

Development of a Collaborative Network Management Model (CNMM) to Improve Thai Student Learning Quality

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Results from the end-of-the-year 2020 test of Thai Mathayom Suksa 3 (9th Grade) students revealed that 20% failed to pass the assessment standards. Therefore, the researchers set out to study which factors affected the development of a collaborative network management model (CNMM) to develop learning quality within Thailand's Secondary Education Service Area Office in Surat Thani and Chumphon (SESAOSC) provinces. After a panel of 17 experts determined the five main components, 351 individuals subsequently participated in a needs analysis from which the PNI modified values and desirable condition gaps were ranked. From highest to lowest were network characteristics, knowledge exchange and development of network members, operational processes of the cooperation network, network administration, and network objectives and goals vision. From the experimental use of the CNMM with 168 learners in 56 schools, a determination was made that 9th Grade learning quality had a total mean increase of 1.53%, with morality and ethics increasing by 1.65%, basic knowledge increasing by 1.38%, thinking ability increasing by 1.63%, and learner competency increasing by 1.41%.

Keywords: cooperation networks, educational administration, learner quality, PNI modified, Thailand

INTRODUCTION

In a postmodern digital world, each country is trying to create a new development paradigm in the context of change in all dimensions, be it political, administrative, economic, social, or educational dimensions (Raschke, 2002). Moreover, it can be said that education is an essential tool in raising the quality of a nation's human resources and is the primary mechanism for developing, promoting, cultivating ideas, and educating individuals.

Technological advances also play a critical role in how digitally enabled 21st-century Generation Z students are taught by higher education (HE) institutions and their teachers (Binheem et al., 2021; Moto et al., 2018). Since the beginnings of the global COVID-19 pandemic in early 2020, there has been a massive upheaval in how education is being delivered and how this New Normal is being administered

(Ruenphongphun et al., 2022; UNESCO, 2020). Therefore, COVID-19 has forced university academics to study and understand the critical nature of online training for student teachers, staff teachers, and administrators (Kanawapee et al., 2022).

Numerous studies have been published since the COVID-19 pandemic caused schools to terminate traditional classroom learning methods and move to online and remote learning formats. In Thailand, this has been particularly so. Therefore, teachers and administrators have been forced to embrace these newer digital technologies and frequently learn to use them effectively, with no outside training or learning assistance (UNESCO, 2020).

However, as a solution to this learning dilemma, some authors have proposed Internet-enabled networking solutions for student learning and teacher collaboration (Nacu et al., 2016). These ideas are supported by Gupta et al. (2011), whose research team proposed a 3D meeting application based on virtual reality (VR) and Web 3.0 between students and teachers.

In Thailand, Kanawapee et al. (2022) detailed how online professional learning communities (PLCs) highly influenced teacher development and support. Similarly, Phiraisaengchan et al. (2021) developed a collaborative network model to promote learning management efficiency. Success was stated to come from sharing the participants thinking, planning, operations, supervision, follow-up, evaluation, and a success appreciation step.

Furthermore, education in Thailand is now stated to be a fundamental right of all Thai people. Therefore, the state is tasked with providing its citizens with the appropriate education they need to be prosperous and have the ability for life-long learning (Changwong et al., 2018).

However, the road to achieving these goals has been long, as it has taken Thailand 26 years to transition to an upper-middle income economy from a lower-middle income economy (Benyaapikul, 2021). Currently, in Thailand, numerous initiatives have been proposed to accelerate this change, including Thailand 4.0 (Baxter, 2017; Duangpummes & Kaewurai, 2017), which is an economic model for economic prosperity, social wellbeing, the increase of human values, and a sustainable environment protected by regulation and law. It should be noted that under the goals listed for human values are the goals that Thailand moves into the top fifty developed countries while simultaneously placing five Thai universities into the top 100 global HE institutions within 20 years (Day et al., 2021).

Given these lofty goals, educational institutions must create quality workers to meet the needs of a rapidly changing workplace (Asok et al., 2016; Phurikultong & Tuntiwongwanich, 2021). They must be digitally savvy knowledge workers who are capable, have patience and perseverance, and are not easily discouraged (Prommun et al., 2022). These future workers must have analytical, critical, and creative thinking skills, which they can apply in their professions and life-long learning (Sitthipon, 2012).

Problem Statement

In recent years Thailand's scores from the *Programme for International Student Assessment* (PISA) have been anything but stellar, with results from the 2018 assessment lower than those from the 2015 PISA assessment (Mala, 2019; Schleicher, 2020). This fact has led to numerous comments in multiple studies since then (Pholphirul & Teimad, 2018; Srijamdee & Pholphirul, 2020). As the PISA is designed to assess each country's educational system quality, it focuses on three areas, including reading literacy, mathematical literacy, and scientific literacy. However, when the Thai PISA 2018 was compared to the PISA 2015 results, it was determined that Thai students scored 426 points in science, significantly below the international average of 489 (Mala, 2019). Moreover, Thais scored 419 points in mathematics, well beneath the OECD average of 489 points. Thailand's reading performance in PISA 2018 was also lower than in any previous assessment and 16 points lower than in PISA 2015 (Mala, 2019). Within Thailand, there are four levels of educational quality assessment: grade level assessment, school level assessment, educational area level assessment, and national assessment. Stated simply, results of the National Basic Education Test (O-NET) have decreased yearly and tend to be worrisomely low (Mala, 2021). Therefore, methods must be found to improve learning quality by developing a collaborative network management model.

THEORIES AND CONCEPTS IN RESEARCH

Pattern and Model Theories

A model is a rational correlation structure of factors or variables or essential elements of a study, which helps simplify the understanding facts or phenomena (Keeves, 1988). Models are also used to create concepts utilizing objective reasoning to achieve clarity in a conceptual framework. According to Jabareen (2009), an analysis of a conceptual framework allows one to build conceptual frameworks based on grounded theory methods. The composition of the model depends on the specific nature of the phenomenon of interest to be studied. There is no definition of what, how many, or how the models are structured and related. It depends on the phenomenon being studied, the conceptual theory's design, and the basic principles for defining each model as the main one (Maxwell, 2013). For creating this study's research model, essential elements are considered for a management model using a network of cooperation to develop learners' quality in educational institutions. These include *network characteristics, knowledge exchange, network member development, a collaborative network management model (CNMM) operational process, network administration, and vision determination* (Kanawapee et al., 2022; Phiraisaengchan et al., 2020; Shindler, 2009).

Cooperation Networks

Networks and collaboration concepts cannot be separated from each other because when there is a network without cooperation, it cannot achieve the goals or objectives that have been set. It can be said that the network is an essential factor in creating cooperation by providing opportunities for organizations to work together, resolve a problem, or define an activity (Agranoff, 2006). This can also include creating knowledge in various fields, sharing resources, and finding ways to practice and work together under the network context. This is an operation that is not under a chain of command; instead, it is a voluntary collaboration without any coercion or directive from any organization (Smith & Wohlstetter, 2006).

Various forms of collaborative networks have been identified in various studies. These include information networks, developmental networks, outreach networks, online professional learning communities, and action networks (Agranoff, 2006, 2007; Kanawapee et al., 2022; Phiraisaengchan et al., 2020). Thus, a cooperation network links an operating environment and the roles of individuals, organizations, agencies, and government sectors. They function voluntarily under the need for a common purpose, collaborative thinking, joint decision-making, and co-planning. Participation in follow-up evaluations and jointly improving and solving problems for better development is essential.

Learner Quality

The Thai National Education Plan (NEP) (2017-2036) is a long-term plan under the provisions of the National Education Act, based on 'people' at the center of its development goals (EduBright Resources, 2018). The NEP's main education management principles include education for all, inclusive education, the philosophy of the sufficiency economy, and the principle of participation of all sectors. Stated objectives also include providing more opportunities and equal access to quality education, developing digital technology, and collaborative learning and teaching management networks.

Context and Policy of the Secondary Education Service Area Office for Surat Thani and Chumphon (SESAOSC) Provinces

The SESAOSC is an educational agency under the supervision of the Office of the Basic Education Commission (OBEC) under Thailand's Ministry of Education. SESAOSC is responsible for providing primary education at the secondary level in Surat Thani Province and Chumphon Province. SESAOSC consists of five United Campus Networks, whose stated goal it to be a leader in developing the learner's education quality to international standards. Specific quality goals include increasing O-Net scores each year while assuring learners have the knowledge, abilities, competencies, and essential 21st-century skills. Additionally, SESAOSC is dedicated to developing student morals, ethics, and desirable characteristics and ensuring students develop life and professional skills according to their abilities and aptitudes. It is also

hoped that learners will achieve the ability to compete internationally while also retaining their Thai identity (Thainess) in accordance with the philosophy of sufficiency economy, and that all learners have life skills, professional skills, morality, ethics, and public mind (NESDEC, n/d).

CONCEPTUAL METHODS AND RESEARCH FRAMEWORK

The study intended to develop a management model using collaborative networks to improve learner quality in educational institutions under the Secondary Educational Service Area Office Suratthani Chumphon (SESAOSC) by using both a research and development (R&D) process and a mixed methods research. The research procedures for the study used three steps (Figure 1).

Step 1

The first step involved a needs assessment of the actual operating conditions and the desired operating conditions of individuals involved in using the proposed Collaborative Network Management Model (CNMM) within the SESAOSC-defined schools. The researchers first used the index of item - objective congruence index (IOC) and the Priority Needs Index Modified (PNI_{Modified}) for the sample group of 351 personnel selected from SESAOSC.

According to Wongwanich (2015), every individual's needs change with time because of their desire for more 'needs.' However, it is possible to develop a systematic process for determining and addressing needs, or 'gaps,' between current conditions and the 'gap.' Therefore, the study adopted and used a modified priority needs index (PNI_{Modified}) to evaluate the *intended condition* (I) and the *desired condition* (D) of the study's 351 participants (Wongwanich & Wiratchai, 2005). Thus, the PNI_{Modified} formula functions as a robust tool for calculating the differential value between the *intended outcome* (I) and the *desired results* (D) (Thammasaeng et al., 2016). The formula to do this is:

$$PNI_{Modified} = (I - D)/D \quad (1)$$

PNI = priority needs index

I = the mean for the *intended* outcome

D = the mean for the *desired* results

Step 2

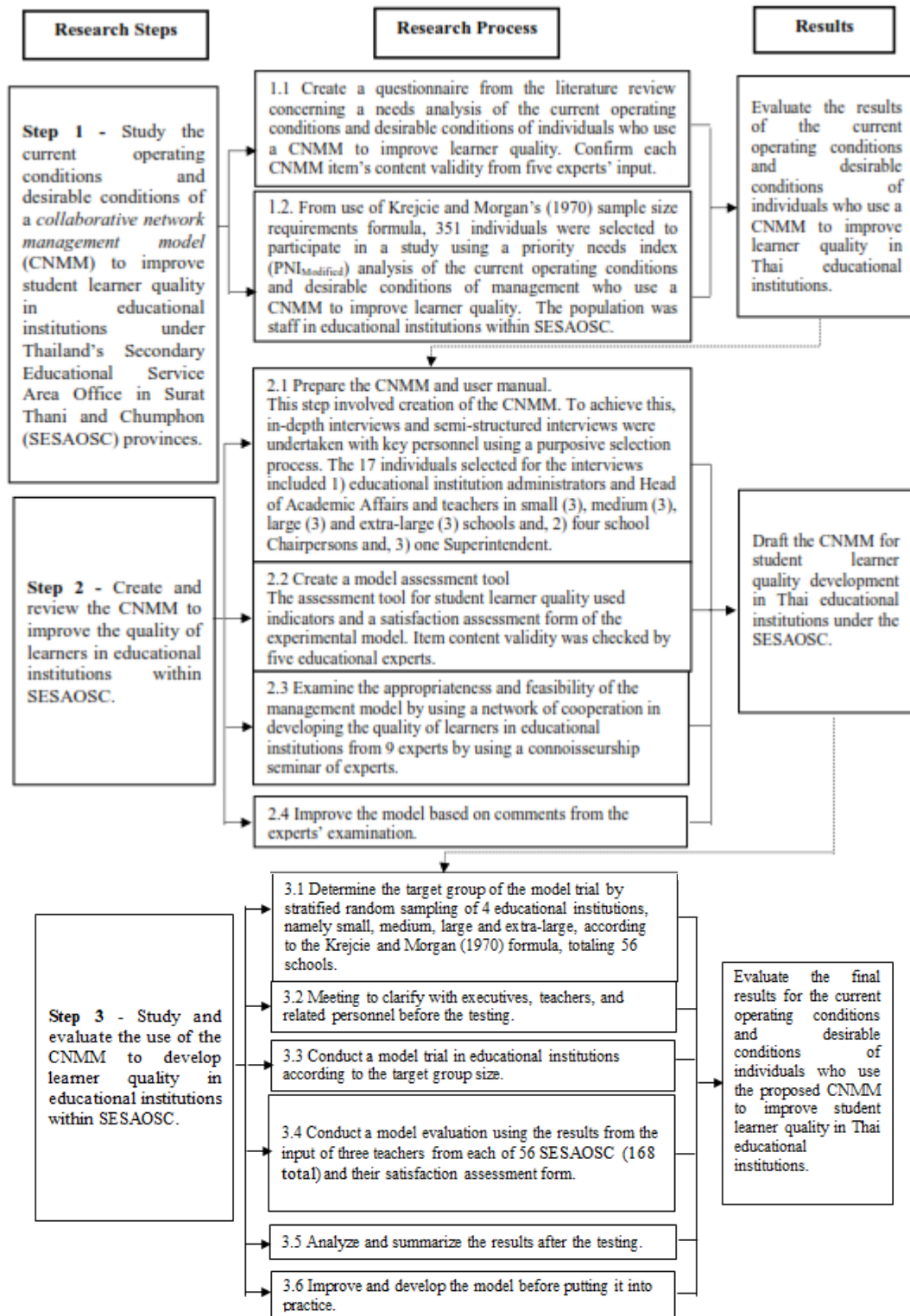
The second step was the actual creation of the CNMM to develop learner quality within SESAOSC schools. To achieve this, in-depth interviews and semi-structured interviews were undertaken with crucial personnel using a purposive selection process. The 17 individuals selected for Step 2's interviews included 1) educational institution administrators and Head of Academic Affairs and three teachers each in small, medium, large, and extra-large schools and, 2) four school chairpersons and, 3) one superintendent.

Moreover, the final development of the CNMM involved nine additional individuals, three of whom were senior executives of Thailand's OBEC, three academics with the rank of assistant professor or higher, and three additional teachers in SESAOSC schools. They participated in a connoisseurship panel of experts (Khongprakob & Kantathanawat, 2021).

Step 3

The third step involved using and evaluating the CNMM within 56 SESAOSC schools (3 individuals per school x 56 schools=168 total) by using quasi-experimental research methods based on the indicators and a satisfaction assessment form to confirm the feasibility before implementing the CNMM. The draft model and management manual were adjusted and modified during this process.

**FIGURE 1
RESEARCH MODEL**



RESULTS

Needs Assessment Results

The results for the needs assessment of current operating conditions and desirable conditions were divided into two parts which partially used future research techniques as detailed in studies using Ethnographic Delphi Futures Research (EDFR) methodology (Mattavarat et al., 2017).

The Results of the PNI_{modified} Analysis of Actual Intended Conditions and Desired Operating Conditions of CNMM Users

The results revealed that the actual operating conditions were at a high-level (mean = 4.23), and the desired operating condition was at the highest level (mean = 4.55). The t-test results also showed that the calculated t-value was 14.56, higher than the t-test. t at the critical point ($t(.01,df(350))$ Sig.(2-tailed) = .000) at the .01 significance level indicating that management conditions in using collaborative networks have higher desirable operating conditions than actual operating conditions.

According to the analysis of PNI_{modified} values and desirable condition gaps ranked from the highest to the lowest mean, were *network characteristics* (PNI_{modified} = 0.10, Gap = 0.40), followed by *exchange of knowledge and development of network members* (PNI_{modified} = 0.09, Gap = 0.38), *operational processes of the cooperation network* (PNI_{modified} = 0.08, Gap = 0.35), *network administration* (PNI_{modified} = 0.07, Gap = 0.30), and *network objectives and goals vision* (PNI_{modified} = 0.05, Gap = 0.19), respectively.

The Mean Aspect Results for CNMM Needs Analysis

The study's results were as follows:

1. **Network Characteristics** - The actual operating condition was at a high-level (mean = 4.11), and the desired operating condition was at the highest level (mean = 4.51). Overall, there was a gap between desired and actual operating conditions of 0.40.
2. **Vision Determination** – The actual operating condition in the determination of the vision, objectives, and goals of the network was at a high-level (mean = 4.38). However, the desired operating condition was at the highest level (mean = 4.57). Overall, there was a gap between desired and current operating conditions of 0.19.
3. **Network Administration** - The current operating condition was at a high-level (mean = 4.25), and the desired operating condition was at the highest level (mean = 4.55). Overall, there was a gap between desired and realistic operating conditions equal to 0.30.
4. **The CNMM Operational Process** -The current operating condition was at a high level (mean = 4.25), and the desired operating condition was at the highest level (mean = 4.60). Overall, there was a gap between desired and current operating conditions of 0.35.
5. **Knowledge Exchange and Network Member Development** - The current operating condition was at a high-level (mean = 4.11), and the desired operating condition was at the highest level (mean = 4.51). Overall, there was a gap between desired operating conditions and realistic operating conditions of 0.38.

Results of Creating a Collaborative Network Management Model (CNMM)

The Result of Creating a Pattern of In-Depth Interviews

The in-depth interviews and semi-structured interviews with 17 key informants concerning the composition of the CNMM to improve the quality of learners in educational institutions within SESAOSC should have five main aspects. These include:

1. **Network Characteristics** – Collaborative networks should embrace three main elements. These are a common philosophy, a shared vision for the network's use, and what are the objectives. Moreover, there should be network advisory, management committees, and a shared collaborative mission (Phiraisaengchan et al., 2020).

2. **Knowledge Exchange and Network Member Development** - There must be an exchange of knowledge among teachers between schools, with the local community, parents, and teachers within subject groups (Kanawapee et al., 2022).
3. **The CNMM Operational Process** is an administrative process within an educational organization's staff to establish common objectives to make educational activities achieve the goals (Kanawapee et al., 2022).
4. **Network Administration** – According to the experts, a cooperative management structure needs to be established to discuss curriculum development issues (Shindler, 2009).
5. **Vision Determination** – The vision determination for the CNMM involves establishing objectives and goals for learning quality improvement that meets the country's development needs. This also included the determination of objectives and indicators of goals for improving the quality of learners in terms of learner competency, thinking ability, morality, ethics, and basic knowledge to develop the quality of learners with the highest quality and efficiency (Ministry of Education, 2008; NESDEC, n/d).

Model Assessment Results from the Expert Connoisseurship Seminars (ECS)

The CNMM evaluation used a systematic process in which input, process, output, and output, along with feedback, are used as model components (Salam, 2015). They are detailed as follows (Figure 2).

Step 1 – Input consists of a 1) network administration structure, 2) network management regulations and mechanisms, 3) educational management objectives and goals, 4) indicators of learner quality and 5) network management factors. The network includes personnel, materials, equipment, budget, and management.

Step 2 - Process includes implementation of a PDCA management model using a collaborative network (Huang & Wongthai, 2019). Elements include 'P' for a *plan* to create understanding, defining the direction (vision, objectives, and goals), and defining the roles and duties in the preparation of an action plan, 'D' is to *do* a meeting to clarify knowledge and understanding in the implementation of the model, 'C' is to *check* the supervision, monitoring and evaluation of the performance according to the learner quality development plan, 'A' is for *action* to improve performance.

Step 3 – Output involves the quality of learners in four aspects. These include 1) morality and ethics, 2) basic knowledge, 3) thinking ability, and 4) learner competency (Ministry of Education, 2008).

Step 4 - Outcome involved values, beliefs, faith, parents, and community satisfaction towards schools and, just as important, Feedback, which is identifying needs, expectations, changing situations and contexts, and results of operations or reports.

The effectiveness results of the CNMM found that overall it was at the highest level (mean = 4.50) in terms of suitability, at the highest level (mean = 4.58) in terms of possibility, at the highest level (mean = 4.76) on its usefulness, and overall at the highest level (mean = 4.80).

The CNMM Satisfaction Assessment Results

Results of an Experimental Model Study

The CNMM for the development of learners within SESAOSC schools was tested with 56 schools that used a model and management manual to evaluate four aspects of learning to consist of 1) *morality and ethics*, 2) *basic knowledge*, 3) *thinking ability*, and 4) *learner competency* (Chardnarumarn et al., 2021).

Results of the Learner Quality Assessment Pre-Test and Post-Test Model Trials

Assessing the quality of learners in educational institutions within the SESAOSC schools before and after the experimental model of 56 experimental groups was used by comparing the results of the student quality assessment in educational institutions between the first semester of the academic year 2021 and the first semester of the academic year 2022. From this, it was determined that the results of the quality assessment of learners in educational institutions at secondary school level 3 (9th Grade-Mathayomsuksa 3) after the model's experiment had a total mean increase of 1.53%. After the results were broken out for each of the four aspects, it was determined that *morality and ethics* increased by 1.65%, basic knowledge

increased by 1.38%, *thinking ability* increased by 1.63%, and *learner competency* increased by 1.41% (Table 1).

FIGURE 2
CNMM FOR THIA STUDENT LEARNER QUALITY DEVELOPMENT

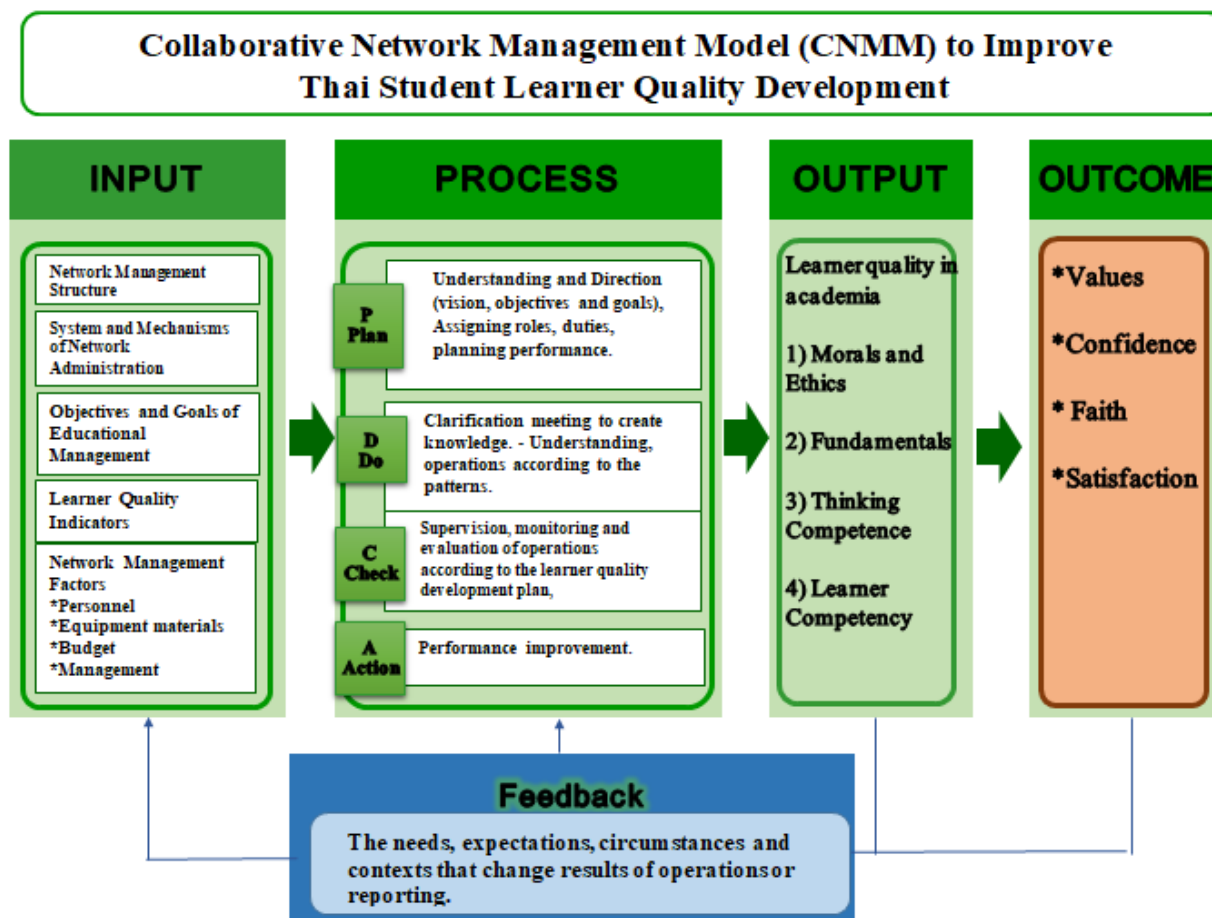


TABLE 1
EDUCATIONAL ASPECTS ANALYSIS RESULTS FOR 9TH GRADE THAI STUDENTS

Educational aspects of Thai 9th Grade student learners	Assessment result (%) Semester 1 Academic Year		Difference	Results
	2021 (before)	2022 (after)		
morality, ethics	91.83	93.48	1.65	higher
basic knowledge	80.59	82.03	1.38	higher
thinking ability	81.46	83.09	1.63	higher
learner competency	85.33	86.74	1.41	higher
Summations	84.80	86.34	1.53	higher

Satisfaction Assessment Results to Confirm the Practicality of the Model

At the end of the CNMM development and testing, the researchers organized the 56 experimental school personnel who participated in the study to take a satisfaction assessment. This included 156

educators/administrators, including three from each SESAOSC school. One individual was the school's administrator, one was a deputy administrator or head of the academic department, and the third individual was a staff teacher.

CONCLUSION

The study evaluated which factors played a role in developing a collaborative network management model (CNMM) to develop learning quality within Thailand's Secondary Education Service Area Office in Surat Thani and Chumphon (SESAOSC) provinces. After a panel of 17 experts determined the five main components, 351 individuals participated in a needs analysis from which the PNI_{modified} values and desirable condition gaps ranked from the highest to the lowest mean, were *network characteristics* ($PNI_{\text{modified}} = 0.10$, gap = 0.40), followed by *exchange of knowledge and development of network members* ($PNI_{\text{modified}} = 0.09$, gap = 0.38), *operational processes of the cooperation network* ($PNI_{\text{modified}} = 0.08$, gap = 0.35), *network administration* ($PNI_{\text{modified}} = 0.07$, gap = 0.30), and *network objectives and goals vision* ($PNI_{\text{modified}} = 0.05$, gap = 0.19), respectively. Subsequently, an expert panel of 17 academics concluded that the CNMM should contain five main aspects: *network characteristics, knowledge exchange and network member development, a CNMM operational process, network administration, and vision determination*. From the experimental use of the CNMM, it was determined that the quality assessment of learners in educational institutions at secondary school level 3 (9TH Grade-Mathayom Suksa 3) after the model's experiment had a total mean increase of 1.53%. After the results were broken out for each of the four aspects, it was determined that *morality and ethics* increased by 1.65%, basic knowledge increased by 1.38%, *thinking ability* increased by 1.63%, and *learner competency* increased by 1.41%.

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