Development of an Online Course on Learning Measurement and Evaluation for Primary School Teachers

Jittirat Saengloetuthai*
Faculty of Education, Rajabhat Nakhon Pathom University, Nakhonpathom, Thailand 73000
*Corresponding author e-mail: sjittirat@gmail.com

Abstract: This research aimed: (1) to develop the online course on learning measurement and evaluation; and (2) to evaluate the appropriateness of the online course on learning measurement and evaluation for primary school teachers. The research sample was 12 interviewees and 36 primary teachers under the Nakhon Pathom Primary Educational Service Area, Office Two. The research instruments included an interview form, a knowledge test and a design ability test on learning measurement and evaluation, an attitude test toward learning management and evaluation, and an opinionnaire on the developed online course. The data were analyzed with percentage, mean, standard deviation, t-test, and content analysis. The research results showed that the online course on learning measurement and evaluation was developed based on gamification concepts. The quality of the developed online course was assessed at a good level. After experimenting with the sample, knowledge and ability in design learning measurement and evaluation of teachers were higher compared to before learning with a statistical significance at .05. Moreover, the teachers' attitude toward learning measurement and evaluation was highly positive, and they opined that the developed online course was appropriate for developing knowledge, abilities, and attitudes of teachers at the highest level both overall and in specific aspects.

Introduction

Thai education, both at the national and local level, places importance on the development of learners to have essential skills in the 21st century. All relevant parties prioritize this matter and jointly plan a systematic approach to learner development, with the aim of equipping learners with the desirable characteristics of global citizenship. According to Rose & Mayer (2002: 5-6), learners in the digital era should have English ability and computer skills to the level enough for autonomous learning. Since English is not the first language in the Thai classroom, Thai learners have a low English level which holds learning back in the digital world. As a result, students lack learning motivation and attraction, causing problems in both behavior and learning disabilities. Moreover, technology change affects the education systems and learning. Learning management is important and essential for enhancing learners to possess desirable characteristics. Learners in a changing society should be developed to live happily and be aware of the flow of change. Teachers should be instructors and experts in learning measurement and evaluation. Loh (2009: 93-94) stated that those in teaching professions must have knowledge and ability to manage learning and create learning management innovation that is appropriate to learning content and development. Learning measurement and evaluation must be accurate and meet the learning objectives and learning management process. Additionally, learning management in schools nowadays has changed its form from traditional onsite learning to offsite learning, remote learning, hands-on learning, and many other forms. These changing learning management models cause problems in learning measurement and evaluation (Best & Kahn, 2014: 21).

Learning measurement and evaluation is the assessment of the characteristics or behaviors of a learner, which are classified into three domains: cognitive domain, psychomotor domain, and affective domain. Appropriate tools are needed to measure each

domain of the learning outcomes. Since almost all learning behaviors are abstract, indirect measurements have been used, which is incomplete and has many weaknesses. However, assessors have invented and developed various learning measurement techniques and tools. One tool is suitable only for measuring one domain, therefore, teachers need to select various learning measurement tools to measure all behaviors. In addition, teachers must develop measurement techniques to suit the situation, curriculum reform, and learning process. Learning evaluation should be based on authentic empowerment evaluation. It examines students' learning outcomes in three aspects, namely, learning processes, learning products, and learning progress. Authentic empowerment evaluation focuses on assessing knowledge and competencies according to learning standards, high-order thinking, morality, ethics, and desirable characteristics. The learning management process must be correlated with all learning activities and reflect learning outcomes. Authentic empowering evaluation is a method that measures and assesses learners' learning outcomes from empirical data or direct learning evidence, e.g., work performance, tasks, and workpieces. The appropriate measurement and evaluation method for 21st-century skills is an assessment of what learners have demonstrated: knowledge, skills, and abilities, as well as desirable attributes resulting from learning management, before, during, or after learning. The evaluation was used as a learning tool and connects learning with the curriculum. Authentic empowering evaluation emphasizes group assessment with a variety of methods and tools, e.g., quizzes, questionnaires, interviews, observation, and practice assessments. Learning measurement and evaluation tools should have the specified quality. In addition, learning measurement and evaluation should be consistent with learner competencies based on authentic empowerment evaluation principles and learner performances (Santrock, 2018: 550-556).

Information technology and global society are both rapidly changing and competitive. Education in the modern world is connected by technology and communication. It becomes lifelong education that learners can learn anytime or anywhere, whether at home or workplace, through high-performance internet networks or online systems. Such rapidly changing learning caused the emergence of new learning management innovations. Licht, Tasiopoulou and Wastiau (2017: 15) defined innovation as an idea, practice, or thing that is perceived as new by a person or a group that has adopted such idea, practice, or thing. Emerging innovations are systematically investigated to ensure that they can foster learners to achieve the set goals (Mills & Gay. 2016: 186). Nowadays, the Internet is widely used. Education has been developed from the traditional format into online platform. Learning management through internet networks has become a learning innovation in the modern era. Online courses are a widely influential teaching material among learners. Teaching materials refer to things used as an intermediary to transfer knowledge, skills, and attitudes to learners or make them set objectives. Due to uncomplicated presentation and communication, the online course can help to make teaching more concrete. Good online courses must include the following characteristics: appropriateness, consistency of content and learning objectives; the appropriateness of teaching style; appropriateness of learner characteristics; and appropriateness of the learning environment. Additionally, the researcher applied innovation development based on gamification concept to design learning activities in the online course for primary teachers. Teachers could learn about learning measurement and evaluation while playing game. However, gamification is different from traditional games or game-based learning.

From the analysis of teachers' learning measurement and evaluation problems, there was a gap between actual conditions and important desirable characteristics. In the digital era, teachers and educational personnel must accelerate their self-development and

work systems to keep pace with technological changes. It is necessary for teachers to have both traditional and online learning management skills. Furthermore, learning measurement and evaluation must be efficient and meet learners' behaviors. The study of teachers' learning management problems revealed that primary school teachers lacked knowledge, skills, and attitudes toward learning measurement and evaluation for both on-site and online learning, which made a gap between the expected and actual conditions. Game-based learning is designed to encourage learning while playing by inserting content into games. In other words, learners gain knowledge through game playing. Gamification is not a game, but it is the application of basic principles in game design and game-playing mechanisms in contexts other than game-playing. For example, in learning management, instructors design a game to suit learning activities. The use of gamification for learning management or training may not be for fun or reward, but rather for entertainment and challenge which foster the acquisition of knowledge, skills, and positive attitudes toward learning content. In conclusion, gamification allows learners to use technology as an important tool in learning and managing overwhelming information efficiently and effectively (Beers, 2011: 9).

Based on the aforementioned problems and conditions, the researcher was interested in conducting research on the development of an online course on learning measurement and evaluation for primary school teachers based on gamification concepts. The research objectives were to develop an online course on learning measurement and evaluation for primary school teachers and to assess the appropriateness of the developed online course. The developed online course is expected to be an alternative learning innovation consistent with teachers' needs which stimulates and motivates teachers to learn anywhere or anytime.

Research methodology

The research sample comprised 12 informants for interviewing derived by purposive selection and 36 teachers from primary schools under the Nakhon Pathom Primary Educational Service Area Office 2 obtained from multi-stage sampling. The research process comprised two phases.

Phase 1: Development of online course on learning measurement and evaluation for primary school teachers
The development process of the online course on learning measurement and evaluation for primary school teachers was divided into five steps.
Step 1: Study of the basic information from documents, textbooks, and research related to problems and conditions of learning measurement and evaluation, online lesson development and gamification concepts. The instrument in this stage was an information record table used for compiling and summarizing information. The researcher studied basic information by exploring relevant documents, textbooks, and research papers about problems and conditions of learning measurement and evaluation, need for self-development of teachers, gamification model, as well as content, presentation, and duration of the online course.
Step 2: Study of basic information by interviewing about problems and conditions of learning measurement and evaluation, the need for self-development of teachers, gamification model, the content of the online course, the presentation of the online course, and the duration of the course. There were 12 informants for the interview obtained from purposive

selection. They consisted of two specialized or expert school administrators with at least five years of experience, two primary school teachers with at least five years of experience, four academics in learning measurement and evaluation and learning management who graduated in learning measurement and evaluation and learning management or had at least five years of experience, two educational supervisors with at least five years of supervisory experience, and two information and communication technologists who graduated in learning measurement and evaluation and learning management or had at five years of experience in learning measurement and evaluation. The data collection instrument was a structured interview form. First, the researcher studied the issues of the interview and developed the structured interview form according to the specified issues. The interview form was assessed by five experts and the IOC of the interview questions was between 0.80-1.00. Data were analyzed using content analysis.

Step 3: Synthesis of the components of the online course on learning measurement and evaluation for primary school teachers. At this step, the researcher synthesized data from Step 1 and Step 2 as components of the online course. There were four lessons, namely, general knowledge of learning measurement and evaluation, objectives of learning measurement and evaluation, tools and methods for verifying the quality of learning measurement and evaluation tools, and techniques for conducting exams.

Step 4: Development of the online course on learning measurement and evaluation for primary school teachers. The researchers developed an online course on learning measurement and evaluation for primary school teachers. Authentic empowering evaluation concepts, gamification process, and interview data were used as guidelines for developing online courses. The developed online course consisted of four lessons, namely, general knowledge of learning measurement and evaluation, objectives of learning measurement and evaluation, tools and methods for verifying the quality of learning measurement and evaluation tools, and techniques for conducting exams. There were quizzes at the end of each lesson. The online course development process was as follows: (1) studying basic information about online course development from relevant documents and interview data; (2) developing an online course; and (3) verifying the quality of the course content by qualified experts. The consistency and appropriateness of the online course were also assessed. The congruence index of the developed online course was equal to 1.00, and the online course was appropriate at the highest level ($\bar{x}$ = 4.89).

Step 5: Assessment of the effectiveness of the online course on learning measurement and evaluation. The developed online course was piloted with 50 primary school teachers who were not in the sample group, and obtained by convenience sampling. The research instrument was the online course on learning measurement and evaluation that had passed the appropriateness assessment by the experts. The teachers piloted the course for three hours and 20 minutes. The results of the course pilot were used to improve the online course. Data from knowledge and ability tests and an attitude questionnaire were analyzed with the coefficient variation (C.V.) (Abdi, 2010:2)

Phase 2: Appropriateness evaluation of the online course on learning measurement and evaluation for primary school teachers.

Phase 2 could be divided into steps.

Step 1: Experiment with the online course with the sample group. The research population was primary school teachers from 238 schools under the Nakhon Pathom Primary Educational Service Area Offices One and Two. The sample was obtained by multi-stage sampling. First, the Nakhon Pathom Primary Educational Service Area Office One was obtained by simple random sampling. The sample size was determined at 15% of

the population, which was 18 schools out of 117. Then, two teachers from each school, a total of 36, were derived by simple random sampling. The instruments of this phase consisted of the following: (1) a knowledge test on learning measurement and evaluation; (2) an ability test on learning measurement and evaluation design; (3) an attitude test toward learning measurement and evaluation; and (4) an opinionnaire on the developed online course.

The knowledge test on learning measurement and evaluation consisted of 30 five-multiple-choice questions. It was constructed based on the study of documents and research studies related to knowledge test development, based on authentic empowering evaluation. The content validity of the test was examined by five experts. The IOC of the knowledge test was equal to 1.00. The test difficulty was between 0.40-0.80, the discrimination was between 0.20-0.78, and a reliability equal to 0.90. The ability test on learning measurement and evaluation design consisted of 20 five-multiple-choice questions. The content validity of the test was examined by five experts. The IOC of the ability test was between 0.60-1.00, the test difficulty was found between 0.37-0.77, the discrimination was between 0.23-0.82, and the reliability was equal to 0.89. The attitude test toward learning measurement and evaluation was developed as a five-point scale survey according to Likert's concept. The content validity of the attitude test was validated by five experts. The IOC value of the test was 1.00 and the reliability of the questionnaire was 0.88. The opinionnaire on the developed online course was constructed based on Likert's five-point scales. The five experts were asked to validate the content validity of the opinionnaire. The IOC value was equal to 1.00, with a reliability value of 0.85.

The researcher contacted the sample schools to use the developed online learning measurement, and an evaluation course. The sample was presented with the course and research project details, including research volunteer information and a consent form for participating in the project. The researcher conducted pretests of teachers' knowledge and ability to design learning measurement and evaluation. Then, the participants were asked to learn from the online course within two weeks. After that, the sample was given posttests and was asked to do the attitude survey and opinionnaire on the developed online course. The data obtained from the knowledge and the ability test were analyzed with mean, standard deviation, and t-test; while data from the attitude test and opinionnaire were analyzed with percentage, mean, and standard deviation.

Step 2: Improvement and dissemination. At this step, the researcher summarized the results of the online course experiment. After that, the developed online course was revised and improved to be ready for dissemination in at least one educational service area.

Research results

The online course on learning measurement and evaluation is the learning of teachers through online media developed, according to the gamification concept with set goals, rules, challenges, feedback, and rewards at the end of the course. The course consisted of four lessons: general knowledge of learning measurement and evaluation, objectives of learning measurement and evaluation, tools and methods for verifying the quality of learning measurement and evaluation tools, and techniques for conducting exams. The developed online course is consistent and appropriate for the development of knowledge, abilities, and attitudes of teachers. Additionally, the quality of the course was at a good level. The comparison of knowledge on the learning measurement and evaluation for primary school teachers is showed in Table 4.1.

Table 1. Comparison of the knowledge of learning measurement and the evaluation of 36 primary school teachers (full 15-point score)

(n=36)

Testing	M	SD	$\bar{d}$	$S.D._{\bar{d}}$	t
Before learning with the online course	8.67	1.84	2.08	0.35	5.95*
After learning with the online course	10.75	2.43			

*Statistical significance at .05

From Table 4.1, the knowledge of teachers about learning measurement and evaluation before and after learning with the online course is significantly different. After learning with the online course, teachers have a higher score than before with a statistical significance at the level of .05.

The results of the comparison of the ability to design learning measurement and evaluation of 36 primary school teachers are detailed in Table 4.2.

Table 2. Comparison of the ability to design learning measurement and evaluation of 36 primary school teachers (15-point full score)

(n=36)

Testing	M	SD	$\bar{d}$	SD_d	t
Before learning with the online course	7.92	2.44	1.22	0.47	2.62*
After learning with the online course	9.14	2.03			

*Statistical significance at .05

From Table 4.2, before and after learning with the online course, teachers had different abilities to design learning measurement and evaluation. After learning, teachers had higher scores than before with a statistical significance of .05.

The results of the attitudes test toward learning measurement and evaluation of 36 primary school teachers detailed in Table 4.3.

Table 3. Mean, standard deviation, level, and order of attitudes toward learning measurement and evaluation for primary school teachers

(n=36)

No.	Statements	M	SD	Level	Order
1.	Awareness of the value or benefit of learning measurement and evaluation	4.74	0.41	Very Good	1
2.	Eagerness to use learning measurement and evaluation	4.72	0.44	Very Good	2
3.	Readiness to conduct learning measurement and evaluation	4.60	0.48	Very Good	3
	Total	4.69	0.41	Very Good	

In Table 4.3, overall teachers had positive attitudes toward learning measurement and evaluation at a very good level (M=4.69). When considering each aspect, all aspects were found at a very good level. The aspects in descending order are awareness of the value or benefit of learning measurement and evaluation (M=4.74), eagerness to use learning measurement and evaluation (M=4.72), and readiness to conduct learning measurement and evaluation (M=4.60).

The opinions on the developed online course on learning measurement and evaluation of 36 primary school teachers are detailed in Table 4.4.

Table 4. Mean, standard deviation, level, and order of opinions on the online course on learning measurement and evaluation of primary school teachers

(n=36)

No.	Items	M	SD	Level	Order
1.	Content of the online course	4.64	0.47	Highest	2
2.	Presentation of the online course	4.60	0.45	Highest	3
3.	Benefits of the online course	4.69	0.47	Highest	1
	Total	4.65	0.43	Highest	

In Table 4.7, overall teachers opined that the online course was appropriate at the highest level (M=4.65). Specifically, all aspects were found to be at the highest level. The aspects in descending order were benefits of the online course (M=4.69), the content of the online course (M=4.64), and the presentation of the online course (M=4.60).

Discussion

1. The online course on learning measurement and evaluation is the teacher learning on an online platform based on gamification concepts with the set goals, rules, challenges, feedback, and the use of rewards at the end of the course. After finishing this course, teachers increased their knowledge and the ability to design learning measurement and evaluation with a statistical significance at .05, and they had positive attitudes toward learning measurement and evaluation. The developed online course is appropriate for improving the knowledge, abilities, and attitudes of teachers at a high level. This may be because the online course was developed based on information from the interviews of stakeholders both inside and outside school. The obtained information included problems and conditions on learning measurement and evaluation, primary teachers' development guidelines, content that primary teachers need to develop, and factors contributing to the success in self-improvement of teachers under the Nakhon Pathom Primary Educational Service Area Office 1 and 2. Moreover, the online course on learning measurement and evaluation was developed was based on gamification concepts. This is consistent with the research of Swacha (2022: 1-13), which has studied the evolution of educational research with gamification. In the past 10 years, there have been many interesting issues or studies on gamification. Gamification has been used both in business and education. In education, gamification is the use of games in learning management process. There are many studies related to gamification. It found 7,572 keywords related to gamification in education from 2,203 articles. The results showed that the most commonly found term is "gamification." The research studies vary spatially and the types of games used are different. It is believed that gamification will attract learners' attention. The cooperation in the game is designed for learners to learn together and help each other. Therefore, for the future use of gamification, it is advisable to encourage interaction, reflection, and opportunities for teachers to participate in all stages of application. This is consistent with the findings of Ugur, Kocadere, Kibar & Bayrak (2021: 24-43) who investigated the development of online lessons to promote the digital competence of teachers. This research gave teachers opportunities to develop their technology skills and lesson plan writing.

2. Regarding the appropriateness evaluation, the developed online course is appropriate at the highest level both overall and specific aspects. This maybe because the online course on learning measurement and evaluation was developed according to the need assessment of school administrators, primary teachers, experts in learning measurement and evaluation and learning management, educational supervisors, and information and communication technologists. Additionally, the researcher analyzed concepts of learning measurement and evaluation from relevant documents, textbooks, and literature necessary for developing new approaches to learning measurement and evaluation. This is in line with the findings of Aleman, Sancho-Vinuesa, & Gómez Zermeño (2015:1546-1568). They researched educational quality indicators in the design of massive open online courses (MOOCs) with the aim of describing the relationship between education, technological structure, and time component to access MOOCs, as well as strategies for using technology in managing online learning. The results revealed that the success of online learning management cannot be directly measured, but rather considered by the educational transition. Educational policy must be linked to assessable principles and the quality of online learning management. The ultimate goal is that in the future everyone shall have access to online learning classrooms. Maxfield (2020: 91-94) mentioned accordingly that feedback data is useful for online learning course development. It can be concluded that feedback is an important opportunity to assess learners and the exchange of useful information among primary school teachers. Wallace, Juban, & Vicknair (2022: 1-6) studied the success of online classrooms and found that at the beginning of the 21st century, online learning was organized widely. At that time, online lessons were widely popular because they gave learners higher motivation to learn than learning in a traditional classroom environment. Yıldırım, & Yıldırım (2022: 1546-1568) investigated the study of science teachers' attitudes toward learning measurement and evaluation. The objective of this research was to study the level of attitudes toward learning measurement and evaluation of science teachers by assessing attitudes and studying recommendations for promoting attitudes toward the measurement and evaluation of science teachers. The study revealed that attitudes positively correlated with knowledge and self-confidence with statistical significance. Gender, work experience, age, and the graduated faculties of teachers showed no differences in attitudes toward the learning measurement and evaluation of science teachers. The recommendations for research application were as follows: (1) the research results showed that the developed online course on learning measurement and evaluation is highly qualified and modernized responding to the needs of primary school teachers. However, the value of this course should be introduced so that teachers recognize the importance and necessity of studying with the online course; (2) after studying the developed online course, teachers had knowledge, abilities, and positive attitudes toward learning measurement and evaluation and they agreed that the course was appropriate at a high level. For the implementation of the course, teachers should study the lessons continuously for further development of their knowledge, abilities, and attitudes. The recommendation for further study included: (1) that research should be conducted on factors affecting the motivation of primary school teachers in learning via online platforms in order to develop an effective learning model for teachers; (2) good practice in learning measurement and evaluation in primary schools should be studied; and (3) it was recommended to do research on mentoring supervision to promote teacher competency in learning measurement and evaluation.

Conclusion

The results of the appropriateness evaluation of the online course showed that the developed online course is appropriate for the development of knowledge, abilities, and attitudes toward learning measurement and evaluation of primary school teachers. After studying this course, teachers had knowledge, abilities, and positive attitudes toward learning measurement and evaluation. Moreover, teachers opined that the developed online course is appropriate at the highest level.

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