will help teacher education program and teacher preparation

program do beyond 21st century classroom. To strengthen the pre-service teachers learning management competencies in four areas are reported: i) Knowledge and competence in learning design; ii) Learning management that focuses on the learners as a priority; iii) The use and development of innovative media and technology for learning management; iv) Measurement and assessment of learning outcomes. In addition, the study present empirical data and then it will provide how to enhance the pre-service teachers' learning management competencies based on TPACK framework.

2. RESEARCH METHOD

2.1. Participants

The setting employed 385 fifth-year of teacher preparation program in bachelor degree in education. They were pre-service teachers who enrolled teaching practicum in schools by academic year 2020. One-year practicum in school set them learn to be a good teacher in school and professional development under an academic collaboration between networking school and one university. The program of study held with the professional development and teaching experiences center, Ubon Ratchathani Rajabhat University, Thailand. Supervisor from university, supporting teacher from school, and pre-service teachers were co-working teaching team through this program of study.

2.2. Procedure

Document analysis was conducted to seek the suitable way, study related concepts and theories in which TPACK framework and learning management competencies success. Data were collected through search engine and online databases. The researchers studied the pre-service teacher competencies, methods for enhancing learning management competencies, the TPACK concept framework, and synthesized the learning management elements. Information from document analysis was used for designing questionnaire in the next step of study. TPACK framework for teaching practicum in schools was made in form of manual guideline.

The tool used to collect data was the pre-service teacher learning management competency questionnaire according to the TPACK concept framework which can be divided into three parts. Part 1is contained basic information of respondents. Hence, Part 2 contained the pre-service teacher learning management competency questionnaire using the TPACK conceptual framework. It is a 5-level approximation scale using the highest, high, medium, low and the lowest criteria. Lastly, Part 3 contained Methods for developing the pre-service teachers' learning management competencies using the TPACK conceptual framework and additional recommendations.

2.3. Research tool

Study the competency assessment handbook of the Office of the Basic Education Commission (2010), Rules of the Teachers Council of Thailand on professional standards (No. 4) B.E. 2562, Regulations of the Teachers Council of Thailand on professional standards B.E. 2556, Rules of the Teachers Council of Thailand on professional standards (No. 4) B.E. 2562, Standards of qualifications at the bachelor's degree in education and in education (Five-Year Curriculum and Four-Year Curriculum, 2019), Basic Education Core Curriculum Document, B.E. 2551 and learning standards and indicators of mathematics learning subjects Science and geography in the subjects of social studies, religion and culture (Revised version 2017) according to the core curriculum of basic education, B.E. 2551.

The researcher analyzed important issues related to enhancing the pre-service teachers' learning management competency as a framework for questionnaire construction. Researcher drafted a questionnaire for the pre-service teacher learning management competency level according to the issues to be studied. This was a rating scale questionnaire of 5 levels, which was the highest, most, moderate, low, and the lowest to study the level of learning management competency of the pre-service teacher. The draft questionnaire was presented to the main thesis advisor to determine the validity and appropriateness of the formulation of questions, use of language idioms, and number of questions, and revised them according to the advice. A questionnaire was presented to five experts to check the content validity of the questionnaire to find the conformity index by analyzing the IOC values of the questionnaire individually and selecting questions with an IOC index greater than or equal to 0.50. It found that the IOC was between 0.80-1.00. Take the results of the assessment questionnaire and expert suggestions for further improvement of the questions and present the main thesis advisor to improve and develop more appropriate questions.

The questionnaire was used for testing with 30 the pre-service teacher of Faculty of Education, Sisaket Rajabhat University. It was found that the learning management performance of the Pre-Service teacher had a discriminant power between 0.312-0.838 and the confidence value of the whole questionnaire was 0.923. Then, questionnaire was revised and corrected to be authentic questionnaire. The research tool was ready to collect data from the teacher preparation program.

2.4. Data analysis

The preparation initiates by sending official request letters for collecting data from participants. Researcher brought 385 letters of assistance and questionnaires to the sample group to answer the questionnaire via online channels on the Internet. Data were corrected and analyzed by mean and standard deviation. The criteria for analysis can be summarized by mean score ranges 4.51-5.00 refers to the competency of learning management at the highest level, 3.51-4.50 refers to the competency of learning management at a high level, 2.51-3.50 refers to the competency of learning management at a moderate level, 1.51-2.50 refers to the competency of learning management at a low level, and 1.00-1.50 refers to the competency of learning management at lowest level.

3. RESULTS AND DISCUSSION

Teaching practicum in schools in the teacher preparation program which employing TPACK framework, purposing pre-service teachers enhance their learning management competencies, incubating them to have professional development as its recognized by rules and Education Act in Thailand. The study found the empirical data which need to be discussed. It revealed that pre-service teachers had level of learning competencies in at moderate level as seen in Table 1. Four components were also at moderate level and each item was rated in the same level.

Table 1. Learning management competency of pre-service teacher

Learning management competencies	\bar{X}	SD	Interpret
Knowledge and competence in learning design			
1. Ability to define learning outcomes that emphasize analysis, synthesis, applied, initiative, suitable for individual learning, nuances and nature of learners	3.05	0.68	Moderate
2. Able to design a variety of learning activities appropriate to the age and needs of the learners	2.93	0.73	Moderate
3. Provide opportunities for learners to participate in learning design, organizing activities and assessing learning outcomes	2.88	0.75	Moderate
4. Able to formulate a systematic learning plan together	2.99	0.74	Moderate
5. Able to apply the results of the learning design to the management of learning and adapt to the situation appropriately and to affect the learner as expected	2.95	0.73	Moderate
6. Able to evaluate the results of learning designs to be used for improvement/development	2.94	0.71	Moderate
Average	2.96	0.72	Moderate
Student-centered learning			
1. Able to create a database for student-centered learning design	2.94	0.70	Moderate
2. Able to use a variety of teaching styles/techniques to enable learners to develop their full potential	2.90	0.73	Moderate
3. Able to organize learning activities that instill/promote the desirable characteristics and competencies of learners	2.93	0.78	Moderate
4. Able to apply the principles of psychology in learning management to achieve happy learning and to develop to their full potential	2.99	0.74	Moderate
5. Able to use the learning resources and local wisdom in the community in the management of learning.	3.05	0.81	Moderate
6. Able to develop learning networks between the school and the parents and the community	3.16	0.88	Moderate
Average	3.00	0.77	Moderate
Use and development of innovative media and technology for learning management			
1. Able to use innovative media and technology for learning in a variety of ways suitable for content and learning activities	2.76	0.76	Moderate
2. Able to search through the Internet to develop learning management	2.66	0.78	Moderate
3. Able to use computer technology in media production/innovation used in learning management	2.68	0.78	Moderate
Average	2.70	0.78	Moderate
Measurement and evaluation of learning			
1. Able to design a wide range of measurement and evaluation methods suitable for content, learning activities and learners	2.98	0.70	Moderate
2. Able to create and implement proper measuring and evaluation tools	3.02	0.74	Moderate
3. Able to measure and evaluate learners based on real conditions	2.90	0.78	Moderate
4. Able to use the results of the learning assessment to improve the learning management	2.91	0.76	Moderate
Average	2.95	0.74	Moderate
Overall of learning competency	2.90	0.75	Moderate

From Table 1, the learning management competency of the pre-service teacher was at the moderate level (\bar{X} =2.90, SD =0.75). On an individual basis, it was found that learning management was at the moderate level with the highest mean (\bar{X} =3.00, SD =0.77). Followed by the knowledge and ability of learning design was at the moderate level (\bar{X} =2.96, SD =0.72) and the learning measurement and evaluation was at the

moderate level ($\bar{X}=2.95$, $SD=0.74$) As for the use and development of innovative media and technology for learning management, the mean was the least ($\bar{X}=2.70$, $SD=0.78$) at the moderate level.

The learning management competency seems to be moderate level, they need to have knowledge and suitable understanding about technology, pedagogy, and modern content in their field of instructional responsibility. The program or curriculum for leading them in TPACK should be developed and implemented due to the course or program of study in teacher preparation program can be fulfill during the university course and school practicum. It is consistent with the Padagas [21] concept of studying the performance of the pre-service teacher in a hands-on learning environment. When considering each aspect, it was found that the pre-service teacher's classroom management competency was at the moderate level, followed by learning and teaching performance, and measurement and evaluation.

The requirement of learning competency of pre-service teachers can be shown in four strategies that TPACK framework should be incorporated as shown in Table 2. Each strategy can be conducted in both during teaching preparation program and in school practicum. The new era of self-learning and peer learning are required.

Table 2. Learning strategies in requirement of pre-service teacher

Strategy requirement	Amount	Percentage
Professional Learning Community (PLC)	276	71.69
Workshop	218	56.62
Self-study method	196	50.91
Field trip	90	23.38

From Table 2, pre-service teacher required to strengthen learning management competencies by professional learning community (PLC) 71.69% followed by Workshop 56.62%, self-study method 50.91% and field trip 23.38 %, respectively. The TPACK framework can be help them to have learning management competency by analyzing program for teacher preparation and TPACK lesson design. In addition, pre-service teacher provided the following recommendations for enhancing competency based on learning management which it should be strengthened during the semester break. Due to they have no academic mission and is very convenient to participate in competency-building activities and can be responsible for the work that may arise from participating in the activities as assigned.

The study pointed out that learning strategies should be diversified with different contexts and culture of learning. Pre-service teachers should have some learning skills that think beyond traditional classroom, but move it forward to new lesson design by integrating technology, pedagogy, and necessary contents for 21st century learners. The process and methods that required, it seems relevant to nature and culture of modern classroom. Pre-service teachers should have and should be prepared based on concept of collaboration through appropriate program [20].

The use and development of innovative technology media should be strengthened first, in order to provide learning to be in line with the current situation that has changed from being affected by the COVID-19 crisis at the opening of the school term [17], [22], [23]. Methods for enhancing learning management of the pre-service teacher is in line with the concept of Koh and Divaharan [24], they required to develop ability about technological integration expertise through the TPACK approach. It was found that reflecting learning outcomes and sharing experiences with peers will improve knowledge and use of technology in teaching and learning management as well as competencies related to TPACK by joining the community of professional learning community [21]. Also. Pre-service teachers should have necessary learning skills which technology can employ for collaboration and effective communication [25], [26].

It is a key factor contributing to their competencies in planning, learning management design, teaching preparation because all three areas are as important as classroom learning. In addition, Kagle [27] studied professional learning communities for the pre-service teacher, found that it is an effective tool that can enhance the pre-service teachers adapting to the instructional suitability [28]. It is to instill a professional learning community culture as a quality of teaching skills when practicing teaching and learning in the real classroom [29]. However, the program should not only intense technology education than those pedagogy and content, some teachers may ignore towards concept of integrating education [30]. The finding showed that pre-service teachers had learning management competency was at moderate level. TPACK framework should be more implement into professional experiences by designing technology, pedagogy, and specific contents into classroom.

4. CONCLUSION

The study revealed that pre-service teachers had level of learning management competency is at moderate level. The traditional program for teacher education is not effective course for new generation of teacher students, especially learning environment is differ from the past. Technology is required for their professional experiences and teacher development.

As for the use and development of innovative media and technology for learning management, the mean was the lowest. Hence, the further study should employ TPACK framework into professional development program and investigate instructional practices as it should be regulated in professional standards. Pre-service teacher learning management competencies should be studied during the semester period. The implementation can start by the first semester for well-prepared in learning management opportunity. They are able to design their lesson in order to provide a learner-centered learning based on the course assigned to them.

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