Developing Professional Ethics for Teachers by Using Community Processes of Professional Learning Through Information Technology Systems for Students Practicing Professional Teaching Experience in Bachelor of Education Program in Early Childhood Education at Chiang Mai Rajabhat University, the Office of the Private Education Commission

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Abstract

The objectives of this research were: 1) to investigate the current conditions and problems related to a teacher's professional code of ethics of teachers; 2) to analyze factors supporting the success in developing a teacher's professional code of ethics; 3) to develop professional learning community processes in developing teacher's professional code of ethics through information technology systems for pre-service teachers; and 4) to propose guidelines for developing a teacher professional code of ethics by using professional learning community processes through information technology systems for pre-service teachers in the early childhood education program at Chiang Mai Rajabhat University, the Office of the Private Education Commission. The instruments used in this research were an in-depth interview form, a meeting record form, and an evaluation form. Data were analyzed by content analysis, classifying them into issues, mean and standard deviation, and summarizing into categories. Results of the research found as follows: 1) Results of investigating the current conditions and problems related to a teacher's professional code of ethics consisted of five aspects. 2) Results of analyzing factors supporting the success in developing teacher professional ethics consisted of six aspects. 3) Results of developing professional learning community processes in developing teacher professional code of ethics through information technology systems of pre-service teachers in the early childhood education program at Chiang Mai Rajabhat University, the Office of the Private Education Commission consisted of nine components. The benefit and feasibility were at the highest level. 4) Results of proposing the guidelines for developing the professional code of ethics by using professional learning community through information technology systems of pre-service teachers in the early childhood education program at Chiang Mai Rajabhat University, the Office of the Private Education Commission consisted of nine items.

Keywords: Teacher professional code of ethics, Professional learning community, Information technology systems, Pre-service teachers, Early childhood education

Introduction

According to the royal speech of HRH Princess Maha Chakri Sirindhorn at the graduation ceremony for graduates from the Teachers College at the new building, Suan Amporn, on Wednesday, May 18, 1983

".....The teacher's profession is significantly important because teachers play an important role in developing the country to be prosperous and stable, and before developing the country to prosper, the people must be developed, including the youth of the nation, so that the young people will grow up to be adults with complete values in all aspects, so they can help build prosperity for the nation. can go on......" It is confirmed that the importance of teachers to the prosperity of individuals and nations is very great. The nation will prosper because the people of the nation receive a good education. and have quality teachers.

Royal Government Gazette (2013, p.73-74), the professional code of ethics referred to the standards of conduct that were set up as a pattern in one's performance which educational professional practitioners must comply with to maintain and promote the honor reputation and status of educational profession to build trust and faith among service recipients and society, which will bring honor and dignity of the profession in terms of professional ethics, personal ethics, professional ethics, client-centered ethics, collegial ethics, and societal ethics. Similarly, Yamkasikorn et al. (2021, p.3) stated that teachers and educational personnel were persons who played roles as good role models for students and were important factors affecting the quality of student learning. In addition, teachers and educational personnel are "models" that society sees and praises for having higher ethical standards than the general public. As a result, the teaching profession is a profession that Thai society accepts and respects as being honored and a thought leader in the community. The teachers who stayed consequently must deal with longer hours, bigger classrooms, and occasionally new, mixed-age learning situations.

Metapanya (2019, p.70) studied the paradigm of a professional learning community for creating learning management to encourage students' capacity for analytical thought. The research revealed that three elements made up the professional learning community model in the development of learning management that supported analytical thinking ability: principles, methods, and evaluation. It was discovered that the quality of instructors' learning management was higher after utilizing the model than it was before. Students' analytical thinking abilities after studying were higher than before, and teachers' comprehension of the process and teaching methods that encouraged it was improved in addicts. They also enjoyed learning.

A process is a series of choices and deeds used to complete tasks. Although the collaborative team might not be aware of them, processes exist in both work and leisure activities. The term "professional learning community," or PLC, refers to a group of educators who routinely work together, exchange knowledge, and convene in order to improve both their own teaching practices and the academic achievement of their students. The expression is widely used to characterize educational institutions or schools that foster professional development through close collaboration in small groups. The PLC's components include action orientation, continuous improvement, outcomes orientation, collaborative teams, group inquiry, and student learning and experiences.

In addition, currently, effective teacher development methods using the Professional Learning Community (PLC) as tools for development are a combination of the concepts of the professional and learning community together to develop professional competency and quality of learners through a collaborative learning process, lessons learned, and sharing learning continuously affecting the quality of the learners (Wongyai & Pattaphol, 2019, p.11–13).

Moreover, Kaeowiset (2023, p.206-207) studied the use of the KWL plus technique to integrate community-based technology transfer for the acceleration of sustainable community enterprises. The transfer of technology, wisdom, and innovation places an emphasis on the thinking process and links between old and new experiences. Using challenging questions along with actual experience, practicing the preparation of Krayasart desserts with knowledgeable speakers to impart knowledge and understanding, the transfer of technology and its use for self-development in learning as well as promoting knowledge. It also helps to build stronger communities by utilizing learning processes that support the sustainable transmission of this knowledge

Furthermore, Reungsri, et al. (2019, p.72) mentioned pre-service teachers and educational management in multicultural schools that were aware of the need to employ instructional approaches in order to accommodate a variety of learners and stay current with knowledge and events. The interest of students will be stimulated by this. The condition of the learning process in multicultural schools with regard to different learner abilities and cultures influences the learning outcome, an increasing rate of teacher burnout is one of the major issues facing early childhood education and it is crucial to develop curricula and teaching strategies that are capable of assisting students in learning as per their abilities and culture in order to achieve better study outcomes.

Accordingly, Early Childhood Education Teachers Union in Finland (2020, p.10) stated that early childhood education teachers focus on observing and considering children's development, allowing them to influence matters. They plan, evaluate, and plan work considering individual needs to ensure children practice social skills in a safe environment, with teachers supporting their inclusion in the group and community.

In terms of Office of Private Education Commission, was administrated t to encourage and support academic aid, quality control, research and development for private education quality control, and managing and supervising the formal school's faculty, staff, and students. All teachers must be developed in every sector; therefore, it is essential for teachers to be developed the quality because private schools are a higher expectation of parents to help take care of their children to study, develop to their full potential, and be able to pass the entrance exams to satisfaction educational institutions.

Furthermore, the third strategy of The National Scheme of Education B.E. 2560-2579 (2017–2026) (Office of the Education Council, 2017, p. j) stated that the training and hiring of teachers and other educational staff to meet international standards was necessary for the development of proficiency for individuals of all ages and the promotion of a lifelong learning society. The main indicators added a database that showed the requirement for teachers, a 10-year plan for the training and recruitment of educational staff (2017–2027) that was fallen apart by academic majors, school size, and educational service areas, an increase in the proportion of teachers who had been educated and hired through the closed application process, and the qualifications and requirements that permission the graduated students from other majors to compete for available teaching positions. Besides, teachers and educational personnel had received standard competency training, so the primary signal was that all educational-level lecturers, teachers, and education officials had completed the necessary training in accordance with professional standards and were qualified to carry out their duties in a way that supported the goals and objectives of the institutions. Increased teacher, lecturer, and education officer satisfaction with training and its advantages were also necessary.

However, there should be a seminar on the evaluation of the teacher production system in Thailand according to the master plan under the national strategy on the issue of learning development and the learning process reform subplot responding to changes in the 21st century, indicators have been set in terms of the proportion of teachers through individual competency tests based on a high-level according to international standards. Moreover, the education

reform plan has set the issue of reforming the mechanism and production system, screening and developing professional teachers and instructors, and obtaining quality teachers that met the needs of the country and have the spirit of being teachers. Therefore, teacher education institutions that have courses that focus on the competencies of the teaching profession, had faith in the profession, and have true competence are consistent with the national education plan 2017–2036 that determined strategies for developing the potential of people of all ages and creating a learning society.

The current situations that are mostly ethical problems are the lack of technological equality, the unequal teaching opportunities through technology, and the inability to provide classroom management. Ethical dilemmas are mostly due to the difficulty of teachers in adapting to education and the inability to communicate with students, and mostly the inefficiency of preschool education. Moreover, there is a shortage of qualified and experienced teachers. Retention of quality teachers is a major concern in education systems. As a faculty lecturer at the early childhood education program at Chiang Mai Rajabhat University, I realize the importance of producing the teachers' essential competencies for teachers and developing teacher professional ethics for pre-service teachers by using a professional learning community through information technology systems as guidelines for relevant agencies.

Research Objectives

1. To investigate the current conditions and problems related to a teacher's professional code of ethics by using a professional learning community through information technology systems of teachers at the early childhood education level under the Office of Private Education Commission. An instrument used was an in-depth interview form. Data were analyzed by content analysis and summarizing empirical data.

2. To analyze the factors supporting success in developing a teacher professional code of ethics by using a professional learning community through information technology systems of teachers in the early childhood education level under the Office of Private Education Commission. The instrument used in this research was. The data were analyzed through content analysis.

3. To develop the professional learning community processes for teacher professional code of ethics through information technology systems for pre-service teachers in the early childhood education program at Chiang Mai Rajabhat University, the Office of the Private Education Commission is divided into two steps as follows:

3.1 To construct a model for developing teacher professional ethics for pre-service teachers. The instrument used was a draft model. Data were analyzed by classifying them into issues.

3.2 To evaluate the benefit and feasibility of a model for developing teacher professional code of ethics for pre-service teachers. The instrument used was an evaluation form. Data were analyzed by mean and standard deviation.

4. To propose the guidelines for developing teacher professional ethics by using a professional learning community through information technology systems for pre-service teachers in the early childhood education program at Chiang Mai Rajabhat University, the Office of the Private Education Commission. The instrument used was a meeting record form during brainstorming. Data were analyzed by summarizing into categories.

Methodology

This research was divided into four phases as follows:

Phase 1: The investigation of the current conditions and problems related to a teacher's professional code of ethics by using the professional learning community through information technology systems of teachers at the early childhood education level under the Office of Private Education Commission. Key informants selected by purposive sampling consisted of administrators in schools that provided the early childhood education level under the Office of Chiang Mai Private Education Commission, for a total of eleven informants. The instrument used for data collection was an in-depth interview using face-to-face interviews at the interviewee's school and interviews via the Zoom meeting program or Google Meetings. The data were analyzed using content analysis and summarizing empirical data.

Phase 2: The analysis of factors supporting success in developing teacher professional code of ethics by using the professional learning community through information technology systems of teachers in the early childhood education level under the Office of Private Education Commission. Key informants selected by purposive sampling consisted of teachers teaching at the early childhood education level under the Office of Chiang Mai Private Education Commission, for a total of eleven informants. The instrument used for data collection was a meeting recording and conducting a workshop via the Zoom meeting program. The data were analyzed through content analysis.

Phase 3: The development of professional learning community processes in developing teacher professional code of ethics through information technology systems for pre-service teachers in the early childhood education program at Chiang Mai Rajabhat University, the Office of the Private Education Commission. This phase is divided into two steps as follows:

Step 3.1 To construct professional learning community processes in developing teacher professional code of ethics through information technology systems for pre-service teachers in the early childhood education program. Key informants consisted of buddy teachers, mentors, external experts or senior educators or faculty supervisors, school administrators/deputy school administrators, and senior teachers or a head of academic affairs or a head of the class level, for a total of seven participants. The instrument used was a draft model. Data were analyzed by classifying them into issues.

Step 3.2 The evaluation of the benefit and feasibility of five components for developing professional learning community processes in developing teacher professional code of ethics. Key informants selected by purposive sampling consisted of school administrators who provided the early childhood education level, teachers teaching at the early childhood education level, and supervisors in charge with the early childhood education level, for a total of eleven informants. The instrument used was an evaluation form. The data were analyzed using mean and standard deviation.

Phase 4: The guidelines were proposed for developing professional learning community processes in developing teacher professional code of ethics through information technology systems for pre-service teachers in the early childhood education program at Chiang Mai Rajabhat University, the Office of the Private Education Commission. Key informants selected by purposive sampling consisted of school administrators provided at the early childhood education level, teachers teaching at the early childhood education level, and supervisors in charge at the early childhood education level, for a total of thirteen informants. The instrument used for data collection was a meeting recording form that was conducted during brainstorming via the Zoom meeting program. The data were analyzed by summarizing into categories.

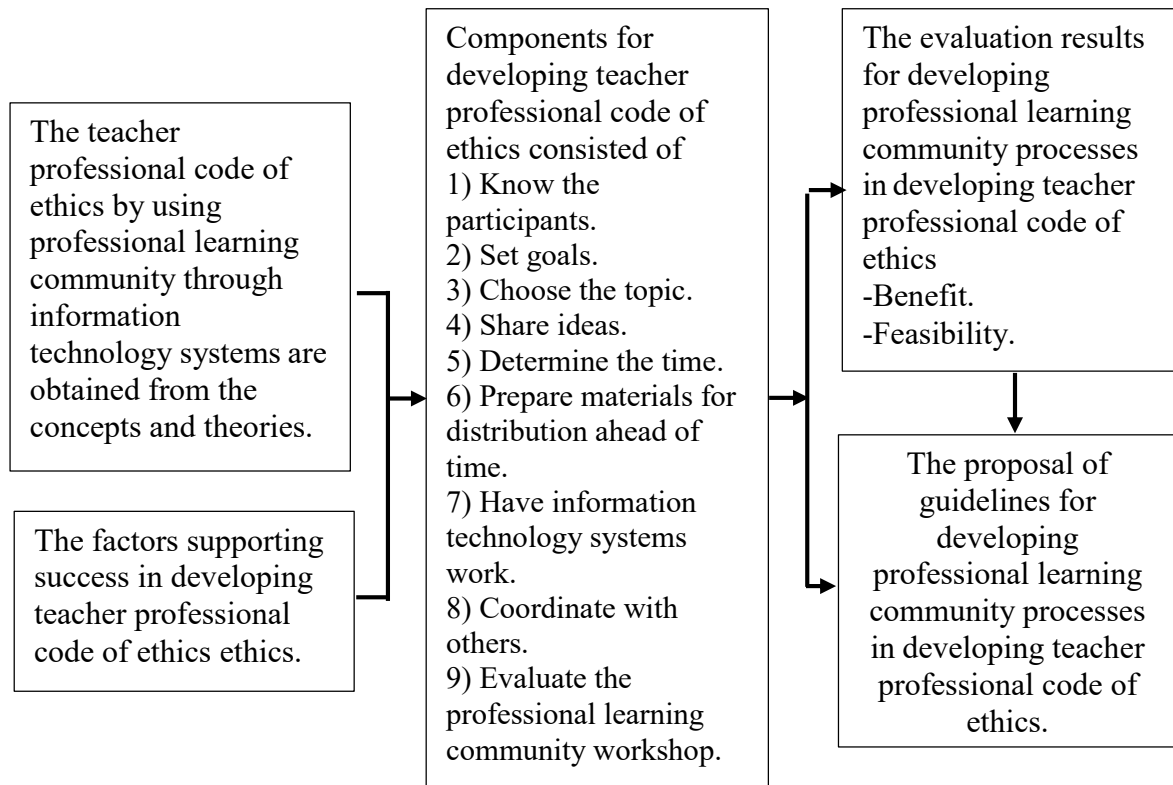The research framework was shown in Figure 1.

Research framework

The teacher professional code of ethics by using professional learning community through information technology systems are obtained from the concepts and theories.

The factors supporting success in developing teacher professional code of ethics ethics.

Components for developing teacher professional code of ethics consisted of
1) Know the participants.
2) Set goals.
3) Choose the topic.
4) Share ideas.
5) Determine the time.
6) Prepare materials for distribution ahead of time.
7) Have information technology systems work.
8) Coordinate with others.
9) Evaluate the professional learning community workshop.

The evaluation results for developing professional learning community processes in developing teacher professional code of ethics
-Benefit.
-Feasibility.

The proposal of guidelines for developing professional learning community processes in developing teacher professional code of ethics.

Figure 1 Research framework

Results

Results of investigating the current conditions and problems related to a teacher's professional code of ethics by using a professional learning community through information technology systems of teachers in the early childhood education level under the Office of Private Education Commission from an in-depth interview comprised of five aspects as follows: 1. Professional ethics: Teachers do not study for knowledge, do not plan for self-improvement or teaching development, and do not regularly collect personal portfolios. 2. Professional ethics: Teachers are not responsible for their assignments and for being good teachers. 3. Client-centered ethics: Teachers do not encourage learners to learn and practice skills in various areas, and all teachers do not perform to their full potential equally. 4. Collegial ethics: Teachers do not try to get students to work together to achieve unity among faculties. And 5. Societal ethics: Teachers do not adhere to support and promote the regime of the democratic system with the King as Head of State.

Results of analyzing factors supporting the success in developing teacher professional code of ethics by using professional learning community through information technology systems of teachers in the early childhood education level under the Office of Private Education Commission comprised of six aspects: 1) teachers must be well prepared in teaching and having a strong commitment to teaching; 2) students and parents must collaborate attending to online and onsite learning; 3) learning management activities must be suitable for the early childhood education level; 4) evaluation criteria covers the authentic evaluation; 5) learning media are

adapted with the real situation; and 6) exercises and worksheets must be different depending on the individual ability.

Results of developing professional learning community processes in developing teacher professional code of ethics through information technology systems for pre-service teachers in the early childhood education program at Chiang Mai Rajabhat University, the Office of the Private Education Commission, the details were as follows:

Results of constructing professional learning community processes in developing teacher professional code of ethics through information technology systems for pre-service teachers in the early childhood education program consisting of nine processes consisted of knowing the participants, setting goals, choosing the topic, sharing ideas, determining the time, preparing materials, classroom management techniques, lesson plans, learning media productions, and crip videos; having information technology systems for the Microsoft team, coordinate with others, and evaluating the professional learning community workshop.

The evaluation results of developing professional learning community processes in developing teacher professional code of ethics from eleven informants as shown in Table 1.

Table 1 The evaluation results of developing professional learning community processes in developing teacher professional code of ethics in terms of benefit and feasibility.

Components of a model for developing professional learning community processes.	Benefit			Feasibility		
	$\bar{\mathbf{x}}$	S.D.	Interpret	$\bar{\mathbf{x}}$	S.D.	Interpret
1. Know the participants.	4.59	0.42	Highest	4.57	0.43	Highest
2. Set goals.	4.57	0.23	Highest	4.63	0.32	Highest
3. Choose the topic.	4.63	0.61	Highest	4.78	0.51	Highest
4. Share ideas	4.78	0.51	Highest	4.53	0.43	Highest
5. Determine the time.	4.53	0.46	Highest	4.59	0.23	Highest
6. Prepare materials, classroom management techniques, lesson plans, learning media productions, and crip videos.	4.59	0.53	Highest	4.63	0.53	Highest
7. Have information technology systems for the Microsoft team	4.63	0.47	Highest	4.51	0.53	Highest
8. Coordinate with others.	4.51	0.47	Highest	4.59	0.42	Highest
9. Evaluate the professional learning community workshop.	4.59	0.42	Highest	4.51	0.53	Highest
Average	**4.60**	**0.46**	**Highest**	**4.59**	**0.44**	**~~Highest~~**

The evaluation results of developing professional learning community processes in developing teacher professional code of ethics in terms of both benefit and feasibility were at the highest level.

Results of proposing guidelines for developing a teacher professional code of ethics by using a professional learning community through information technology systems for pre-service teachers in the early childhood education program at Chiang Mai Rajabhat University, the Office of the Private Education Commission consisted of

1. The Teachers Council of Thailand and relevant agencies related to the professional code of ethics should organize the development through training in a variety of channels, including both onsite and online lessons, for administrators, teachers, and pre-service teachers by setting up an appropriate time and duration of the training conducive to them having the opportunity to be trained for enhancing knowledge, reviewing, revising, understanding, and raising awareness of teacher professional ethics.

2. The faculty of education of all Rajabhat Universities should have the same policy in promoting the development of a professional code of ethics for pre-service teachers in the early childhood education program in terms of knowledge and practical proposals to cope with changing situations.

3. The office of the Private Education Commission should have the same policy in developing a professional code of ethics for pre-service teachers in the early childhood education program to be able to provide quality teaching and learning according to early childhood education standards.

4. The professional learning community processes should be provided in the workshops to enhance the professional code of ethics by conducting guidelines for pre-service teachers in the early childhood education program consisting of 1) building a team, 2) studying and developing together leading to raising awareness, 3) reflection to develop the professional code of ethics for pre-service teachers in the early childhood education program, 4) collaborative evaluation, and 5) building a development network according to the royal initiatives of His Majesty King Bhumibol Adulyadej, such as geosocial, explosion from inside, participation, common interest, holistic, hierarchical, non-textbook, and economical and simple get the most.

4. A platform through information technology systems of professional code of ethics where the pre-service teachers in the early childhood education program should be ready and easy to access both self-improvements online and provide dashboard discussion with specialists and experts actively.

5. The collaboration among mentors, external experts, senior educators, faculty supervisors, school administrators, deputy school administrators, senior teachers, a head of academic affairs, or a head of the class level should play appropriate roles to promote and enhance the professional code of ethics for pre-service teachers in the early childhood education program.

Discussions

Results of investigating the current conditions and problems related to a teacher's professional code of ethics by using a professional learning community through information technology systems of teachers in the early childhood education level under the Office of Private Education Commission from an in-depth interview comprised of five aspects as follows: 1. Professional ethics, 2. Professional ethics, 3. Client-centered ethics, 4. Collegial ethics, and 5. Societal ethics. Similarly, Royal Government Gazette (2013, p.73-74), the professional code of ethics in terms of professional ethics, personal ethics by having self-discipline and self-improvement against professional personality and vision; professional ethics by taking responsibility for a professional organization; client-centered ethics by loving kindness, caring, helping, encouraging, and encouraging students; collegial ethics by helping one another creatively; and societal ethics in behaving as a good leader.

Results of analyzing factors supporting the success in developing teacher professional code of ethics by using professional learning community through information technology systems of teachers in the early childhood education level under the Office of Private Education

Commission comprised of six aspects: 1) teachers must be well prepared in teaching and having a strong commitment to teaching; 2) students and parents must collaborate attending to online and onsite learning; 3) learning management activities must be suitable for the early childhood education level; 4) evaluation criteria covers the authentic evaluation; 5) learning media are adapted with the real situation; and 6) exercises and worksheets must be different depending on the individual ability. It was consistent with Sanguanngarm (2020, p.2), who studied variables that contribute to Thai education's failure to adequately prepare Thai students with twenty-first-century skills, the results showed that the key skills stated in the core curriculum for primary Thai education were efficient and met requirements for education in the twenty-first century. The belief among principals and teachers that students were dependent learners and the idea that innovative teaching methods were closely linked to the desired learners' key competencies were all unsupported by evidence. Neither did the lack of understanding among teachers and principals regarding the expectations and goals of the curriculum, as well as innovative teaching methods and 21st-century education in general. It was intriguing because the findings showed a connection between the cultures and beliefs of the teachers and how they affected the way they taught.

Results of developing professional learning community processes in developing teacher professional code of ethics through information technology systems for pre-service teachers in the early childhood education program at Chiang Mai Rajabhat University, the Office of the Private Education Commission, the details were as follows:

Results of constructing professional learning community processes in developing teacher professional code of ethics through information technology systems for pre-service teachers in the early childhood education program consisting of nine processes consisted of knowing the participants, setting goals, choosing the topic, sharing ideas, determining the time, preparing materials, classroom management techniques, lesson plans, learning media productions, and crip videos; having information technology systems for the Microsoft team, coordinate with others, and evaluating the professional learning community workshop. Correspondingly, Wongyai & Pattaphol (2019, p.11–13) explained that effective teacher development methods using the Professional Learning Community (PLC) as tools for development were a combination of the concepts of the professional and learning community together to develop professional competency and quality of learners through a collaborative learning process, lessons learned, and sharing learning continuously affecting the learner quality.

The evaluation results of developing professional learning community processes in developing teacher professional code of ethics from eleven informants in terms of both benefit and feasibility were at the highest level.

As a result, Serviss (2022) explained the benefits of PLCs, which allowed teachers opportunities to develop instruction directly, strengthened the relationships among team teachers, assisted teachers in staying up with current research and classroom technology resources, and helped teachers consider their ideas.

Results of proposing guidelines for developing a teacher professional code of ethics by using a professional learning community through information technology systems for pre-service teachers in the early childhood education program at Chiang Mai Rajabhat University, the Office of the Private Education Commission consisted of the Teachers Council of Thailand and related agencies should organize training for administrators, teachers, and pre-service teachers to enhance knowledge, review, revise, and raise awareness of teacher professional ethics. Rajabhat University faculty should promote the development of a professional code of ethics for pre-service teachers in early childhood education programs, while the Private Education Commission should develop a code to provide quality teaching and learning. Professional learning community processes should be provided in workshops, focusing on

building a team, studying, and developing together, reflecting, collaborative evaluation, and building a development network. A platform through information technology systems should be available for pre-service teachers to access self-improvement online and engage in discussions with specialists and experts. Collaboration among mentors, external experts, senior educators, faculty supervisors, school administrators, and class heads should play appropriate roles in promoting and enhancing the professional code of ethics for pre-service teachers in early childhood education programs.

Accordingly, Satjapiboon (2019, p.118) studied the evaluation of the professional learning community in teacher professional ethics developing through the information technology systems (e-plc) and reported that the proposed policies were the creation of policies to help teacher candidates grow through a structured, ongoing professional learning community; to encourage the stakeholders to engage in community participation by fostering awareness and inspiration; to develop the essential framework for knowledge promotion; to assist in the development of a network of professional learning communities built on confidence, trust, and teamwork; to promote and train teachers to use the professional learning community in learner development, a structure, and network must be established; to create an organizational culture that supports educational institutions and fosters long-term collaboration in the growth of learners; and to promote the construction of a professional learning community by fostering the development of information technology systems.

In addition, the third strategy of The National Scheme of Education B.E. 2560-2579 (2017-2036) (Office of the Education Council, 2017, p. j) stated the proficiency development for people of all ages and the promotion of lifelong learning society that the training and recruitment of teachers and educational personnel must meet international standards. The teachers and educational personnel had received standard competency training determined the primary signal was that all educational level lecturers, teachers, and education officials had completed the necessary training in accordance with professional standards and were qualified to carry out their duties in a way that supported the goals and objectives of the institutions. Increased teacher, lecturer, and education officer satisfaction with training and its advantages were also necessary.

Furthermore, Sithsungnoen et al. (2020, p.15) indicated that the strengthening of an ethical professional learning community in terms of e-PLC in pre-service teachers that e-PLC had six steps that included communicating, objective setting, small group meetings, planning, and designing, lesson studying and reflecting.

Conclusion and suggestions

In summary, the professional learning community (PLC) is an ongoing, continuous process that impacts a school's structure, culture, and professional assumptions. It requires a schoolwide or districtwide effort, with regular meetings with peers functioning as a PLC. The National Scheme of Education B.E. 2560-2579 states that training and hiring teachers and other educational staff to meet international standards is necessary for developing proficiency and promoting a lifelong learning society. Key indicators include a database of teacher requirements, a 10-year plan for staff training, increased teacher education and hiring through closed applications, and standard competency training for all educational-level lecturers, teachers, and education officials. Increased satisfaction with training and its advantages is also necessary.

New knowledge and the effects on society and communities

The professional code of ethics is a set of standards for educational professionals to maintain and promote the honor and dignity of the profession. Teachers and educational personnel are important role models for students and contribute to the quality of learning. In Thailand, the teaching profession is respected as an honor and thought leader. Professional learning communities in Rajabhat Universities involve collaboration, shared ideals, student learning, thoughtful conversation, and action inquiry. These communities align with the pedagogical strategy and review at Rajabhat Universities, supporting the transition from individual to collective professionalism. The approach is system-wide, involving schools, local and national policymakers in promoting and sustaining system transformation.

Acknowledgments

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