

DEVELOPING GUIDELINES OF LEARNING MANAGEMENT COMPETENCIES FOR SCIENCE TEACHERS IN SECONDARY SCHOOL

Sathaporn Pinthong
Narong Pimsarn
Sawien Jenkwao

ABSTRACT

This study is a mixed methods research. The purposes of this research were 1) to study components of learning management competencies for science teachers in secondary school; 2) to investigate problem of learning management competencies for science teachers in secondary school; and 3) to analyze and synthesize guidelines for developing the learning management competencies for science teachers in secondary school. The samples were 150 persons consist of 50 school directors, 50 deputy directors, academic affairs and 50 head of the science department in secondary school from the office of private education in Bangkok, Thailand. The data collecting instruments were questionnaire and interview form. The data was analyzed by using arithmetic mean (\bar{x}), standard deviation (S.D.) and content analysis. The results found as follows: 1) the key components of learning management competencies for science teachers were 5 components: (i) science knowledge and integration in science, (ii) science curriculum management, (iii) science learning activity management, (iv) innovation management for learning in science, (v) measurement and evaluation in science; 2) problem of learning management competencies for science teachers in 5 overall was the high level; 3) guidelines for developing the learning management competencies for science teacher in secondary school were: workshop, mentor teacher system, teaching supervision, and self-assessment.

Keywords: Learning management competencies, science teachers.

INTRODUCTION

Learning science is one of the students' competencies nowadays. It arises from the teacher who is the director of learning and builds capacity for learners according to the goals of the curriculum. Science teachers as an important participant in the management of science teaching must have competency standards and competency-based learning objectives that are organized in order as a framework for teaching. Teachers must have clear goals that will help students develop what they can do. They must analyze and integrate the knowledge across sciences to develop students. The learners must acquire knowledge and practice using scientific knowledge in their work, as well as develop the scientific mind that should be required to do so in order to be successful at the specified level. Teachers must proactively manage learning so that learners can learn from thinking, doing, and implementing processes. Moreover, teachers must give them the feedback, improving, developing and being encouraged to apply the knowledge, skills and learned characteristics in a variety of situations to achieve the required level of scientific performance that each learner may take different time to learn.

In reality, the preparation of science teachers has not been as successful in practice as it should be. This is because teachers are still used to the old style of teaching (teacher centered) and misunderstanding of the new teaching methods that are suitable for learners nowadays (Malisorn & Ruengmontri 2020). For the era of the 21st century, it has a lot of new knowledge occurring rapidly, traditional teaching will not be able to develop students. Therefore, it may cause learners to become bored or have negative attitudes about studying science as well. On the other hand, researcher found that some teachers would like to change their teaching methods but still haven't found a good way to start when compared with the old teaching that is more specialized. To compare with the old content-based standards, teachers may find themselves but still unsure with a new teaching science method that will actually work with students.

The real reasons of the problem are the science curriculum is too difficult and too many, the time in the teaching session is not enough for effective learning management, teachers have little time to prepare for teaching with other tasks that assigned by the supervisor (Petchsuriya et al., 2020). Therefore, it is necessary to use a descriptive teaching method as the main. From the researcher's pilot study found that the system of supervision of science teaching within the school and outside is still a lack of specific characteristics of the development of science teaching and learning. The current supervision is still developing and giving suggestions as a whole. Therefore, it is unclear for teaching or organizing the learning process in science. In some schools, there is not enough media in the management of science learning such as a laboratory experimental equipment, chemicals, etc. The procurement budget is not approved or insufficient to make science teaching materials. As a result, the learning management performance of science teachers did not meet the goals set by the curriculum and reduce the effectiveness of science teaching.

From the importance and problems above, researcher needs to achieve a pathway to be a developing guideline of learning management competencies for science teachers in secondary school as a role model. Therefore, the learning management process of science teachers is one of the indexes to indicate the quality of learners. The Differences between teachers' teaching competency will directly affect the learning efficiency of the learners.

RESEARCH OBJECTIVES

1. To study components of learning management competencies for science teachers in secondary school.
2. To investigate problem of learning management competencies for science teachers in secondary school.
3. To analyze and synthesize guidelines for developing the learning management competencies for science teachers in secondary school.

RESEARCH QUESTIONS

1. What are the components of learning management competencies for science teachers in secondary school?
2. What are the problems of learning management competencies for science teachers in secondary school?
3. How should developing guidelines of learning management competencies for science teachers in secondary school?

CONCEPTUAL FRAMEWORK

The conceptual framework of this research was the followers:

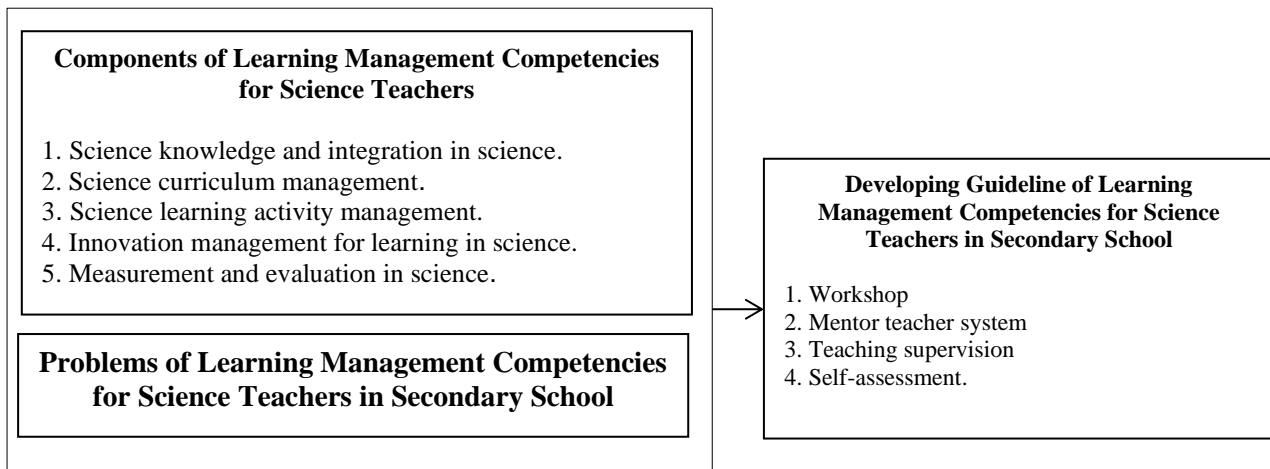


Figure 1: Conceptual framework

METHODOLOGY

The research methodology of this study was a mixed methods research (Convergent Parallel Mixed Methods). (Creswell, 2014)

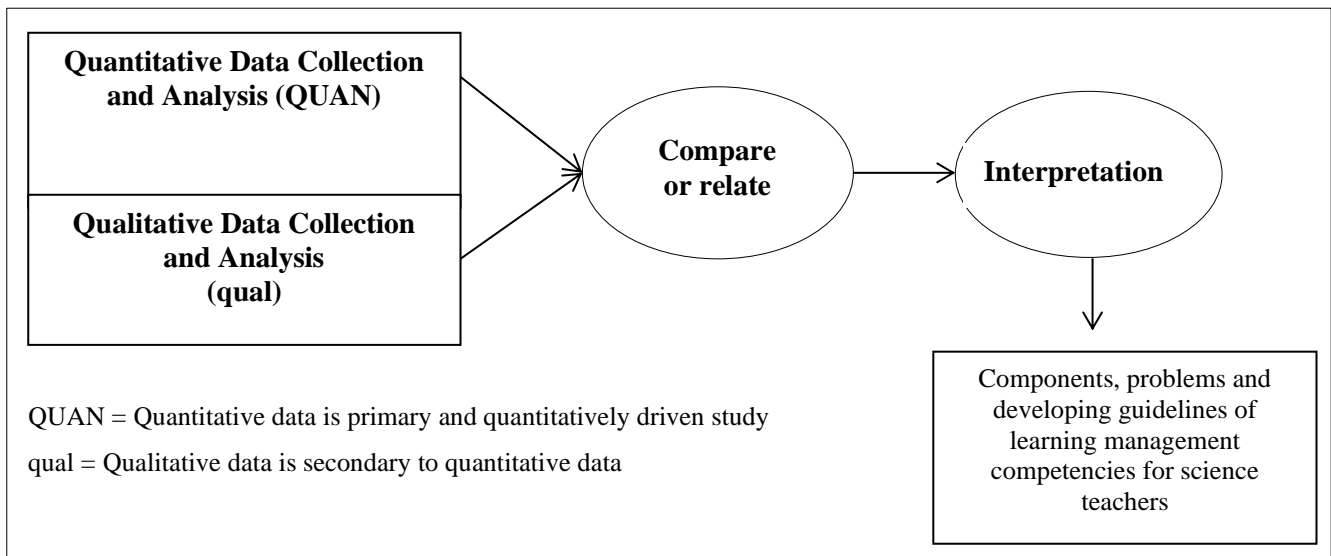


Figure 2: Methodology

The researchers study components of learning management competencies for science teachers in secondary school from documents and related research. Then investigate problem of learning management competencies for science teachers in secondary school by collecting the questionnaires and interview forms. Collection and analysis from questionnaires are quantitatively driven studies. In terms of collection and analysis from interview forms are secondary to quantitative data. Researchers interpreted both quantitative and qualitative data to analyze and synthesize developing guidelines of learning management competencies for science teachers in secondary school.

POPULATION AND SAMPLES

A population of this research was 240 persons. The samples were 150 persons consist of 50 school directors, 50 deputy directors, academic affairs and 50 head of the science department in secondary school from the office of private education in Bangkok, Thailand (Krejcie & Morgan 1970).

VARIABLES

The variables of the research were as follows:

1. Components of learning management competencies
2. Problem of learning management competencies
3. Developing guidelines learning management competencies

RESEARCH INSTRUMENTS

There were two data collection:

1. Questionnaire: Components of learning management competencies and their problems
2. Interview form: Problems and developing guidelines of learning management competencies

DATA COLLECTION

For data collection by using a questionnaire and interview form, there were steps as follows:

1. Asked the Graduate School of North Bangkok University to prepare a letter of permission for data collecting.
2. Sent the letter of permission for data collecting to the school of the samples.
3. Collected the data from the samples.

DATA ANALYSIS

For data analysis can be divided into 2 parts as follows:

1. Questionnaire Data Analysis

The researchers collected the data from questionnaire were analyzed by using arithmetic Mean (\bar{x}), standard deviation (S.D.). In terms of questionnaires, the researchers analyze the data base on five Likert scales as shown:

Table 1: Rating levels and Criteria for interpretation base on five Likert scales

Rating levels	Criteria for interpretation
5 = Very high	4.51 – 5.00 = Very high
4 = High	3.51 – 4.50 = High
3 = Moderate	2.51 – 3.50 = Moderate
2 = Low	1.51 – 2.50 = Low
1 = Very low	1.00 – 1.50 = Very low

2. Qualitative Data Analysis

The researchers collected the data from interview forms were analyzed by content analysis.

From the quantitative and qualitative data analysis above, the researchers used analyze problem of learning management competencies for science teachers in secondary school. After that interpreted both quantitative and qualitative data to analyze and synthesis developing guidelines of learning management competencies for science teachers in secondary school.

LITERATURE REVIEW

Research titled “Components and developing guideline of learning management competencies for science teachers in secondary school”, the researchers presented the literature review of this study into two parts: 1) Components of learning management competencies for science teachers in secondary school. 2) Developing guideline of learning management competencies for science teachers in secondary school.

1. Components of learning management competencies for science teachers in secondary school

The development of teaching profession in the new era under the strategy of educational reform in any subject, there is an important indicator of development that is Competencies - Based Development and in the development of teaching profession have basic competencies that are necessary for the performance of work, especially in learning with an emphasis on learners (Student Centered Learning). In the past, under the education reform, Thailand has conducted research studies by Queensland University of Technology, Australia (QUT, 2002). It found that Thai teachers need to develop professional competence in various fields related to knowledge that is Types of New Knowledge which is a new model that will affect the success of learning. The Institute for the Promotion of Teaching Science and Technology (IPST, 2016) has mentioned the knowledge in learning management of science teachers that Science teachers must have a strong body of science and help learners to develop their knowledge and skills according to the indicators which must have knowledge understanding of the goals of learning science and technology. In addition, IPST (IPST, 2010) found about science curricula management that teachers must analyze, formulate, use, assess and develop curricula to be able to develop into an institution's curriculum and must prepare a lesson plan and put it into suitable practice with learners. A lesson plan could focus on the development of learners according to their aptitudes and interests to have intelligence innovative and happy to learn.

In case of Science learning activity management, The National Science Teachers Association (NSTA, USA) found that learning environment is effective teachers of science are able to plan for engaging all students in science learning by identifying appropriate learning goals that are consistent with knowledge of how students learn science and are aligned with standards. These Plans reflect the selection of phenomena appropriate to the social context of the classroom and community, and safety considerations, to engage students in the nature of science and science and engineering practices (NSTA, 2020). OBEC (2010) found that teachers must allow learners to participate in the design of learning management. They should have activities pattern in variety of teaching methods and techniques to enable learners develop in to their full potential. Teachers must organize learning activities that promote desirable characteristics and competences of learners. Psychology is used in learning management for learners to learn happily.

Besides curriculum and design of learning, teachers need to choose innovations for learning management. Teachers must use digital technology to manage their learning. OBEC (2010) found that teachers must use information technology for communication and apply or develop media for learners' learning. It could raise the learners to be innovators and teachers can create innovations and apply them to benefit of learning for students. In measurement and evaluation in science, IPST found that teachers must be assessed to improve learning. Use the authentic assessment methods and apply the assessment results to confirm the continual development of learners' learning, intellectually, socially, and physically (IPST, 2010).

2. Developing guideline of learning management competencies for science teachers in secondary school

Developing science teachers to be a teacher with the highest potential is important that must be taken seriously and continually through practice. There are many ways to be a professional teacher:

1. Workshop: Educational institutions or related organizations should provide support for teachers in educational institutions to be developed by organizing the curriculum and practical training. So that teachers can gain knowledge and be able to practice and apply them in teaching lesson plans effectively (Noppakhun, 2018).

2. Mentor teacher system: The mentoring process depends on the potential of the mentor. Therefore, the mentor system must focus on finding potential and should provide opportunities for exchanging knowledge and experiences. In addition, the mentor system will exchange experiences with each other, talk about problems, operational barriers and how to solve all the problems. It also builds relationships between mentors and science teachers in order to jointly plan the development of work periodically as well (Chanprasert, 2018).

3. Teaching supervision: Teaching supervision is a teacher development process for teachers to improve and develop the learning process at the same time. This process can help teachers to be competent and able to organize learning activities effectively to achieve educational management goals (Phujeeb, 2016).

4. Self-assessment: This is a long-term personal development and wants people to learn and develop themselves (Self-learning). It also gives the teachers' opportunity to prepare and develop their own potential in the areas that they need before taking other training methods. When teachers are empowering themselves, this will result in increasing the potential or learning capacity of the team as well (Prasertpon, 2013).

RESULTS

The research result were:

1. Components of learning management competencies for science teachers in secondary school

The researchers studied Components of learning management competencies for science teachers in secondary school from documents and related research. Then, did the content analysis of the components as the table below:

Table 2: Components of learning management competencies for science teachers in secondary school

Components of learning management competencies	Consistency										Total (10)	Percentage
	OBEC.(2010).	DFE.(2013).	IPST.(2010).	ASTE.(2020).	IPST.(2017).	Maotuek.S.(2015).	Jindanurak,T.(2016).	Malisorn, Y.,Reuengmontri,K. (2020)	Nouri. (2021)	Copriady. (2014)		
1. Science knowledge and integration in science.	✓	✓	✓	✓	✓	✓	✓		✓		8	80
2. Science curriculum management.	✓	✓	✓	✓	✓	✓		✓	✓	✓	9	90
3. Science learning activity management.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	10	100
4. Innovation management for learning in science.	✓				✓		✓	✓		✓	5	50
5. Measurement and evaluation in science.	✓	✓	✓	✓	✓	✓		✓	✓	✓	9	90

From the table above found that the key components of learning management competencies for science teachers were 5 components: (i) science knowledge and integration in science, (ii) science curriculum management, (iii) science learning activity management, (iv) innovation management for learning in science, (v) measurement and evaluation in science.

2. Problem of learning management competencies for science teachers

2.1 Results of quantitative research

Table 3: Problems of learning management competencies for science teachers in secondary school

Problems of learning management competencies	\bar{x}	S.D.	Level
1. Science knowledge and integration in science	4.32	.28	High
2. Science curriculum management	4.48	.43	High
3. Science learning activity management	4.45	.36	High
4. Innovation management for learning in science	4.45	.36	High
5. Measurement and evaluation in science	4.56	.51	Very high
Overall	4.39	.31	High

From the table above found that the problems of learning management competencies for science teachers were rated at high level of 4.39 (overall). The study reported that the problems of learning management competencies for science teachers in the aspect of Measurement and evaluation in science was rated at the level of 4.56, in the aspect of Science curriculum management at the level of 4.48, in the aspect of Innovation management for learning in science and Science learning activity management was rated at the level of 4.45, and in the aspect of Science knowledge and integration in science at the level of 4.32, respectively.

2.2 Results of qualitative research

From the questionnaire about the problems of the learning management competencies for science teacher in secondary school should be as follow:

2.2.1 Science knowledge and integration in science

Thai science teachers need to develop professional competence in various fields related to knowledge, namely the Types of New Knowledge, which is a new model that will result in success. For continuation of learning in the new era, teachers must acquire new knowledge skills that will be used to organize the teaching and learning process and integrated together. They must have ability to classify a new knowledge and apply it appropriately for teaching and learning. Including action research, which teachers must have the competence of being a researcher. This will lead to the development of both teachers and students to be effective in the short and long term.

2.2.2 Science curriculum management

Science teachers analyze curriculum only at the level they teach. It leads to lack of review the indicators that students have studied. Teachers are not good at designing science learning activities through lesson plans.

2.2.3 Science learning activity management

Organizing of learning activities for learners to practice through the quest for knowledge (Inquiry) and in accordance with the nature of science is not as good as it should. Science teachers also choose inappropriate learning management strategies. This should be a way to allow students to think, explore and use contemporary technology through fun learning.

2.2.4 Innovation management for learning in science

Science teachers have lower-level skill of competency in information technology (ICT Competency). The teacher must increase teaching competency by using information technology media as a base in the learning process (ICT-based Learning) in order to develop teaching and learning which is the foundation of technological innovation development.

2.2.5 Measurement and evaluation in science

Teachers still lack various forms of measurement and evaluation. Therefore, measurement and evaluation are not appropriate. Teachers tend to be used to evaluating with paper-exams only. In addition, the system of supervision to help learners is not as good as it should be. This system must be in teacher skills as supervision, follow-up and assistance to learners after measurement and evaluation occurred. This system can build a good relationship between teachers and students, as facilitators to students in teaching and learning.

3. Developing guidelines of learning management competencies

3.1 Results of quantitative research

Table 4: Developing guidelines of learning management competencies for science teachers in secondary school

Developing guidelines of learning management competencies	Frequency	percentage
1. Workshop	8	89
2. Mentor teacher system	9	100
3. Teaching supervision	7	78
4. Self-assessment	8	89

From the table above found that the developing guidelines of learning management competencies for science teachers were important at high percentage. The study reported that the developing guidelines of learning management competencies for science teachers in the aspect of mentor teacher system was rated at the level of 100% , in the aspect of workshop and self-assessment was rated at the level of 89%, and teaching supervision was rated at the level of 78%, respectively.

3.2 Results of qualitative research

From the interview about the developing guidelines of the learning management competencies for science teacher in secondary school should be as follow:

3.2.1 Workshop

Development of learning management competencies of science teachers with workshop is a short-term development of science teachers. Educational institutions must focus on the development of science teachers to gain knowledge and apply it to their own classes after workshop. In addition, the training must consist of a variety of activities to have a responsive atmosphere and support each other.

3.2.2 Mentor teacher system

This system can be used to develop learning management competencies of science teachers effectively, in addition to the development of teachers in the long term. It also develops effective team relationships because caring for each other must be communicated and trust in working with each other.

3.3.3 Teaching supervision

Development of learning management competencies of science teachers with teaching supervision can help science teachers develop a systematic and continuous learning management in order to allow teachers to improve teaching and solve problems that science teachers face student attack alone in learning management. It also creates a strong academic system within the school.

3.3.4 Self-assessment.

This system can be used to develop learning management competencies of good science teachers in the long term. This allows teachers to self-assess before and after taking other training methods. It is also a test of self-readiness to go beyond the next level of self-improvement.

DISCUSSION

The results of this research found as follows:

1. The key components of learning management competencies for science teachers were 5 components: (i) science knowledge and integration in science, (ii) science curriculum management, (iii) science learning activity management, (iv) innovation management for learning in science, (v) measurement and evaluation in science. The all of these components are a part of competencies that teachers must be when science teacher face student attack alone to manage the science classroom. Unfortunately, the all components of science teacher were at risk when compared with the other country by PISA-ranking which in 66 from 79 countries (IPST, 2019). This result can reflect that one of the reasons of the problem is low learning management competencies of science teacher.

2. Problems of learning management competencies for science teachers in 5 overall components were at the high level. After surveying, the researchers found that Thai science teacher did not have enough time to manage the efficiency teaching. The overload of students in the classroom, the quality performance assessment with papers and the other duties from the director may be lead to the low-performance of learning management competencies for science teachers. As Petchsuriya, P. et al. (2020) points out that the problems of teachers have are different levels of students in class, teaching loads, and also have other responsibilities in school.

3. Guidelines for developing the learning management competencies for science teacher in secondary school were: workshop, mentor teacher system, teaching supervision, and self-assessment. The development of learning management competencies of science teachers has specific characteristics. It needs teachers who have specialized training and have been trained in the teaching profession and become high-quality science teachers. This ensures that students have a quality study and work experience in science. As Arsingsamanan, W. et al. (2020) points out that if the teacher has been developed appropriately, it will result in teachers having a systematic planning process, knowledge, skills, ideas, attitudes, and ability to perform well and effectively. They also have a sense of responsibility to perform their duties for better results as the educational institutions need to success with their goals.

RECOMMENDATIONS

For this research, the researchers present useful recommendations to instructions and other researchers as follows:

1. Recommendations for research implementations

1.1 School directors should provide an agreement between the teachers to perform a developing guideline before taking a pathway.

1.2 While doing the activities, the teachers might be separated into a mix ability grouping to comprehend a whole range of scientific knowledge. For example, the “chemistry workshop” the chemistry teacher should be participated in each group.

2. Recommendations for further research

2.1 In-depth exploration, the researchers should provide a sample which in other level of education such as the upper primary school or the lower secondary school.

2.2 Researchers should study the competencies in quality schools that are highly equipped for learning management such as demonstration school or science high-school.

CONCLUSION

Learning science is one of the students' competencies nowadays. It arises from the teacher who is the director of learning and builds capacity for learners according to the goals of the curriculum. Science teachers as an important participant in the management of science teaching must have competency standards and competency-based learning objectives that are organized in order as a framework for teaching. The components of learning management competencies for science teachers were found in 5 components that could help the science teacher to be successful in learning management: (i) science knowledge and integration in science, (ii) science curriculum management, (iii) science learning activity management, (iv) innovation management for learning in science, (v) measurement and evaluation in science. The problems of learning management competencies for science teacher were at high level of 4.39 (overall). The study reported that the problems of learning management competencies for science teachers in the aspect of Measurement and evaluation in science was rated at the level of 4.56, in the aspect of Science curriculum management at the level of 4.48, in the aspect of Innovation management for learning in science and Science learning activity management was rated at the level of 4.45, respectively. The solving of the problem in learning management competencies for science teacher may parallel with the guidelines development of learning management competencies of science teachers such as workshop, mentor teacher system, teaching supervision, and self-assessment.

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Sathaporn Pinthong
Graduate School
North Bangkok University, 10220 Bangkok, Thailand
Email: sathaporn.pint@northbkk.ac.th

Narong Pimsarn
Graduate School
North Bangkok University, 10220 Bangkok, Thailand

Sawien Jenkwao
Educational Innovation College
Saint John's University, 10900 Bangkok, Thailand
Email: sjenkwao@gmail.com