Enhancing Thai Secondary Teacher Lifelong Learning Competencies In A Digital Age

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Abstract

This research used mixed methods to analyze 48 lifelong learning competency (LLC) indicators to determine which elements were best suited for use in a teacher LLC learning management model. 960 Thai teachers were selected by stratified random sampling from four regional small, medium, and large schools. Qualitative research was conducted using the Multi Attribute Consensus Reaching (MACR) method and multiple groups of experts to confirm the multiple LLC Models proposed. LISREL 9.1 was used for the first and second-order confirmatory factor analyses (CFAs). Further data analysis used descriptive statistics. The questionnaire's confidence value was .991. The results showed that there are five teacher LLC components. These were self-improvement, ability to succeed during technology disruption and change, having a growth mindset, using technology to benefit individual professional development, and staying abreast of technological change (digital literacy). The proposed ARCAE (attitude, recognize, conceptualization, action, evaluation) Model used to implement LCC improvement had five steps. These were Step 1's attitude creation, Step 2's recognition and value, Step 3's conceptualization, Step 4's action, and Step 5's evaluation and dissemination of the work. The research makes an important contribution to the research literature concerning the use of professional learning communities' use in teacher LLC development.

KEYWORDS: Digital Age, Disruptive Technology, Lifelong Learning Competencies, Multi Attribute Consensus Reaching, School Learning Communities, Thailand.

INTRODUCTION

Uncertainty has become one of the greatest challenges facing organizations today in their efforts to create linkages between work and learning (Nipasuwan et al., 2021). Disruptive change

now comes in many forms, which now includes things such as public health concerns (COVID-19), artificial intelligence (AI), communication and digital technologies, climate change, and societal changes such as aging economies.

Furthermore, many would agree today that society is changing quickly due to many different factors including the COVID-19 global pandemic, digital device use, and information communication technology (ICT) infrastructure development. Thus, these disruptive changes require people to acquire 21st-century skills, including critical and creative thinking, programming and computational skills, digital literacy and Internet behavior skills (Kerdtip & Angkulwattanakit, 2023). All of which need to be integrated into professional and lifelong learning processes if nations such as Thailand wish to create a competitive labor force of digitally savvy knowledge workers.

As such learning how to learn and the creation of lifelong learning competencies has become a critical need in a nation's ability to compete and survive within our global economy (World Bank, 2018). Moreover, as traditional education systems experience shutdowns (UNESCO, 2020), new methods are required to reskill and upskill individuals out of school or unemployed as a response to technology-induced labor market disruptions. Federico, et al. (2020) has also added that educators must adjust their learning management according to new digital technologies to improve their work. and living.

Unfortunately, education systems resist change (World Bank, 2018) which is a critical factor in how quickly nations are able or not able to cope with changing job skill requirements and the supply of workers to meet the needs of a competitive industry. This is consistent with reporting from the International Labour Office (ILO) (2010) which has stated that skill development is a strategic objective which nations, organizations, and individuals all face common challenges. Of the five major objectives outlined it is important to note that broad availability, quality education for all, lifelong training, and matching skills to the needs of organizations were noted as essential. Additionally, continuous workplace training and lifelong learning which can

adjust to technological changes was also stated as critical due to the increasingly rapid pace of change. Finally, anticipating and building competencies for future needs was highlighted in their importance.

Operationally, Wannapiroon and Pimdee (2022) have pointed out how professional learning communities (PLCs) support development of community-level lifelong development processes in a flexible, competency-based education (CBE). In a similar fashion, self-directed learning is an element of personalized learning which when integrated with CBE in non-traditional higher education serves potential employer needs (Camacho & Legare, 2016; DeMink-Carthew et al., 2017). Kanawapee et al. (2022) has also pointed out the importance of PLCs as a collaboration tool in teacher competency development. Finally, these studies support Thailand, Thailand's National Strategy 2018-2037 (2017) which has also outlined the effectiveness of local community learning communities and the development of CBEs (Wannapiroon & Pimdee, 2022).

Another method pointed out by Sittisak et al. (2022) is the usefulness of having a teacher's needs assessment (NA), as NAs are useful in helping educators acquire learning management skills, developing competency in developing learning management plans, technology use, media learning measurement, and using evaluation tools.

Thus, organizational development within educational institutions needs to be continuous which keeps abreast with change (Taguma & Barrera, 2019). This requires the development of essential skills that creates a positive atmosphere willing and able to deal with change.

However, these ideas are not new as Mezirow (1991) decades ago outlined the transformative dimensions in adult learning. Later, Mezirow (2008) again reviewed transformative learning (TL) and indicated that TL is involved with learning how to think critically by questioning the expectations and assumptions that influence and shape what people do and think.

During the age of COVID-19 Eschenbacher and Fleming (2020) reviewed TL and lifelong learning and reported that there has been significant damage done to workers, families, individuals, and economies since its inception. The authors go on to state that this has led to an unprecedented and urgent search for knowledge and suggest that learning is the only method available to find our way out of this terrible predicament. Finally, quite interestingly they state that not-knowing is the new normal.

In Thailand, even before the COVID-19 pandemic, numerous studies had been undertaken on how to implement educational change and the numerous problems that required change and as well as the potential solutions in making change happen.

One common theme in these studies is the inability of some educators and administrators to keep pace with change and new situations, another is the unwillingness to change from the use of traditional concepts (chalk and talk), and yet another is the inability to embrace new knowledge and skills.

Other problematic themes now include how well or bad teachers can develop online teaching materials, which then is connected to their ability at course management and evaluation guidelines. Admittedly, COVID-19 forced many teachers into environments they had no training for and no experience in. Another problem in Thailand even before the pandemic forcing education online was that many teachers and student teachers were teaching subjects, they had no qualification or experience in. In addition, teachers take on other tasks besides teaching. which affects the potential and competency of teachers according to professional standards. As a result, Thailand's competitiveness in education compared to other countries has decreased in recent years (Office of the Education Council Secretariat, 2017).

To be fair, not all the problems are due to the educators but instead due to the limits in educational budgets (Laovanich et al., 2021), poor or no training (UNESCO, 2020), poor information communication technology (ICT) infrastructure, limited or no Internet connections, or lack of knowledgeable ICT support

staffs (Sermsri et al., 2021). Other studies have explicitly identified how rural schools operate at a significant disadvantage to urban schools due to their lack of ICTcapabilities including lacking software, computers, and consistent broadback Internet connectivity (Phuapan et al., 2015; Sinlapasakkhajorn & Unaromlert, 2015; Watnayoo et al., 2019).

Therefore, teachers should be given the opportunity after their initial university and internship training to develop their capacity to develop their profession through a process of lifelong learning. Additionally, this competency development needs to come through the integration of a teacher professional development model not only for experienced teacher but teachers which lack experience as well. Teachers should be involved in creating knowledge and seeking outside knowledge. They should also be involved in a continuous learning process involving knowledge creation, skill enhancement, and development of their own personal characteristics which then will lead to teaching and learning competencies.

LITERATURE REVIEW

Motivation

Enhancing teacher lifelong learning competencies entails creating motivation that arises from an individual's knowledge, skills, and characteristics (Nipasuwan et al., 2021). Motivation also involves the creation of an academic environment that nourishes a sense of belonging and a perception of competence (Han & Yin, 2016).

However, motivation can be both an extrinsic and intrinsic process with extrinsic motivation involved with the pursuit of rewards and escaping punishment, while intrinsic motivation is involved with the satisfaction gotten from performing tasks (Prapatsaranon et al., 2022).

Lifelong Learning Competency (LLC)

Lifelong learning competency has been identified in various ways

by researchers and organizations. From the Council of the European Union (2018), LLC was stated to involve eight core competencies including both literacy and digital skills, multi-lingual abilities, STEM skills, citizenship skills, cultural awareness, learning how to learn, and entrepreneurial skills.

In Thailand, Siddoo et al. (2019) reported that when employers were asked what digital skills were desired most, LLCs were in the top five. Other studies point our that although somewhat vague to its meaning, a 'digital workforce' and its ability at developing LLCs is a critical element when worker competencies are discussed (Tan & Tang, 2016).

Thus, LLC learning management must responds to needs and focus on the individual's education. It is an education that is linked to changes both at the personal and social level by combining education in a non-formal educational system and self-study. It must adapt to change and challenges quickly. It must seek to continuously improve the quality of life and bring complete understanding of learning to enhance the experience of knowledge, skills, and personal characteristics.

Digital Disruption

Digital disruption can be defined as technology convergence which is constantly and quickly changing and difficult to predict. Thus, it requires teachers to quickly adapt to changing environments (e.g., the COVID-19 global pandemic) and the requirements for online and distant learning. Technology development can also disrupt economic systems by creating and destroying existing business models, supply chains and employment patterns (Boucher et al., 2020).

ARCAE (Attitude, Recognize, Conceptualization, Action, Evaluation) Model

The motivation element in the model for enhancing teacher lifelong learning competencies was determined to have various components. These were general information, dynamism, a growth mindset, learning with technology, self-improvement, innovation, teaching and learning development and life skills.

When integrated into a model to enhance lifelong learning competency, the authors named it the ARCAE Model which involved five steps including Step 1's Attitude creation, Step 2: Recognize and value/appreciate, Step 3: Conceptualization framework, Step 4, Action, and 6. Evaluation and dissemination.

Research Objectives

1) To analyze components of teacher lifelong learning in during disruptive times.
2) To present a model for enhancing teacher lifelong learning competency during disruptive times.

METHODS

This study used mixed methods research including both a quantitative research process and a qualitative research process to determine which elements were most suitable in a a model for enhancing Thai secondary school lifelong learning competency. The research concept framework was as follows:

Part 1 – Lifelong learning

In the development process, 48 observed variables were initially identified from which a confirmatory factor analysis (CFA) was conducted (Table 1). The number 48 was then used as the multiplier in the determination of the sample size for the subsequent second-level CFA and final statistical analysis.

Table 1: Latent and observed variables for the first CFA.

	There were 48 variables observed.
Lifelong Learning (8 items)	1. Encouraging individuals to learn (3 variables). 2. Promotion of work skills and abilities (1 variable). 3. Promotion and support of self-development, planning, and research (1 variable). 4. Teamwork (3 variables).
Learning for Change (8 items)	1. Importance and necessity of learning technology (2 variables). 2. Self-development and organization (1 variable). 3. The importance of learning and adapting to changes (5 variables).

	There were 48 variables observed.
Learning Society (16 items)	1. Self-development and society (5 variables). 2. Building a community learning center (2 variables). 3. Community development (1 variable). 4. The importance of participating in professional learning community (PLC) activities (5 variables) 5. The importance of network partners (3 variables).
Digital Literacy (16)	1. Access to digital technology (2 variables). 2. Collection of technology learning resources and learning atmosphere arrangement (1 variable). 3. Importance of inquiry skills and critical thinking (4 variables). 4. Networking (3 variables). 5. Website information utilization (4 variables). 6. Website information reliability (2 variables).

Numerous scholars have made recommendations of how to determine sample size but one commonly used and accepted method is to use a multiple of 10-20 questionnaires for each observed variable (Hair et al., 2021). Thus, the reason for the 960-teacher sample collected for the study (Table 2). It should also be noted that one large, one medium, and one small school were selected from each of the four major Thai geographical regions, from which teachers were randomly selected.

Table 2: Teacher sampling process.

Region	Population				Sample			
	Teachers				Teachers			
	Large	Medium	Small	Total	Large	Medium	Small	Total
Northern	135	65	26	226	127	62	25	214
Central	148	82	40	270	140	78	38	256
Northeast	172	66	39	277	163.	62	37	262
Southern	147	67	28	242	138	64	26	228
Totals	961	270	123	1,015	568	266	126	960

Research Tools

The research tool was a questionnaire which after review by a panel of experts using the index of item-objective congruency (IOC) was determined to have content consistency values from

0.67 to 1.00. After the pilot test, the questionnaire's confidence and Alpha reliability = .991, which is considered excellent (Hair et al., 2021).

Data analysis was conducted using descriptive statistics including the mean, standard deviation (SD), skewness and kurtosis. Structural validity of the measurement model was analyzed using the LISREL 9.1 program to verify the theoretical validity and consistency of the lifelong learning measurement model.

Part 2 – Creation of a Transformative LLC Model for Thai Secondary School Teachers

1) To confirm teacher lifelong learning competency during disruptive times, multi-attribute discussions were used to find consensus using the MACR (Multi Attribute Consensus Reaching) technique (King et al., 2001). Nine experts were selected using a purposive selection method.

2) The research tools employed concepts from McClelland (1973) and Spencer and Spencer (1993) from which each component was integrated with their indicators and separated into their performance units according to the results and synthesis of the literature review for lifelong learning competency concepts. separated into performance units. Each competency unit consisted of knowledge, skills, and attributes. Targets for lifelong learning competencies were also applied.

3) The concept of OKRs (Objective and Key Results) was applied by using each competency unit to determine objectives and key results (Doerr, 2019). The researchers then used the Key Results to identify ways to achieve the specified objective which was then used to measure success progress. Additionally, a form was used to identify activities or to do lists that had a clear time frame.

4) The researchers then collected data using the MACR

technique as an assessment of the importance and necessity of lifelong learning competencies. The rating system used a 5-point scale, ranging from 0-100 points. Each expert assessed the need for a lifelong learning competency program according to their own perceptions using the Likert estimation system which had scores ranging from 1-100.

5) Data analysis was undertaken by calculating the mean and range of the guideline items which was provided as feedback to the experts for discussion. During Round 1's investigation if any approach had a range of more than 40, a second assessment round (Round 2) was undertaken to let the experts vote using the assessment form. The researchers then analyzed the data by calculating the mean and range.

Model's Creation

The initial draft of the model's development enlisted five experts who were selected using purposive selection. They were then asked to consider and evaluate the model's accuracy, content consistency, and format possibilities using a suitable and correctness assessment form. The results of the IOC assessment of suitability and validity had a range of 0.80-1.00 which confirmed the model's conceptual draft.

Model's Suitability

Further confirmation of the model's suitability came from the use of the MACR multi-discussion meeting technique to find consensus amongst the ten invited experts who were selected using a purposive selection method (Kansaart et al., 2017). The rating system used five levels from 0-100 points.

Model's Assessment

1) Round 1 Assessment: The researchers analyzed the data by calculating the mean and range of the items to provide feedback to the experts. If any approach has a range wider than 40, the researches summarized the data analysis results for the experts for the next assessment.

2) Round 2 Assessment: The experts voted using the assessment form. The researchers then analyzed the data by calculating the mean and range.

3) The researchers analyzed the data by analyzing the content of the MACR assessment form and its suggestions.

4) Improvement was made on the teacher lifelong learning competency model according to the recommendations of the experts.

CFA Results

Table 3 and Figure 1 identifies and details the five final factors selected for the second-order CFA analysis of teacher lifelong learning competencies.

Figure 1: Second-Order CFA for Teacher LLC.

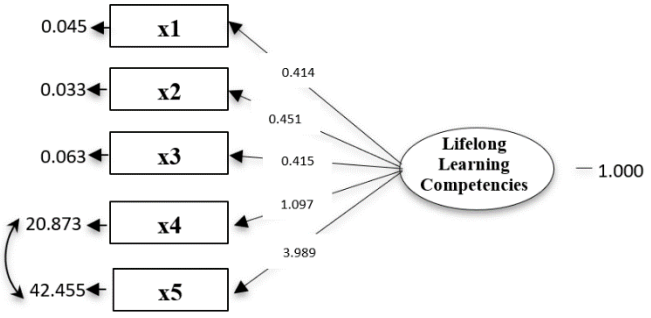


Table 3 details the component weight values, standard deviations, statistical values and coefficient of determinations for the CFA's lifelong learning competency factors for teachers.

Table 3: Results from the 2nd-order CFA for LLC,

Indicators	CWV	SE	t	R^2
Ability for self-improvement (x1).	0.414	0.012	34.504	0.792
Ability to succeed during technology disruption and change (x2),	0.451	0.012	36.895	0.860
Having a growth mindset (x3).	0.415	0.013	32.433	0.732
Using technology to benefit individual professional development (x4).	1.097	0.155	7.065	0.055

Staying abreast of technological change (digital literacy) (x5).	3.989	0.237	16.834	0.273

Notes: CMV=component weight value, SE=standard deviation, t=statistical value, R^2= Coefficient of determination, χ^2=7.30, df=4, p=0.12075, CFI=1.00, GFI=0.997, AGFI=0.989, RMR=0.0373, RMSEA=0.029

RESULTS

Part 1 – LLC CFA results

The CFA results for lifelong learning in a disruptive world for teachers showed that the coherence test had a χ2 value of 7.30 and a statistical significance (p) of 0.12075, indicating that χ2 was not statistically significant, meaning that the empirical data were significant and consistent with the structural model.

Also, the chi-relative value was -0.175, which is less than 2.000, indicating that the model is consistent with the empirical data at a good level. In addition, the researchers considered other goodness-of-fit indices and determined that the GFI=0.997, the AGFI=0.989, the CFI=1.00, and the RMSEA=0.029 which measured near zero, indicating that the model is very consistent with the empirical data.

Part 2 – Model Creation Process

The researchers studied the model development process and determined there were two major steps. These were the 1) integration of unit competencies and the setting of goals and 2) the creation of a model for enhancing teacher lifelong learning competency was separated into competency units consisting of knowledge, skills, and personal characteristics (attributes).

Then each competency unit was defined by their objectives and key results to identify ways to achieve those objectives that can be used to manage learning. Based on learning standards and indicators, a total of eight competency units were obtained, and a summary of the lifelong learning competency units and objectives and key outcomes was obtained of learning

management.

Part 2 – MACR Results

Evaluation results using the MACR technique to ascertain and verify the importance and necessity of lifelong learning competencies came from two rounds of interviews. In Round 1, nine experts assessed the necessity of an LLC program for Thai teachers. In Round 2, the experts considered the results of the analysis from the first-round issues which had an average of less than 80% and a range of more than 40. These issues were then discussed again in an attempt to find consensus (Table 4).

Table 4: MACR findings for teacher LLC.

Issues to consider	Mean **Rnd. 1**	Range **Rnd. 1**	Mean **Rnd. 2**	Range **Rnd. 2**	**Rank**
1. Strategic planning competency	77.35	40	82.54	40	highest
2. Dynamic performance					
2.1 Participate in the exchange of learning as a partner in the career development network.	79.95	45	81.06	40	highest
2.2 Use a group process to find out how things works so you can solve problems to develop work skills.	80.31	40	83.28	33	highest
Average	80.13	42.50	82.17	37	highest
3. Growth mindset competency					
3.1 Learn how to think and see broadly.	79.57	40	81.06	40	highest
3.2 Learning, seeking, and challenging lifelong changes.	79.58	53.33	81.80	40	highest
Average	79.58	46.67	81.43	40	highest
4. Technology learning competency					highest
4.1 Ability to use technology	78.83	46.67	81.06	40	highest
4.2 Knowledge of technology systems	81.06	40	81.06	40	highest
4.3 Keeping up with technological changes	80.50	40	81.06	40	highest
Average	80.13	42.22	81.06	40	highest
5. Self-development competency	79.39	40	82.17	35	highest
6. Innovation performance	79.57	40	81.06	40	highest
7. Learning competency management development					highest

7.1 Accessing and choosing learning sources to develop learning management.	78.83	50	81.06	40	highest
7.2 Design a variety of learning activities.	78.83	40	81.06	40	highest
7.3 Selecting technology media and designing, measuring and evaluating results in accordance with the content and suitable for learners.	79.95	40	81.06	40	highest
Average	79.20	43.33	81.06	40	highest
8. Life skills competency					
8.1 Be a strong citizen who is aware of changes, having life skills, overcoming obstacles, well-rounded, and having a pleasant attitude when working with the public.	79.39	40	highest	40	highest
8.2 Understand situations and problems when receiving information. Have a positive attitude towards disruption and changes.	78.09	40	highest	40	highest
8.3 Be responsible for yourself and able to distinguish wrong Be a good member of a professional group.	79.95	40	highest	40	highest
Average	79.14	40	highest	40	highest
Average totals	79.31	41.84	highest	39	highest

Drafting the LLC Model

The Thai teacher LLC model was drafted using a consensus-based approach (MACR) to confirm and validate the model's appropriateness and feasibility. In the first round, ten experts assessed the suitability and feasibility of the model while in the second round, the experts considered the results of the analysis from the first round on issues with an average of less than 80% and a range of more than 40. Each expert was then asked to discuss their reasons.

Table 3 summarizes the consensus findings (MACR) from the first and second rounds of ten experts of the appropriateness and feasibility of the draft model for building teacher lifelong learning competency. In Round 1 the experts returned a highest-level ranking of consensus, with a mean score of 84.98 and a mean range of 23.22 (Table 5). However, due to some inconsistencies in the result a second round was undertaken

from which the results showed a highest-level ranking of consensus with a mean score of 85.50 and a mean range of 20. This showed that the drafting of a transformative lifelong learning competency building model for teachers is appropriate and feasible. According to the criteria, the format should have a high score point average of 80 or more and a narrow range of not more than 60-100.

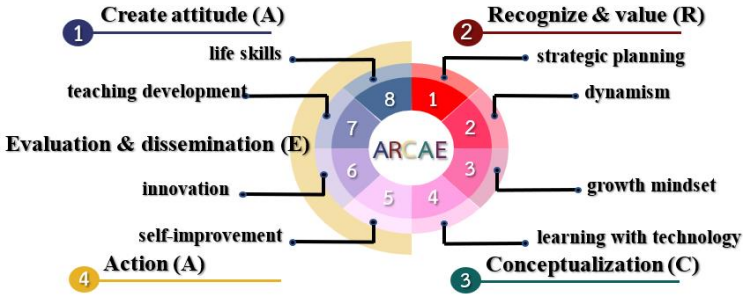
Table 5: MACR findings for the appropriateness and feasibility of the model.

Issues to consider	Round 1		Round 2		Rank
	Mean	Range	Mean	Range	
General information	84.00	25	80.50	20	highest
Teacher Lifelong Learning Competencies in a Digital Age					
2.1 Strategic planning	84.17	26.67	85.50	20	highest
2.2 Dynamicity	85.50	20	85.50	20	highest
2.3 Growth mindset	84.83	26.67	85.50	20	highest
2.4 Learning with Technology	85.28	22.22	85.50	20	highest
2.5 Self - development	85.50	20	85.50	20	highest
2.6 Innovation	85.50	20	85.50	20	highest
2.7 Learning management development	85.500	20	85.500	20	highest
2.8 Life skills	84.55	26.67	85.50	20	highest
3.0 Lifelong learning competency building activities	85.000	25	85.500	20	highest
Averages	84.98	23.22	85.50	20	highest

The researchers used the suggestions from the multidisciplinary

discussion to improve the proposed ARCAE Model detailed in Figure 2. Step 1 creates an attitude, Step 2 is used to recognize and value, Step 3 involves conceptualization, Step 4 involves action, and finally, Step 5 involves evaluation and dissemination of the work.

Figure 2: The Proposed ARCAE LLC Model.



DISCUSSION

The study's results revealed that five major indicators influenced a Thai secondary-teacher's lifelong learning competency development. These were the ability for self-improvement (x1), ability to succeed during technology disruption and change (x2), having a growth mindset (x3), using technology to benefit individual professional development (x4), and staying abreast of technological change (digital literacy) (x5).

Teacher Self-Improvement

These ideas are consistent with various scholars including Daengneam et al. (2023) in Thailand which reported that learning ability is contingent on a student's self-awareness knowledge, their ability at self-directed learning, their self-esteem, and their critical thinking skills.

Digital Technology Disruption

In Malaysia, Kuanysheva et al. (2019) examined how technology affected teacher self-improvement and determined the connection between continuous innovation and self-improvement. However, quite interestingly the authors noted that in older teachers the desire was much greater than that of younger teachers.

Globally as might be expected, numerous studies and reports have detailed the impact of how the COVID-19 pandemic has turned traditional education upside down (Krishnamurthy, 2020). Even a commonly used pedagogy used for online education is called 'flipped'. Therefore, the COVID-19 crisis now requires educators to renew themselves, albeit in a very disruptive way.

García-Morales et al. (2021) succinctly highlighted these issues by stating that radical transformations are being driven by the requirement for digital education, with the problem being that the educators expected to implement it lacking the innate technological abilities for online teaching. This is consistent with other studies in Southeast Asia even before the pandemic in which researchers have noted the many problems with technology's use in education (Phuapan et al., 2015; Sinlapasakkhajorn & Unaromlert, 2015; Watnayoo et al., 2019). As such, technology's limitations are often cited as significant limitations in using new learning models such as flipped classrooms and blended learning by teachers and school districts (Srinuan & Srinuan, 2021).

Growth Mindset

Seaton (2018) examined how having a growth mindset could empower teachers and showed with even have only three months of training, effective changes could be made. There was also a recognized connection between teacher and student growth mindsets.

This is consistent with Robinson (2017) who highlighted the historical research in 'mindsets' but believed that a classroom culture of 'growth mindsets' helped students develop strong work habits which then leads to success and achievement. This is consistent with Dweck (2000) who showed that students with a growth mindset are far more likely to take on more challenging work than students with a fixed mindset - even if all the factors stay constant. A growth mindset gives teachers the desire to learn, seek opportunities, new challenges, learn by doing, while connecting old ideas with new ones. Therefore, technology is the key with Curran (2018) stating that digitization has an impact on people's daily lives both personally and professionally.

Technology use in Professional Development

Selvi (2011) has said that teachers with lifelong learning abilities who learn on their own increase productivity. Therefore, technology, digital media, learning, knowledge, and innovation are essential factors in a knowledge society's development, which allows for the creation and promotion of lifelong learning (Hannafin et al., 2000). Simultaneously, technology advancements have allowed for the integration of the Internet into an educator's developer toolkit and other complementary resources such as social media, digital tools, smartphones, and learning management systems (LMSs) (Curran, 2018; Nonthamand & Songkhla, 2018).

However, as Curran (2018) pointed out, digital economies pose risks to their participants. Some factors include the reshaping of interpersonal co-presence and solitary lives, the growing threats of AI in increasing unemployment and inequality, and the negative effect of an 'always on' and 'always upgrading' digital communication ecosystem.

Within the classroom, technology can be used to enhance the learning process (Piriyaphokanont & Sriswasdi, 2022) and add to the development of teacher development competencies. Specific areas that need to be enforced are knowledge and use of ICT, traits and self-concepts, and their motivations and attitudes.

The ARCAE Model Teacher LLC steps

The proposed LLC ARCAE Model development included five steps. These were:

Step 1's Attitude: Creating a positive teacher attitude entails building and promoting learning from experience and mistakes. Positive attitude creation also makes use of news and information, being aware of changes, and being able to create and/or participate in a network of digital media connected to a PLC (Trust et al., 2016).

Step 2's Recognize and Appreciate (R&A): Often used interchangeably, some authors have suggested there is a large difference between their meaning and use (Robbins, 2019) as recognition involves giving positive performance feedback,

while appreciation concerns acknowledging inherent values within individuals. In simple terms, recognition is about what individuals do, while appreciation is about who they are (Robbins, 2019).

Strong support for the value of work appreciation comes from a 1946-1986 meta-analysis of 1,000s of studies which determined that when employees ranked the top 10 job reward factors, employees consistently ranked appreciation in their job over other items such as higher wages or job security (Wiley, 1998).

Unfortunately, Higher Education studies have shown that educational campuses lack robust climates in which educators are afforded R&A (Kezar & Elrod, 2020). However, numerous studies point out that R&A improves morale, motivation, and performance, while campus climates run by bullies and intimidating attitudes significantly degrade the potential for academic achievement. Academic leaders can create support for R&A by conducting surveys, providing professional development, and strength-based assessment processes (Kezar & Elrod, 2020).

The R&A process also sets learning and working goals as a co-creation of a strategic plan, while making individuals aware of the changes and potential problems that are arising. These ideas are consistent with Lessing and Witt (2007) who determined that successful continuous professional teacher development was successfully served by formal and systematic workshops. However, with the advent of a global pandemic precluding human contact and the need for social distancing, PLCs and social media platforms have soared in their importance and use in teacher development.

Therefore, teachers must learn and consistently work on ways to improve their learning management skills, where open environments are created, which today will most probably entail a social media group allowing teachers to participate in the learning management process and knowledge sharing (Kerdtip & Angkulwattanakit, 2023; Sittisak et al., 2022).

Step 3's Conceptualization: In Nursing, the most important characteristics of a lifelong learner have been conceptualized as reflection, questioning, enjoying learning, understanding the

dynamic nature of knowledge, and engaging in learning by actively seeking learning opportunities (Davis et al., 2014).

In Europe, lifelong learning (LL) conceptualization and guidelines have been a central pillar to Europe's goal to become a world 'knowledge economy' (Alves et al., 2010). In a study of documents related to LL, it was stated that individuals lacking key competencies are most likely not to achieve personal fulfillment, not get a good job, and not able to become active members of society.

Step 4's Action and Implementation (A&I): A&I's role in professional learning development evolves around the ability to continuously develop the teaching profession, from which teachers encourage students to learn (Sachs, 2007). Teacher professional development also involves four aspects. These are the ability to retool, remodel, revitalize, and reimagine. The identification of priorities and needs for each teacher's professional learning must also be set.

Lifelong learning has also been established in various studies as essential to social development (Alves et al., 2010), lifelong learning should also respond to social and technologicalchanges, be flexible, and have sustainable value over a person'slifespan.

These ideas are consistent with Duţă and Rafailă (2014) who wrote that perhaps education is one of the most essential social activities in a person's entire life, with LL emphasizing the 'how' of learning to learn and the ability to keep learning for a lifetime.

Step 5's Evaluation and Dissemination (E&D): Numerous model development studies have emphasized the importance of E&D activities at the end of their proposed courses (Kummanee et al., 2020; Sittisak et al., 2022). Often this is also followed by a feedback process.

One popular formative evaluation (FE) model is the Seels and Glasgow Model (SGM) which has even been adopted by the US military, as FE serves as a way for instructional designers to improve instruction (Resiser & Dempsey, 2018; Uzunboylu & Koşucu, 2017).

CONCLUSION

The study concerning Thai secondary-school teachers' lifelong learning competencies used a mixed methods approach involving quantitative and qualitative analyses. From the initial inclusion of 48 indicators into the analysis, a first-order CFA was run followed by refinement using a second-order CFA. Multiple groups of experts were also used to assess both the developed questionnaire and the proposed initial model. The experts employed the Multi-Attribute Consensus Reaching (MACR) method to confirm the multiple LLC Models proposed. Stratified random sampling was then used to select 960 teachers across four dispersed Thai regions in 12 small, middle, and large schools to gain further input into the model's use.

The results showed that there are five teacher LLC components. These were having the ability for self-improvement, the ability to succeed during technology disruption and change, having a growth mindset, using technology to benefit individual professional development, and staying abreast of technological change (digital literacy).

The proposed ARCAE Model used to implement LLC improvement had five steps. These were Step 1's attitude creation, Step 2's recognition and appreciation, Step 3's conceptualization, Step 4's action, and Step 5's evaluation and dissemination of the work.

Suggestion for Research Application

1. Future implementations of the ARCAE Model used to implement LLC development should review the strengths and weaknesses of the model. Teacher competencies should also be assessed and ranked in order of importance.

2. When employing the ARCAE Model, schools should make available to each instructor a multi-media recording device so teachers can collect information, reflections, and knowledge gained. This information can then be shared with a professional learning community (PLC) or published online across social media platforms such as Line or Facebook.

3. Schools should have activities to disseminate teachers' work both inside and outside the educational institution.

4. Executives must be aware and pay attention to the promotion and creation of teacher lifelong learning competencies, especially during times of disruptive technologies or medical emergencies such as the global COVID-19 pandemic.

5. Teachers should continuously embrace lifelong learning and the development of their professional competencies.

Conflict of Interest

The authors declare no conflict of interest.

Author Contributions

C. K. and P. T. conceptualized the research design. C. K. reviewed the literature and designed the initial proposed model. C. K. wrote the paper's draft. P. T. supervised the data collection process. C. K. and P. T. analyzed the data. Both authors approved the final version.

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Bibliography

1. Alves, M. G., Neves, C., & Gomes, E. X. (2010). Lifelong learning: Conceptualizations in European educational policy documents. European Educational Research Journal, 9(3), 332-344. https://doi.org/10.2304/eerj.2010.9.3.332
2. Boucher, P., Bentzen, N., Lațici, T., Madiega, T., Schmertzing, L., & Szczepański, M. (2020). Disruption by technology. European Parliamentary Research Service. https://tinyurl.com/snn32nvf
3. Camacho, D. J. & Legare, J. M. (2016). Shifting gears in the classroom—movement toward personalized learning and competency-based education. The Journal of Competency-Based Education, 00, 151 – 156. https://doi.org/10.1002/cbe2.1032
4. Council of the European Union (2018), Key competences for lifelong learning. https://tinyurl.com/bddtdks3
5. Curran, D. (2018). Risk, innovation, and democracy in the digital economy. European Journal of Social Theory, 21(2), 207-226.

https://doi.org/10.1177/1368431017710907

6. Daengneam, B., Deebhijarn, S., & Saengnoree, A. (2023). Integrative medicine and health training for Thai general practitioners (GP): A SEM Analysis. Journal of Higher Education Theory and Practice, 23(1), 75-88. https://tinyurl.com/mpjy6k49
7. Davis, L., Taylor, H., & Reyes, H. (2014). Lifelong learning in nursing: A Delphi study. Nurse Education Today, 34(3), 441-445. https://doi.org/10.1016/j.nedt.2013.04.014
8. DeMink-Carthew, J., Olofson, M. W., Legeros, L., Nercoh, S., & Hennessey, S. (2017). An analysis of approaches to goal setting in middle grades personalized learning environments. Research in Middle Level Education, 40(10), 1 – 11. https://doi.org/10.1080/19404476.2017.1392689
9. Doerr, J. (2019). Measure what matters**.** Penguin Random House.
10. Duţă, N., & Rafailă, E. (2014). Importance of the lifelong learning for professional development of university teachers–needs and practical Implications. Procedia-Social and Behavioral Sciences, 127, 801-806. https://doi.org/10.1016/j.sbspro.2014.03.358
11. Eschenbacher, S., & Fleming, T. (2020). Transformative dimensions of lifelong learning: Mezirow, Rorty and COVID-19. International Review of Education, 66(5), 657-672. https://doi.org/10.1007/s11159-020-09859-6
12. Dweck, C. (2000). Mindset: The new psychology of success. Random House Inc.
13. Federico, B., Dominik, T. M., Angelo, B., Alberto, D. L., Giulio, P., Guido, O. (2020) Digital transformation challenges: Strategies emerging from a multi-stakeholder approach. The TQM Journal, 32(4), 697-724.
14. García-Morales, V. J., Garrido-Moreno, A., & Martín-Rojas, R. (2021). The transformation of higher education after the COVID disruption: Emerging challenges in an online learning scenario. Frontiers in Psychology, 12, 616059. https://doi.org/10.3389/fpsyg.2021.616059
15. Han, J., & Yin, H. (2016). Teacher motivation: Definition, research development and implications for teachers. Cogent Education, 3(1), 1217819. https://doi.org/10.1080/2331186X.2016.1217819
16. Hannafin, M. J., Hannafin, K. M., & Gabbitas, B. (2000). Re-examining cognition during student-centered, web-based learning," Educational Technology Research and Development, 57, 767 – 785. http://tinyurl.com/hubppx64

17. Hair, J. F., Hult, G. T. M., Ringle, C. M., & Sarstedt, M. (2021). A primer on partial least squares structural equation modeling (PLS-SEM). Sage publications.
18. International Labour Office. (2010). A Skilled Workforce for Strong, Sustainable and Balanced Growth: A G20 Training Strategy. International Labour Office – Geneva. https://tinyurl.com/tvsktpfr
19. Kanawapee, C., Petsangsri, S., & Pimdee, P. (2022). The importance of sharing, caring and collaboration in Thai teacher competency development through online professional learning communities. Journal of Positive Psychology and Wellbeing, 6(1), 3674-3689. https://tinyurl.com/bdd9spm9
20. Kansaart, P., Suikraduang, A., & Panya, P. (2017). Developing the learning management evaluation model for fostering life skills in the 21st century of lower secondary students' school classes. European Journal of Education Studies, 3(3), 109-126. https://doi.org/10.5281/zenodo.270237
21. Kerdtip, C., & Angkulwattanakit, R. (2023). Thai school learning communities (SLC): An exploratory factor analysis. Journal of Higher Education Theory and Practice, 23(2), 226-237. https://tinyurl.com/mpjy6k49
22. Kezar, A., & Elrod, S. (2020). Taken for granted: Improving the culture of celebration, appreciation, and recognition in higher education," Change: The Magazine of Higher Learning, 52(5), 29-36. https://doi.org/10.1080/00091383.2020.1807880
23. King, J. A., Stevahn, L., Ghere, G., & Minnema, J. (2001). Toward a taxonomy of essential evaluator competencies. American Journal of Evaluation, 22(2), 229-247. https://tinyurl.com/2p9v4cck
24. Krishnamurthy, S. (2020). The future of business education: A commentary in the shadow of the Covid-19 pandemic. Journal of business research, 117, 1-5. https://doi.org/10.1016/j.jbusres.2020.05.034
25. Kuanysheva, B. T., Aubakirova, R. Z., Pigovayeva, N. I., & Fominykh, N. I. (2019). Technologization of the Pedagogical Process as a Teacher Self-Improvement Factor. Journal of Social Studies Education Research, 10(3), 404-433.
26. Kummanee, J., Nilsook, P., & Wannapiroon, P. (2020). Digital learning ecosystem involving STEAM gamification for a vocational innovator," International Journal of Information and Education Technology, 10(7), 533-539. https://doi.org/10.18178/ijiet.2020.10.7.1420
27. Laovanich, V., Chuppunnarat, Y., Laovanich, M., & Saibunmi, S. (2021). An investigation into the status of Thailand's music

education systems and organisation. British Journal of Music Education, 38(2), 131 - 144. https://doi.org/10.1017/S0265051720000327

28. Lessing, A., & De Witt, M. (2007). The value of continuous professional development: Teachers' perceptions. South African Journal of Education, 27(1), 53-67. https://tinyurl.com/mry6vxax
29. McClelland, D. C. (1973). Testing for competence rather than for intelligence. American Psychologist.
30. Mezirow, J. (1991). Transformative dimensions of adult learning. Jossey-Bass.
31. Mezirow, J. (2008). An overview on transformative learning. In Lifelong Learning, (pp. 40-54). Routledge.
32. Nipasuwan, N., Thanabordeekij, P., & Ussivakul, A. (2021). Towards a Learning Organization Learning How to Learn: A Key Competence for Sustainable Employment. Journal of ASEAN PLUS Studies, 2(2), 40-65. https://tinyurl.com/4umz2yyp
33. Nonthamand, N., & Songkhla, J. N. (2018). The correlation of open learning, collaboration, learning tools, and creative problem solving by graduate students in Thailand. International Journal of Emerging Technologies in Learning, 13(9), 280 – 289. https://doi.org/10.3991/ijet.v13i09.7835
34. Office of the Education Council Secretariat. (2017). National Scheme of Education 2017-2036. Office of the Education Council Secretariat Ministry of Education. https://tinyurl.com/5t24wcs4
35. Phuapan, P., Viriyavejakul, C., & Pimdee, P. (2015). An Analysis of digital literacy skills among Thai university seniors. International Journal of Emerging Technologies in Learning, 11(3), 24 – 31. https://doi.org/10.3991/ijet.v11i03.5301
36. Piriyaphokanont, P., & Sriswasdi, S. (2022). Using technology and drama in education to enhance the learning process: A conceptual overview. International Journal of Information and Education Technology, 12(7). https://doi.org/10.18178/ijiet.2022.12.7.1670
37. Prapatsaranon, P., Tuntivivat, S., & Poonpol, P. (2022). Assessing how goal setting and motivation development affects Thai financial institution sales officers' learning engagement. Journal of Higher Education Theory and Practice, 22(16), 74-86. https://doi.org/10.33423/jhetp.v22i16.5602
38. Resiser, R., & Dempsey, J. (2018). Trends and Issues in Instructional Design and Technology (4th ed.), Pearson.
39. Robbins, M. (2019). Why employees need both recognition and appreciation. Harvard Business Review.

https://tinyurl.com/35c5swjd

40. Robinson, C. (2017). Growth mindset in the classroom. Science Scope, 41(2), 18. https://tinyurl.com/v28hnyxe
41. Seaton, F. S. (2018). Empowering teachers to implement a growth mindset. Educational Psychology in Practice, 34(1), 41-57. https://doi.org/10.1080/02667363.2017.1382333
42. Selvi, K. (2011). Teachers' lifelong learning competencies**.** International Journal of Curriculum and Teaching, 1(1), 61-69. https://www.ijocis.com/index.php/ijocis/article/view/52
43. Sermsri, N., Sukkamart, A., & Kantathanawat, T. (2022). Thai computer studies student teacher complex problem-solving skills development: A cooperative learning management model. Journal of Higher Education Theory and Practice, 22(16), 87-99. https://doi.org/10.33423/jhetp.v22i16.5603
44. Siddoo, V., Sawattawee, J., Janchai, W., & Thinnukool, O. (2019). An exploratory study of digital workforce competency in Thailand. Heliyon, 5(5), e01723. https://doi.org/10.1016/j.heliyon.2019.e01723
45. Sinlapasakkhajorn, N. & Unaromlert, T. (2015). The study of issues and obstacles facing the use of media and technology for education in primary school the Province Nakorn Pathom. Veridian E-Journal, Silpakorn University, 8(2), 628 – 638. https://tinyurl.com/nn3rfhkp
46. Sittisak, R., Sukkamart, A., & Kantathanawat, T. (2022). Thai pre-service teacher learning management model development for online learning and coaching. Journal of Higher Education Theory and Practice, 22(12), 23-37. https://doi.org/10.33423/jhetp.v22i12.5460
47. Spencer, M. & Spencer, M. S. (1993). Competence at work: Models for Superiors Performance. John Wiley & Sons.
48. Srinuan, C. & Srinuan, P. (2021). Determining spectrum caps and service efficiency: A case study of mobile operators in Thailand. Telecommunications Policy, 102225. https://doi.org/10.1016/j.telpol.2021.102225
49. Taguma, M., & Barrera, M. (2019). OECD future of education and skills 2030: Curriculum analysis. https://tinyurl.com/5eeh57jn
50. Tan, K. S., & Tang, J. T. (2016). New skills at work: Managing skills challenges in ASEAN-5. https://tinyurl.com/ye8235dx
51. Trust, T., Krutka, D. G., & Carpenter, J. P. 2016). Together we are better: Professional learning networks for teachers. Computers & Education, 102, 15-34. https://doi.org/10.1016/j.compedu.2016.06.007

52. UNESCO. (2020, April 21). Education Minister Nataphol Teepsuwan on COVID-19 strategy in Thailand. https://tinyurl.com/4kev72z5

53. Uzunboylu, H., & Koşucu, E. (2017). Comparison and evaluation of Seels & Glasgow and Addie instructional design model. International Journal of Science and Research, 73(6), 98-112. https://tinyurl.com/yswp6bfh

54. Wannapiroon, N., & Pimdee, P. (2022). Thai undergraduate science, technology, engineering, arts, and math (STEAM) creative thinking and innovation skill development: a conceptual model using a digital virtual classroom learning environment. Education and Information Technologies, 1-28. https://doi.org/10.1007/s10639-021-10849-w

55. Watnayoo, C., Toonthong, S., & Chalaywares, N. (2019). Developing the 21st century skills on information, media, and technology on computer creativity towards learning for Grade 5 students using coaching. Thai Journal of Science and Technology, 10(1), 1 – 16. https://tinyurl.com/3s5m5zm7

56. Wiley, C. (1998). What motivates employees according to over 40 years of motivation surveys. International Journal of Manpower, 18(3), 263-280, https://doi.org/10.1108/01437729710169373

57. World Bank. (2018). Lifelong Learning. https://doi.org/10.1596/978-1-4648-1328-3_ch4