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The Interdisciplinary Research Review (IRR) was established with academic cooperation by the Nakhon Pathom Rajabhat University, The Royal Society of Thailand Committee of Interdisciplinary Research and Development, Rajabhat University (Western Group), and Rajamangala University of Technology Rattanakosin. This Issue, Volume 15 Number 5 (September – October 2020). This issue contains of seven interesting articles in multidisciplinary fields: (1) Soil water retention curve and permeability function of the para rubber biopolymer treated sand, (2) Lifestyles of Myanmar migrant workers under Thai socio-cultural context: A challenge of state management in the future, (3) Administration model of civil state schools to improve the quality of education, (4) Disaster management program compliance and problems encountered in two provinces in Central Luzon, Philippines, (5) Evaluation of water footprint of Phitsanulok-2 rice yield under alternate wetting and drying cultivation in dry season, (6) The development of life and family curriculum according to theory of reasoned action in association with active learning concept, and (7) The model of integrated learning management to develop learning in the 21st century for students of Northeast Sports School.

The Editorial Board of the IRR encourages anyone to submit articles for evaluation and review. The processes of submission, review and publication of articles are described on the journal's website, <https://www.tci-thaijo.org/index.php/jtir>. The Editorial Board and Committees of the IRR sincerely thank all peer reviewers who have sacrificed their time to help us produce a better journal, and also wish to thank all teachers, researchers and other academicians for submitting their valuable research to this journal. Finally, we thank readers of our journal who help to spread the knowledge and benefits gained to others. With your feedback and suggestions, we will strive to improve the quality and relevance of the IRR.

Yongyudh Vajaradul
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Soil water retention curve and permeability function of the para rubber biopolymer treated sand

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Abstract

Unsaturated flow phenomena impact all the geotechnical engineering applications. Requirements the understanding include seepage, shear strength, and volume change behaviors of unsaturated soil are important. Since several researchers have put efforts to conduct a potential of biopolymer for soil improvement for the last decade. This paper aimed to conduct a comprehensive experimental study on soil water retention curve (SWRC) and a permeability function prediction of para rubber (PR) biopolymer treated sand. Sand-para rubber (SPR) mixtures were prepared with sand being the base material and with different PR contents (15%, 17.5%, 20%, and 22.5%). A series of laboratory tests were conducted including the filter paper method and falling head test. The results showed that the wetting SWRC of the four SPR mixtures is significantly different compared with untreated sand which tends to give a higher value of saturated volumetric water content and water entry suction. The permeability test result displayed that the values of saturated hydraulic conductivity decreased with increasing PR content. The shape of the unsaturated hydraulic conductivity curve is quite similar for all SPR mixtures but values vary in three orders of magnitudes compared with a value of untreated sand. This experimental study showed the remarkable effectiveness of the in the wetting SWRC shape and hydraulic conductivity function of the poorly graded sand. The results also indicated that the para rubber significantly influenced on the pore size distribution of the SPR mixtures.

Keywords: para rubber, soil suction, water content, hydraulic conductivity, biopolymer

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1. Introduction

The majority of geotechnical engineering applications occur in the vadose zone. Unsaturated soil applications include foundations, excavation, landslide, compacted soil, and contaminant migration [1]. Since the main aims of ground improvement can be summarized as follows: to increase bearing capacity, decrease settlement, control shrinking and swelling, control permeability, and reduce susceptibility to liquefaction [2]. While, the unsaturated soil problems require the understanding of broad behavior include seepage, shear strength, and volume change behaviors. The last decade has seen significant growth of research on biopolymer (e.g., starch, beta-glucan, xanthan gum, gellan gum, agar, polyacrylamide, and guar gum) application to geotechnical engineering, especially for soil stability and improvement purposes [3]. Researchers have found that biopolymers are an alternative to conventional construction materials and soil stabilization. For instance, that can enhance the

shear strength characteristic [4-6], mitigating seismic-induced liquefaction [7], erosion resistance [8-9], and decreased hydraulic conductivity [10-11] of granular soil.

Natural rubber latex (herein referred to para rubber, PR), an elastomer that was originally derived from the sap of para rubber plant, has been successfully used as a civil engineering material. An advantage property of para rubber comprises excellent dynamic properties with a low hysteresis loss, good low-temperature properties, strong bonding, and high resistance to tear and abrasion. For geotechnical engineering works, many efforts on investigating a potential of PR used as an admixture in soil improvement have been carried out on shear strength behavior [12], mechanical properties of geosynthetic clay liner [13], para rubber soil-cement road [14], and drought relieving water pond [15]. These study results suggest the potential utility of PR as a cementation material for geotechnical engineering purposes. Nevertheless, the previous studies did not explore associate with unsaturated soil context.

The constitutive relationship between water content or degree of saturation and matric suction of unsaturated soil represents by the soil water retention curve

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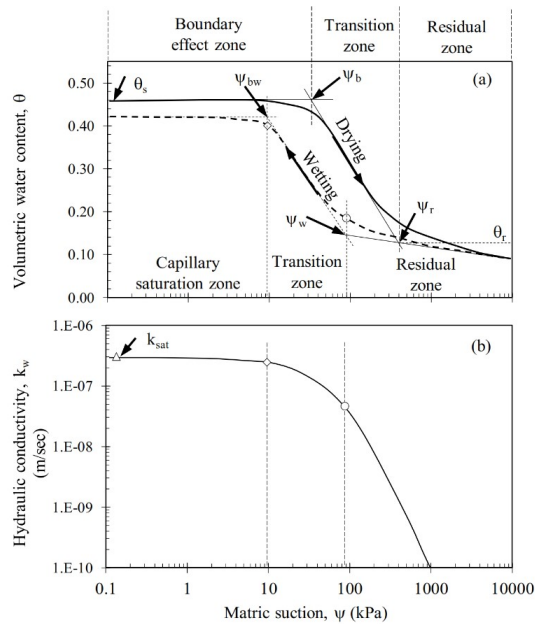


Figure 1: Typical (a) SWRC and (b) unsaturated hydraulic conductivity function.

(SWRC). SWRC is also referred to as soil water characteristic curve or capillary pressure curves. While in unsaturated soil, hydraulic conductivity is the most crucial parameter which affected on flow process in this zone. Fig. 1a illustrates a typical SWRC that includes drying (desorption) and wetting (adsorption) processes associated with unsaturated hydraulic conductivity varies with soil suction as shown in Fig. 1b. There are various devices and techniques for measuring soil suction of unsaturated soils, among which the filter paper (FP) method is relatively uncomplicated and economical. The FP method has also been used in geotechnical engineering applications by several researchers which showed a reliable soil suction measurement. For example, shear modulus behavior of compacted lateritic soil [16], shear strength of an expansive soil by combining the PF method and direct shear tests [17], compacted subgrade soil [18], and compacted loess soil [19].

Thus, the objective of this paper is to investigate on the SWRC and permeability function prediction of four sand-para rubber (SPR) mixtures. A series of laboratory tests including the FP method and falling head test is conducted. Wetting SWRC was tested and best-fitted using the Fredlund and Xing (1994) [20] equation and unsaturated hydraulic conductivity of the SPR mixtures was estimated using the equation of Fredlund et al. (1994) [21]. Finally, the fitting parameters obtained and the PR affected by sand characteristics have been discussed.



Figure 2: Materials used in this experiment; (a) sand and (b) para rubber.

2. Materials and Methods

2.1 Materials

2.1.1 Sand

The sample of sand used in this study (Fig. 2a) was collected from the Songkhla Province area, Southern Thailand. The grain size distribution curve of sand is displayed in Fig. 3. The particle size ranged from 0.150 to 1.200mm. Sand is classified as poorly graded sand (SP) according to USCS classification. The coefficient of uniformity (C_u), coefficient of curvature (C_c), specific gravity (G_s), effective grain size (D_{10}), and other soil properties are presented in Table 1.

Table 1. Physical and mechanical properties of sand used in this experiment.

Properties	Value
Specific gravity, G_s	2.640
D_{10} (mm)	0.260
D_{50} (mm)	0.430
D_{60} (mm)	0.480
Coefficient of uniformity, C_u	1.846
Coefficient of curvature, C_c	1.068
Minimum void ratio, e_{min}	0.640
Maximum void ratio, e_{max}	0.880
Minimum dry density, ρ_{dmin} (g/cm ³)	1.399
Maximum dry density, ρ_{dmax} (g/cm ³)	1.603
Soil type (USCS)	Poorly graded sand (SP)

2.1.2 Para rubber

Para rubber latex (Fig. 2b) is a stable colloidal dispersion of polymeric materials in an aqueous medium and that is commercially available [22]. High ammonia centrifuged latex was used in this study with ammonia content of 0.700%. The significant physicochemical parameters (Table 2) comprise dry rubber content (DRC) of 60.050%, total solid content (TSC) of 61.730%, volatile fatty acid (VFA) number of 0.024, alkalinity, potassium hydroxide (KOH) number of 0.645, a viscosity of 59.200 centipoises, and specific gravity (at 25°C) of 0.945.

2.2 Experiment program

A report of Lukjan et al. (2019) [12] indicated that a PR content about 18% by weight of dry sand yields

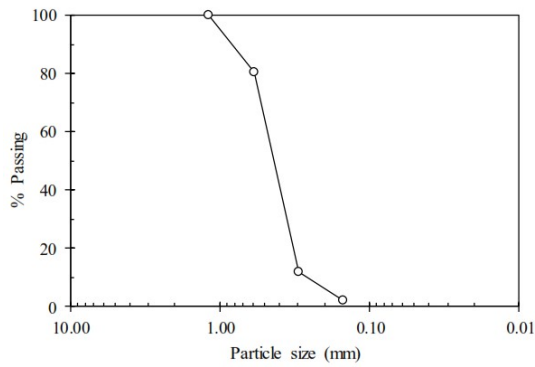


Figure 3: Grain size distribution curve of the poorly graded sand.

an optimum content which improved shear strength of the poorly graded sand. Therefore, sand-para rubber (SPR) mixture of four mix proportions was prepared in this experiment. In preparation for wetting SWRC and permeability tests, sand was oven-dried at 105 °C for 24 h before mixing with PR. Four SPR mixtures include SPR15, SPR17.5, SPR20, and SPR22.5 corresponding to the PR content of 15, 17.5, 20, and 22.5% by weight of dry sand, respectively (Table 3). Soil suction measurement and permeability tests are described as following.

Table 2. Physicochemical parameters of para rubber.

Properties	Value
Dry rubber content, DRC (%)	60.050
Total solid content, TSC (%)	61.730
Ammonia content (%)	0.700
Volatile fatty acid number, VFA	0.024
KOH number	0.645
Viscosity (cps.)	59.200
Specific gravity at 25 °C	0.945

Table 3. Description of sand-para rubber (SPR) mixtures used in this experiment.

Mixtures	PR content (%)	Initial Dry density (g/cm ³)
SPR15	15	1.441
SPR17.5	17.5	1.520
SPR20	20	1.544
SPR22.5	22.5	1.460

2.2.1 Soil suction measurement

The sample high affected in the SWRC test was suggested by Silva et al. (2018) [23] which recommended using soil samples not more than 25 mm. Therefore, the tests were performed with a sample of 60.500mm diameter and 12.500mm height. The preparation process of the SPR specimens comprised: (1) weighing and mixing sand with PR at a specific proportion; (2) tamped with 25 strokes of tamping rod in a mold; (3) oven-dried at 105 °C for 24 h and then allowed to cool

at room temperature; (4) wetted by spraying water on the dried SPR specimens to achieve a series of a targeted degree of saturation approximately 10% to 90%; (5) sealed inside plastic jars at 25 °C room for 48 h to ensure the moisture equalization and; (6) conducted following the filter paper method procedure according to ASTM D5298-03 [24]. This study, 55mm diameter of Whatman Grade 42 filter paper is used to measure the matric suction (direct-contact method). Left the SPR samples for 10 days to ensure a thorough equilibrium. Finally, the matric suction value is derived from the ASTM calibrated water retention curve of the filter paper and then the volumetric water content of the soil is calculated by the Eq. (1). Fig. 4 demonstrate the procedures of the FP method.

$$\theta_w = w(\rho_d/\rho_w) \quad (1)$$

where θ_w = the volumetric water content of soil; w = gravimetric water content of soil; ρ_d = dry density of soil; and ρ_w = density of water (1 g/cm³).

2.2.2 Soil permeability test

The specimens used for the permeability test were separated into 2 groups, namely: (i) the pure sand for the constant head test according to ASTM D2434 [25] and (ii) the SPR samples for falling head test according to ASTM D5084 [26]. Only the procedure of the test for SPR samples was described in this paper. The SPR specimen preparation and falling head test consist of 5 main steps: (1) mixed sand with PR by a ratio as well as the FP method; (2) each mixed, contained the sample that divides into two layers in a cylinder mold of 70 mm in diameter and 75 mm in height and tamped with tamping rod of 25 blows/layer; (3) oven-dried at 105 °C for 48 h and then allowed to cool at room temperature; (4) soaked at room temperature in a water bath for 48 h to ensured saturation; (5) tested following ASTM standard method and calculated saturated hydraulic conductivity. Fig. 5 represents the falling head test procedures of the SPR specimens.

2.3 Fitting of the SWRC data

Among all the existing SWRC equations, Fredlund and Xing equation has been suggested by Leong and Rahardjo (1997) [27] which cover a wide range of soils over the entire range of matric suction. Therefore, the Fredlund and Xing's equation in SEEP/W numerical software [28] was adopted in this study to characterize the SWRC of the SPR samples. Eq. (2) present the Fredlund and Xing (1994) [20] equation for SWRC.

$$\theta_w = \theta_s \left[1 - \frac{\ln(1 + \psi/\psi_r)}{\ln(1 + 10^6/\psi_r)} \right] \left[\frac{1}{\{\ln[e + (\psi/a)^n]\}^m} \right] \quad (2)$$

in which θ_w = volumetric water content at any suction; θ_s = saturated volumetric water content; e = the natural number (2.71828...); ψ = any soil suction (kPa); ψ_r = residual soil suction (kPa) corresponding to the

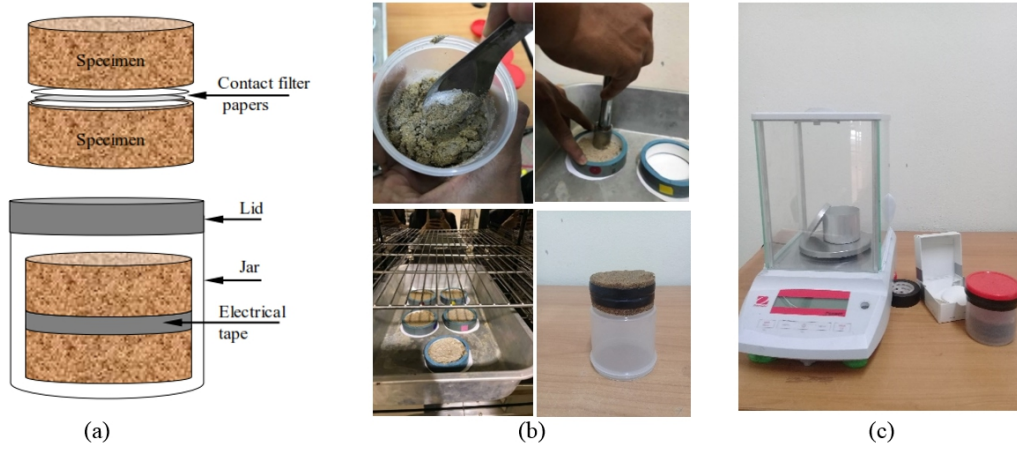


Figure 4: Filter paper method: (a) test configuration; (b) the SPR specimen preparation and; (c) suction measurement set up.

Table 4. Soil water retention curve model fit parameters.

Description	Symbol	SP	SPR15	SPR17.5	SPR20	SPR22.5
Saturated volumetric water content	θ_s	0.282	0.292	0.309	0.332	0.334
Volumetric water content at ψ_w	θ_{ψ_w}	0.015	0.070	0.072	0.080	0.085
Wetting saturated point (kPa)	ψ_{bw}	2.100	2.800	1.800	2.200	3.420
Water-entry value (kPa)	ψ_w	6.900	9.050	10.150	11.500	11.800
Fredlund and Xing best fit parameters	a (kPa)	2.977	3.325	2.451	3.077	3.972
	m	1.345	0.534	0.561	0.609	0.486
	n	4.797	5.842	3.884	3.652	6.871

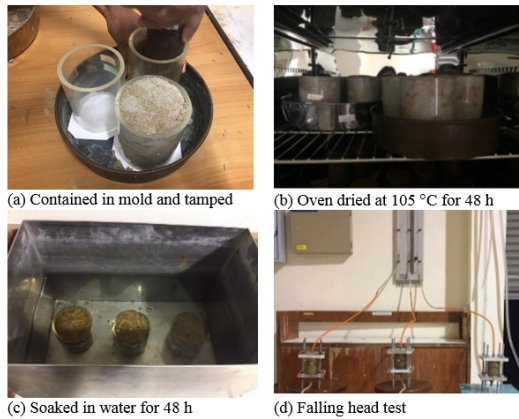


Figure 5: The procedures of the falling head test.

residual water content, θ_r ; and a, m, n = fitting parameters.

2.4 Prediction methods of unsaturated hydraulic conductivity

Permeability function of unsaturated soil is known as a relationship of hydraulic conductivity varies with the changes in matric suction. SWRC and permeability function is required for analyses of water flow throughout soil pores concerning variations in matric suctions. In this paper, the indirect measurement

based on the statistical predictive methods proposed by Fredlund et al. (1994) in SEEP/W program [28] for unsaturated hydraulic conductivity was used to determine the permeability function from SWRC together with the saturated permeability of the SPR mixtures. The equation proposed by Fredlund et al. (1994) [21], consists of developing the unsaturated hydraulic conductivity function by integrating along the entire curve of the volumetric water content function, is as shown in Eq. (3).

$$k_w = k_{sat} \left[\frac{\int_{\ln(\psi)}^b [\theta(e^y) - \theta(\psi)] / e^y \theta'(e^y) dy}{\int_{\ln(\psi_{aev})}^b [\theta(e^y) - \theta_s] / e^y \theta'(e^y) dy} \right] \quad (3)$$

where k_w = unsaturated hydraulic conductivity for a specified water content or soil suction (m/s); k_{sat} = measured saturated hydraulic conductivity (m/s); ψ = soil suction (function of volumetric water content, θ); θ_s = saturated volumetric water content; e = the natural number (2.71828...); y = dummy variable of integration representing the logarithm of suction, θ' = the first derivative of the Eq. (1), $b = \ln(10^6)$; and ψ_{aev} = air entry value.

3. Result and Discussion

3.1 Wetting SWRC

When soil is in a wetting stage, as water infiltrates the soil structure and displaces pore air, the water con-

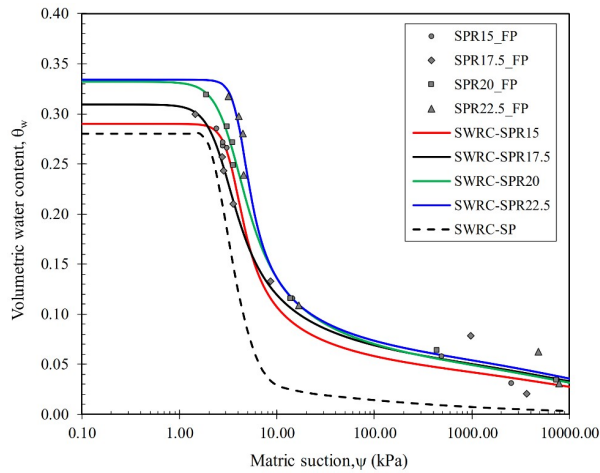


Figure 6: Soil water retention curve of the sand-para rubber (SPR) mixtures.

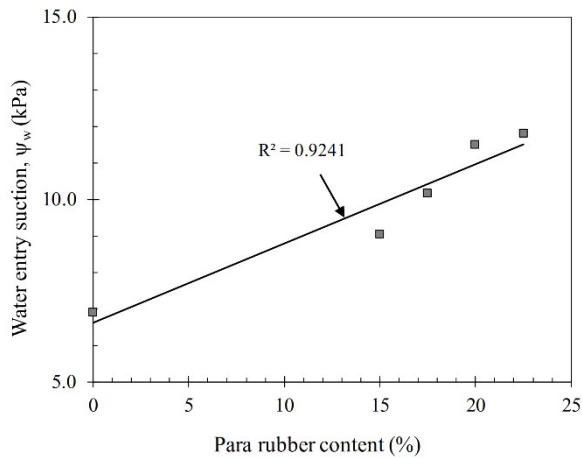


Figure 7: Water entry suction corresponds to the PR content of the wetting SWRCs.

tent will gradually increase [29]. In this study, the wetting SWRCs were obtained for the four SPR mixtures using the FP method. For the poorly graded sand, the SWRC was estimated by using the SEEP/W numerical program based on the grain-size distribution method which used the parameter obtained in Table 1 include grain size of D_{10} and D_{60} . The SWRC parameters fitting are summarized in Table 4. The experimental data and the best-fit SWRC results of the SPR mixtures are depicted in Fig. 6. The results show that the SWRC of the four SPR mixtures has significantly different compared with untreated sand (SP) which tends to give a higher value of saturated volumetric water content (θ_s) at low matric suction. Such increasing included about 3%, 10%, 18%, and 19% for the SPR mixtures of SPR15, SPR17.5, SPR20, and SPR22.5, respectively. The water entry value (ψ_w) is the suction at which the water content of soil starts to increase in the adsorption process. From the result in Fig. 7 indicates the value of ψ_w increases of 31%, 47%, 67%,

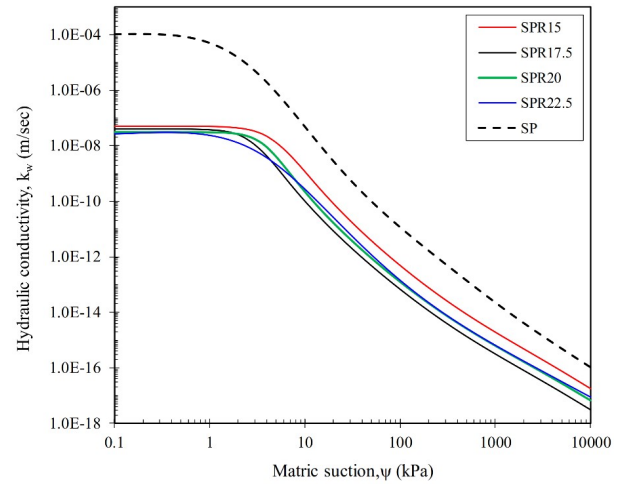


Figure 8: Unsaturated hydraulic conductivity function of sand-para rubber (SPR) mixtures.

and 71% for the SPR mixtures of SPR15, SPR17.5, SPR20, and SPR22.5, respectively. This implies that the PR causes the sand to reduced pore size. Increasing the values of volumetric water content (both θ_s and θ_{ψ_w}) of the SPR specimens demonstrated the effect of the water-holding capacity to the sand of para rubber. In other words, the high amount of water retained due to the water-absorption of the PR.

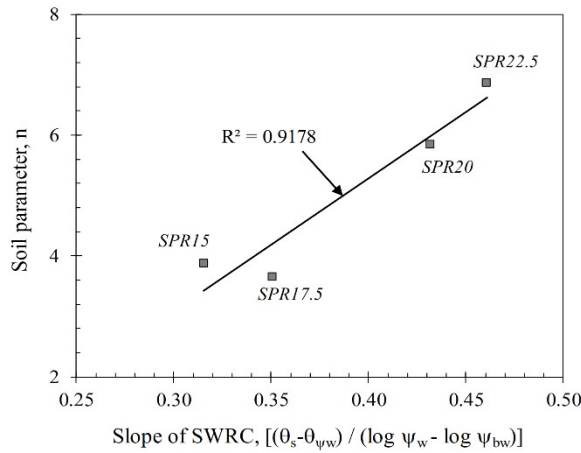
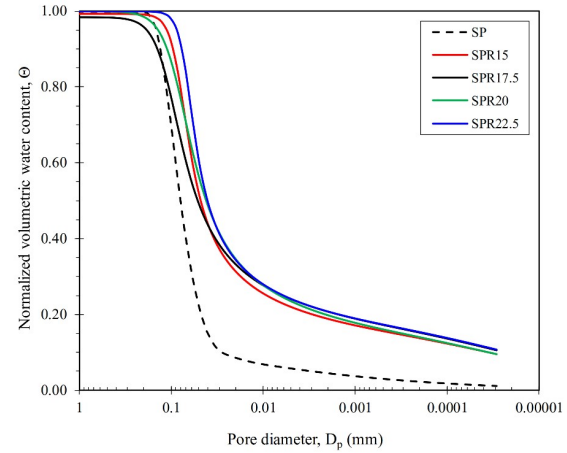
The absorption behavior for all mixtures found that there is some variability of the SWRC for each zone, especially in the transition zone. Water content increases moderately in the residual zone ($\psi > 12$ kPa) although soil suction decreases by several orders of magnitude. This is because pores have high capillary tension as a result of small sizes. In the transition zone ($\psi \approx 2 - 12$ kPa), water content increased rapidly rate with suction decrease. Compared the SWRCs among all mixtures found that there are variations of water content and suction in this zone. Such as the smallest of ψ_{bw} value of the SPR17.5. For the capillary saturation zone ($\psi < 2$ kPa), the soil suction almost be unchanged which found that having increased saturated water content mention above.

3.2 Measured saturated hydraulic conductivity

The permeability testing includes constant head and falling head test methods. The testing results of the sand sample (SP) and the SPR mixtures are shown in Table 5. The initial saturated hydraulic conductivity (k_{sat}) of SP is 6.890×10^{-5} m/s. The values of k_{sat} generally decreased with increasing PR content. Addition of 15%, 17.5%, 20%, and 22.5% PR contents to SP sand decreases its k_{sat} about 3 orders of magnitude. Overall, the ranges in the measured k_{sat} for the SPR mixtures varied from 4.890×10^{-8} m/s (SPR15) to 2.280×10^{-8} m/s (SPR22.5). The results implied that PR has the potential for permeability control of sand.

Table 5. Summary of the hydraulic conductivity values obtained from laboratory testing and permeability function prediction.

Description	Symbol	SP	SPR15	SPR17.5	SPR20	SPR22.5
Saturated hydraulic conductivity (m/sec)	k_{sat}	6.890e-05	4.890e-08	3.960e-08	3.100e-08	2.280e-08
Unsaturated hydraulic conductivity at wetting saturated point (m/sec)	$k_{\psi_{bw}}$	1.500e-05	3.520e-08	3.020e-08	2.000e-08	1.250e-08
Unsaturated hydraulic conductivity at water-entry value point (m/sec)	k_{ψ_w}	2.800e-07	2.000e-10	1.000e-10	1.420e-10	1.800e-10

**Figure 9:** Slope of sand-para rubber (SPR) mixtures.**Figure 10:** Pore size via normalized volumetric water content of sand-para rubber (SPR) mixtures.

3.3 Prediction and analysis of permeability function

Using the SWRC fitting parameters summarized in Table 4 and the saturated hydraulic conductivity obtained from the laboratory test described in the previous section, the unsaturated hydraulic conductivity (k_w) was predicted using the equation of Fredlund et al. (1994) [21]. Fig. 8 displays the k_w values of four SPR mixtures and the SP sand concerning matric suction. The shape of the curve is quite similar for all SPR mixtures but values vary in three orders of magnitudes compared with a value of untreated sand. The value of unsaturated hydraulic conductivity at wetting saturated point $k_{\psi_{bw}}$ (Table 5) is decreased with the PR content increased.

3.4 Effect of PR on the pore size distribution

To describe the influence of PR content on the shape of SWRC, the slope and pore size variations were discussed. Generally, the slope of the SWRC describes the rate of water lost from the soil (drying) or filled in pores (wetting) [30]. The steeper slope of the SWRCs, larger the parameter n . The slope of wetting SWRC can be calculated as $[(\theta_s - \theta_{\psi_w}) / (\log \psi_w - \log \psi_{bw})]$, as depicted in Fig. 9. Yang et al. (2004) [31] reported that the SWRC of a uniform soil has a steeper slope than that of a less uniform soil. In this study, the shape of the SWRCs (Fig. 9) of the pure sand has a slightly steeper slope than that of the SPR mixtures. For SP sand, the slope of SWRC has a consistent to grain-size distribution whereas that slope reduces with the SPR mixtures. Since the shape of SWRC is related to pore

size [30]. The pore size diameter can be calculated from the Laplace's equation of $[D_p = 4T_s \cos \alpha / \psi]$, in which T_s = surface tension of water (72.750 mN/m at 20 °C), α is the contact angle between pore water and particles which can be 0 for water-soil interface. Fig. 10 presents the relationship between pore size distribution and the normalized volumetric water content $[\Theta = \theta_w / \theta_s]$. The pore size ranged from 3.000e-05 to 1 mm. For the same water content, the D_p of the SPR mixtures is evidence smaller than that of SP sand which exhibits the presence of the PR.

4. Conclusions

The wetting soil water retention curves (SWRCs) using the filter paper method and the falling head test of the SPR mixtures were conducted in this study. The experimental results showed that the PR contents have prominent effects on the SWRC of poorly graded sand. Increasing the volumetric water content of the SPR mixtures represented the effect of the water-holding capacity to the sand of para rubber. The saturated hydraulic conductivity reduced about 3 orders of magnitude when sand was treated with the PR. The unsaturated hydraulic conductivity prediction based on the statistical method showed the evident effected of the para rubber biopolymer. The decrease of the hydraulic conductivity and pore size of the SP sand suggest the significant potential of the PR that can be applied for various geotechnical engineering applica-

tions such as sandy soil stabilization, surface erosion reduction, sand liquefaction, and so on.

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Lifestyles of Myanmar migrant workers under Thai socio-cultural context: A challenge of state management in the future

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Abstract

In recent decades, millions of labors have gradually migrated to the destination countries in search of better economic opportunities and more fulfilling way of their lives. In Thailand, labor migration is highly affected in driving the Thai economic growth, especially increasing of total factor productivity due to efficiency gains generated by increased specialization in the labor forces. Concurrently, a rapid economic growth causing labor shortage, neighboring countries encounter the economic recession, lack of quality of life and migrants illegally immigrate into Thailand to find work. Around 3.7 million migrants are living in Thailand, however, most of them are from Myanmar which accounted for 79.28%. This study has aimed to investigate the context of wider lifestyle choices that Burmese migrants made. The participatory action approach was applied to explore and reflect the migrants' certain livelihood in Samut Sakhon Province of Thailand. The major finding shows means of Burmese migrant's livelihood when the most surviving and earning for their families and living in Burmese migrant communities located in the down town city. The essential conditions which drive migrant laborers to migrate to Thailand are the cycle-like process involving children, family, and social networks of migrant workers. Most of them recognize the benefits of Thai language adaptation as it will facilitate them to have better lives. However, many of them face difficulties in terms of lacking recognition and accessibility of their labor rights and public services. To solve these problems, it is essential for all migrants to improve Thai language skills along with better understanding of Thailand's legislation and regulations. In addition, relevant governmental agencies should join hands with employers to establish a protocol for the promotion and protection of migrants' rights. Particularly, all relevant institutions should seek the inclusion of the migrant community in developing policies, practices, and responses to help establish appropriate interventions to reduce the abuse, exploitation, and trafficking of migrant domestic workers. Finally, this welfare policy of migrant workers can be implemented successfully through adopting a holistic approach and collaboration among departments; economic and social development, education, public health, and human rights.

Keywords: lifestyle of Myanmar migrant workers, well being, state management

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1. Introduction

During the 1970s and 1980s, Thailand was an important exporter of migrant workers to the Middle East, East Asia, and Singapore. After the mid-1980s Thailand became a major receiving country in this region due to neighboring countries' political instability. [1] At present, the situation of migrant workers in Thailand is a highly significant aspect of driving the Thai economy and migrants are a crucial part of the Thai economy's success in recent decades. [2] The number of migrants in the 2017 census has increased dramatically, around 3.7 million migrants are living in Thailand, accounting for 5.5% of the total number of workers in the country. Only about a half or 2.06 million are legally registered migrant workers who are

permitted to work following the Thailand Working of Alien Act 2008, Section 59, Migrant labor-intensive in Elementary Occupations and Domestic Workers. [3] This migrant group is identified as Grassroot laborers, employed in various industrial sectors of Thailand's economic production, accounting for 44.7 percent of the whole workers in Thailand.

As a direct result of the grave political, economic, and cultural conflict in neighboring countries, many million people have crossed borders into Thailand without documentation. Fearing persecution, and often without recognition of their rights to receive refugee status and international protection, the vast majority of those migrating from Myanmar find themselves desperate to survive, obtaining work in underground and, often, illegal labor markets. The majority of migrants from Myanmar who flee their country end up in neighboring Thailand, where an estimated two

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million people have taken up squalid residence working “3-D jobs” (dangerous, dirty, and difficult), for pay well below minimum wage, accounting for 79.28% of all migrant workers. [4] The province with the highest number of migrant workers in Thailand is Samut Sakhon. It is also a province with a high concentration of Burmese migrants with 307,443 people, accounting for 91% of all migrant workers. [5] Samut Sakhon is a province with remarkable fishery industries in the country. It is the center of the trading of aquatic animals and products. There are extreme demands of migrant laborers because Thai laborer is not popular in the fishing industry. Employers prefer migrants over Thai workers since most migrants do not mind accepting heavy and unpleasant work. However, migrant workers from neighboring countries particularly Myanmar poured into Thailand. [6] This is a crucial issue that is raising awareness of the dynamics of population change in Thailand along with a making-of insightful understanding of the migrants’ lifestyles. Whereas a lifestyle typically reflects an individual’s attitudes, way of life, values, or world view and is a means of forging a sense of self and to create cultural symbols that resonate with personal identity. Not all aspects of a lifestyle are voluntary. Surrounding social and technical systems can constrain the lifestyle choices available to the individual and the symbols she/he can project to others and the self. Lifestyle may include views on politics, religion, health, intimacy, and more. All of these aspects play a role in shaping someone’s lifestyle. Eventually, an earlier study on lifestyles [7] focuses on the analysis of the social structure and of the individuals’ relative positions inside it. It showed that lifestyle is the most visible manifestation of social differentiation, even within the same social class, and in particular, it shows the prestige which the individuals believe they enjoy or to which they aspire. Significantly, lifestyles made up mainly of social practices, and closely tied to individual tastes, represent the basic point of intersection between the structure of the field and processes connected with their neighbors. While social and cultural phenomena are other points that reflect the discrimination or integration of living with Thai people. For this reason, the researchers are interested in studying the livelihoods of migrant workers in Samut Sakhon. Although the Thai government shows a growing awareness of their isolation and vulnerability to labor exploitation and violence, there is little data available documenting their realities under the questions of how Burmese migrants living among ethnic, racial, social, and cultural differences, what is the way of their lives today, and what obstacles do they face? This results in the disaffection of domestic workers and extends the disregard for their labor and basic rights. This information is useful for the future management of migrant workers.

2. Objectives

This research has overall aimed to describe the lifestyles of migrants from Myanmar, as well as their employment and working environment, adaptation, and the social reunion of diversified ethnic groups. The special objective of this study was to explore whatever new trends in socio-cultural issues of the studied area relating to widespread dissatisfaction with rural living conditions and services and to make policy suggestions and state management directions that would promote better living conditions for the migrants.

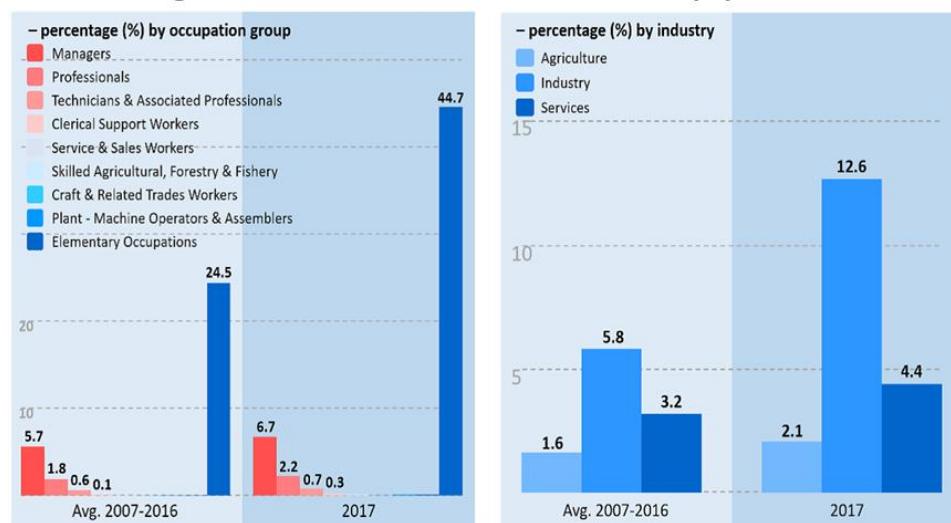
3. Research Methods

This research employed a qualitative study of Burmese migrant workers living in Samut Sakhon Province, Thailand. The fieldwork of the study employed in-depth interview by using a semi-structured interview schedule along with using participant observation approach as a specific form of field research in which the researcher participated as an actor in the events under study. This methodology of data collection employed both scientific observations and general observations with the target groups to identify key characteristics of migrant networks, broker employer relationships, and the relationships of workers with one another and with brokers and employer. Information was also gathered on the working and living conditions of migrant workers to track their experiences and gain better insight into their living standards and daily struggles. The sample size of 36 key informants consisting of 9 from each of the 4 studied groups, to achieve diversity of “typical case” perspectives without achieving “data saturation” were selected for in-depth interview—the point at which additional interviews supply essentially redundant rather than new and significant information. [9]

3.1 Population and recruitment

Purposive sampling was used to recruit Burmese migrant workers who worked in Samut Sakhon Province classified by 4 major types of working engagement; 1) fishing boat, 2) seafood processing industry, 3) factory, and 4) agriculture. A total of 36 cases were selected for conducting in-depth interviews using contacts listed by one of the key informants who also acted as a field researcher, coordinator, and interpreter for this research. Besides, two from each type of working engagement group or 8 migrants were invited to engage in a focus group discussion. The researchers need to negotiate with participants on their availability for focus group discussion and interviews, so as not to interfere with the participant’s working schedule.

Share of Migrant Workers in Thai Labour Market (%)



Source: Data from Foreign Workers Administration Office, MOL and Labour Force Survey 2017 [8]

Figure 1: Migrant workers in Thailand classified by occupation groups and types of industries (2017)

3.2 Data collection and analysis

The qualitative study was implemented by the Mahidol University research team and two coordinators who also acted as our field researchers from non-governmental organizations (NGOs) were employed as they have the capacity to reach migrant communities in the target provinces and can understand Burmese language. Besides, the study was supported by a research advisor who worked with teams throughout the entire research process. The data was collected using observational checklist, in-depth interview, and focus group discussion techniques. The venue for interview was at Drop-in Center, a public place and meeting point for Burmese migrants located in downtown of Samut Sakhon as well as at their places of work, from June 2016 to February 2017. A semi-structured interview guideline was developed to assess individuals' perception of their position in life in the context of their surrounding culture and value systems concerning their goals, expectations, standards, and concerns. Thirty-six individuals participated in in-depth interviews each lasting 60-90 minutes. Initially, the field researchers randomly met migrant workers in the markets or temples and others were appointed by the field coordinators. The field researchers never tried to interview at the first meeting. The initial meeting was to introduce themselves and the project, request their consent to participate, observe the environment, and discuss the best way of meeting again. The in-depth interviews were undertaken over extended periods, often necessitating five to six visits over three months. Also, field notes were taken to keep track of the researchers' informal interviews and participant observations, decisions, and thoughts during the data-gathering process. Participant observation is a specific

form of field research in which the researcher participates as an actor in the events. [10] The observation was performed for one month. Moreover, the research team employs an ethnographic method by following up with the participants over a while to track their experiences and gain better insight into their living standards and daily struggles. The researchers test the scientific rigor of the study: validity, reliability, and confirmability. The collection of data was guided by adherence to ethical principles. Ethics approval was granted to conduct the study from the Human Research Ethics Committee, Faculty of Social Sciences and Humanities, Mahidol University, Thailand. Five key ethical principles were adhered to in the study: obtaining informed voluntary consent; ensuring privacy and confidentiality; making sure the workers who took part did not experience harm as a consequence of involvement in the study; respecting their right to withdraw at any time without explanation or penalty, and maintaining secure storage of data.

The analysis of data is concentrated on the interrogation of the migrants' daily lives and routine works to explore their diversified lifestyles and life struggles, thus it can be concluded as significant supporting and hindering factors for improving and formulating a long-term government policy under the realistic conditions. The data have been used for content analysis giving spotlight on five domains; 1) General information and inside story, 2) Employment conditions and working environment, 3) Actual way of life underlined at social contribution and cultural engagement, 4) Reunion setting of diversified Myanmar ethnic workers and 5) State challenges in managing Myanmar migrant workers. The researchers transcribed the audio recordings into text and read and re-read the transcripts to be-

come familiar with the data. Raw data were manually analyzed using line-by-line analysis, to break down and code the data. Following this, codes were clustered into groups and then categorized. Patterns and connections were then identified within and between categories. Findings are presented in terms of qualitative and descriptive insights.

4. Results and Discussion

Lifestyles of Burmese migrant Workers under Thai Socio-cultural Context in this study is highlighted in 5 extremes: 1) General information and inside story, 2) Employment conditions and working environment, 3) Actual way of life underlined at social contribution and cultural Engagement, 4) Reunion setting of diversified Myanmar ethnic workers, and 5) State challenges in managing Burmese migrant workers.

4.1 General information and inside story of the Burmese migrant workers

The studied participants consisted of 36 migrant workers in Samut Sakhon Province, comprising of 20 males and 16 females. Most of them were in the adult aged group, 28 to 47 years old. And among this key informant population group, majority of them, that is, 29 participants have registered for work permits. Because of their poor family status, they have to come to work at an early age to earn living for themselves and their families. Some of them have finished elementary and junior high school in Myanmar. Most participants were in a common-law relationship or single. Their average monthly income was over 5,000 Baht, and the average length of time that they had worked in Thailand was 4 years.

With indispensability, it revealed that an inside story on living and family life of migrant workers before migrating to Thailand is a fundamental influence onto the migration into Thailand. Life of the workers and their families are certainly poor and full of hardship. The most of them finished only the primary school education without chance to further their studies due to their poverty, large families, and low-income occupation, particularly farming. The study also found that the political instability raised from racial and cultural conflict in Myanmar had pushed the migrants to cross the border to Thailand. As they said that *"A rather backward economic in the downturn city and sometimes war in the country caused an insecurity in life and property, so made me decided to kick off migration to Thailand."* The economic hardship of the origin is another key factor that motivates the migrants to migrate to work in Samut Sakhon City in Thailand. The results show that social motives are less prominent than economic motives for migration.

4.2 Employment conditions and working environment

The findings show that workers working on fishing boats encounter in general extremely poor conditions, much worse than those in other sectors: the seafood processing industry, factory, and farming sector. It is no doubt that migrant workers especially those who are being forced by their employers to work are more likely to end up working aboard fishing boats. Physical and verbal abuse by employers is common in the fishing sector, and alarmingly this seems to be more commonly faced by child workers aged below 15 [11] and as pointed out by one migrant labor ... *"I have observed that especially most child laborers they can't leave because if they leave, they won't get paid, and if they want to leave it is possible only if the employers allow them. In addition, if the young child leaves without getting their money and (pink) card, they have to obtain their permission"*. Most migrants work under pitiable conditions and most of them feel that they can't leave their jobs because of fear of police arrest.

Most migrants work at an average for 12 hours per day as they start the work even before 5 am on days when there is a heavy workload, and a few get an hour or less break time per day. On average they can take 4 days off per month, only some are paid for these days off. Certainly, working such long hours is considered unacceptable for the migrants especially if the overtime paid and the kind of treatment are not guaranteed. Most jobs for migrant workers in the fishing sector are insecure due to variable working hours and payment methods and rates. Migrants employed on fishing boats work in inferior conditions, in nearly all aspects, when compared with migrants employed in fish processing. Jobs on fishing boats are less attractive than in fish processing factories because of the nature of work which is tough, dangerous and it is lonely being far away from family. In light of this, migrants working aboard fishing vessels maybe those who have nowhere else to go, or those who have fewer job opportunities, such as unregistered migrants or child workers. This could easily force these workers into more vulnerable situations than other migrant workers.

Financial reward affected the migrants' cognitions of well-being. Workers, who were satisfied with their wages, were typically paid more than the standard wage. Their salary was dependent upon the level of productivity. Some daily wage earners, who received less than standard wage, were dissatisfied but reluctant to raise this with employers as they were fearful of losing their jobs. Significantly, the findings showed that even though nearly all the workers were poor, those who had stable employment and earned an adequate income were more satisfied with their jobs as having a stable income enabled them to meet their basic needs and send money to their families in Myanmar. Whilst workers who were paid less than the standard wage felt unhappy and were dissatisfied with their jobs. [12]

As a whole, most workers accepted they had insufficient money to cover their expenses. As they had increasing debts from a combination of sending money to family members in their homeland and having to spend money to live and work in Thailand. This seems to be affecting the migrants' perception of their well-being.

There were concerns about several aspects of their living circumstances, such as the number of people who shared dwellings, unhygienic conditions, and the proximity of their homes to their places of work. With the level of occupancy, some lived in overcrowded conditions lacking in privacy. For instance, two families who shared a small room had to take turns to carry out personal activities like dressing and undressing clothes. Concerning their hygiene condition, most residents lacked proper cooking facilities; food was prepared and cooked on the ground. As a result of this poor environmental conditions, many were at risk to get sick. Most of their children frequently developed respiratory and digestive illnesses, such as common colds, coughs, and diarrhea.

4.3 *Actual way of life underlined at social contribution and cultural engagement of diversified ethnic Burmese workers*

In Samut Sakhon City, lifestyle migrants' search for a better way of life is a relative struggle, defended against negative presentations of life before migration. Migration is therefore described as 'getting out of the trap', 'making a fresh start', or 'a new beginning'. [13] The life stories of Myanmar migrants told in this study include tales of individualism and consumerism of contemporary lifestyles.

Nevertheless, the migrants' lifestyle in this study focuses on everyday lives including leisure and working, how to negotiate, adjust and improve their lives, somehow, they described this in terms of their adjustment and excitement about stepping on an accelerator or increased adaptation and autonomy. Several of the migrants express an entrepreneurial spirit, establishing their 'dream' businesses, or illustrating their potentiality within the labor market. In these cases, migrant workers described that ...

"I had wanted to be the owner of one seafood shop and working to have a more fulfilling alternative for my better life. I have learned many things while working in the seafood industry and met many likeminded people from whom I can get the aspiration."

Overwhelmingly, this reflected their entrepreneurial passion which would give them greater control over their working lives. As for the others who work in the agriculture sector to raise the well beings, they imagined to even return to their home country once they have enough money to invest in their fruit orchard. Many of the migrants are establishing a more favorable work-life balance as they think it is a key feature

to enhance their good lives shortly. Interestingly, one migrant worker said ...

"I want to make my life more meaningful and escaping to the Good Life. I also have preferred to provide a better way of life for my children, I wish to protect them from the materialism and push them to have such a good education".

When exploring the lifestyle affected by social and cultural differences experienced by Mahee (not real name), a Burmese migrant working in a factory, spoke out that *"Social and cultural difference made my life-limited and cause frustration. As I got married with a Thai-Chinese man and had become part of the hierarchical and mixed tradition structure family, most of my autonomy had been limited. My life following migration is thus causing frustration."* The study also reveals that the reality of migrants' life after the migration is often in opposition to their original aspirations. It is shown that many lifestyle migrants seek social goodness which is often similarly attended by their friends or other countrymen. At the same time, some migrants demonstrate the extent to which establishing new social relations is part of their everyday lives following migration. Through their participation in certain groups, voluntary organizations, and attendance at various events, migrants build up new social relations and implanted themselves within the regional social structure, in the process of stocking up whatever social capital.

In terms of the migrants' requiring particular support it has shown that family and relatives are central support figures for most migrants, this is especially the case for migrants employed in fish processing. Migrants employed on fishing boats depend more on their workmates and friends and less on family members and relatives. This is due to the unique physical environment of working on fishing boats and spending long periods at sea. There is no support from employers in giving social security or welfare benefits to care and support these migrant workforces. However, the migrant workers have to depend on employers for basic information such as working registration and accessibility to health services and some of these migrants are exploited and harassed by their employers. One migrant complained that *"I think we need help. Sometimes we need the company that will be able to help us with every problem. We cannot change our job frequently as it was hard for us to get adjusted in a new work place and employer"* Therefore, work information and advice should be provided through leaflets, Drop-in centers, Multicultural events, etc. which most migrants are accessible. Doing this will help to ensure the migrant workers to have access to general information and advice related to employment of work Myanmar migrant community.

4.4 Reunion setting of diversified Myanmar ethnic workers

Social and community networks play a major role in connecting migrant laborers with relatives, friends, and employers. Social support can be both tangible (informational and instrumental support) and intangible support (emotional support) that a person receives from network members. It is well documented that social supports are the functional aspects of social relationships and act as mediating factors between social networks and health. [14] Many migrants rely on their social network as a key source of information, which they may consult before deciding to work aboard or take up a job at a specific place. [15] Social networks also help facilitate a migrant family's living arrangements. These agents are an essential element that enables the cycle of labor migration to Samut Sakhon to continue.

Some workers developed good relationships with the Thai people in the local communities where they resided. Some of the workers established close personal relationships and married Thai citizens. In contrast, a few workers perceived that the Thai communities they lived in generally discriminated against them. Some workers also lacked the self-confidence to approach or initiate activities with the Thai people in their community, perceiving that they were viewed as foreigners. As one of the migrant workers said that ...

"I stay in the factory all the time. I have never joined in any activities in the community. I go out only to buy things in the market. When I walk in the market, I feel Burmese. I am afraid that someone might catch me."

Most workers felt they maintained a good relationship with their family members in Thailand, while a few acknowledged that their relationships were poor. Generally, however, they loved each other and perceived that conflict, such as disagreements between spouses, was a normal part of family life. Several workers indicated that they maintained good relations with their Thai employers. They believed their employers were generally good people who did what they could to support them, such as providing a place to live, taking ill workers to the hospital, and occasionally lending money without charging interest. When workers experienced difficulties, they usually consulted their employers.

However, after migrating, they must establish strong social networks among transnational migrants to accommodate their needs and adapt to unfamiliar situations in the destination country. Social networks and social relationships, such as friends and acquaintances, are usually established in a workplace, construction site, church, or temple. This study proposes three ways to strengthen and maintain the social network of Myanmar migrant workers: 1) the development of environments or situations that stimulate the social networks, social activities, and network man-

agement; 2) the development of network organization, and 3) persuade the migrant workers to participate and join as a member to help or support their social and economic problems.

4.5 State challenges in managing Burmese migrant workers in Samut Sakhon province

The Thai government is certainly aware of the low potential in the migrant labor supply from Myanmar, and especially accounting for formalizing labor importation arrangements with other countries, such as Vietnam and Cambodia. When considering beyond the industries which will likely be most affected by rapid changes in the migration patterns among Myanmar group of labors. Since nowadays Thailand carries out under the model of low-wage employment, it is just an illusion to expect that other foreign migrant workers would be willing to come to Thailand through a formal labor migration scheme and agree upon such wages. Also, with rising production and labor costs in Thailand, the labor-intensive, low-technology manufacturing sector has, in general, lost the comparative advantage it previously held. However, workers imported from other countries may work for some job sectors in mainly non-border provinces, where the level of income is mostly above the minimum wage. [16]

Thailand has strictly applied the migrant worker's registration regulations as a tool to enable them to work legally. From the first registration in 1996 to the recent one in 2018, the process covers the registration of migrant workers by employers, the conduct of a health examination, preparation of a photo identification card and fingerprint procedures, and the issuance of a work permit. In each registration, the government announced its policy through cabinet resolutions; the process requires the cooperative effort of various government offices.

In responding to migration issues, the Thai government emphasizes establishing cooperation agreements with many neighboring countries. The government has also routinely conducted registration of undocumented migrant workers from Cambodia, Laos PDR, and Myanmar. The Thai government has continued to provide the exception and establish procedures for registration of undocumented migrant workers every one or two years, since 1996. Undocumented migrants from three neighboring countries – Cambodia, Laos PDR, and Myanmar, have been allowed to register and work. [17]

There is also a crucial point from another edge that if the Thai government plans to accept migrant workers from other countries, the registration system will need to be worked out thoroughly. This study suggested that Thailand is nowadays entering a new phase of labor importation. To draw in a steady flow of migrants with a low turnover, both the employers and the government should work out to sustain the minimum standards that are promised to migrant work-

ers, as these standards are already quite low, even for labor-receiving markets. Besides, historically Thailand has never achieved formally imported workers in the millions. – What is currently dominating the migrant workers' management system is the need and effort to recognize who came to Thailand through unregulated channels, and the recruitment of regular workers through the official channel. The regular recruitment system should thus be revised and enhanced as Thailand moves away from its dependency on Myanmar migrant workers. [18]

5. Conclusion

Disruptive change in living circumstances among Myanmar migrants is undoubtedly in chaotic situation, leading to many transformations in their lives. Within the context of the individualized seeking behavior for a better way of life, these transformations are indicated as personal challenges to be conquered through the migrants' individual and group mobilization. They will be able to learn how to live with their new lifestyle choices, how to cope with lives led in their workplaces, how to make new friends, and how migrants manage cultural differences including establishing new social relations which is part of everyday life following migration. Their way of migration is essentially a form of spatial mobility. However, spatial mobility can involve moving anything, from people to goods, money, information, and so forth, while the migration is a subject of spatial mobility that is limited to the movement of people. [19] Mobility can be categorized in different ways based on its application: temporally vs. spatially, nationally vs. internationally, and forced vs. voluntary. These categorizations stress the different types of migrations and highlight their vast array of applications. For instance, the forced migration of refugees is very different from the case of retirees in search of a good life, although both may end up in the same destination and both would be considered migrants.

In conclusion, the way of life of Myanmar migrant workers on the economic aspect of income is not enough to spend, it must save money, find hard work and low labor costs living in a family with relatives, the environment is generally crowded. Employers have legitimate wages in the social and cultural aspect, some migrants had unanticipated experiences and reality of upset living condition following migration caused by social and cultural differences, as they are often in opposition to their original aspirations. It is also shown that the lifestyle of migrants seeks social goodness which is often similarly attended by their friends or other Burmese natives. At the same time, some migrants demonstrate the extent to which establishing new social relations is part of their everyday lives.

It is apparent that migrants' effort and success is on

the way to a better way of life, to stimulate the sense that they are bettering themselves; as individuals in the contemporary world, they have taken their lives into their own hands and are engaged in the process of improvement. Overcoming the obstacles in their way, their difficulties at adapting to life in the destination are presented positively. They learn how to cope with insecurity or their uncertain futures through their entrepreneurship passion and initiative. They express a sense of empowerment from taking individual responsibility for their actions and lifestyles as well as the extent to which dreams of self-realization and improvement has been realized. The lifestyle of migration is a complicated and disruptive phenomenon, varying from one migrant to another, from one location to the other. It keeps at its core social transformation and broader processes; and it is a response to practical, moral, and emotional conditions.

Regarding the management of immigration of CLM migrants, the Thai government adopted an inconsistent and pro-employer policy. There have been endless rounds of registration which do not promote a good climate for the regularization of migrant workers and do not allow the cooperative agreement or feeling systems to work. There are neither effective preventive or/and subjective measures nor other contributing measures to discourage reliance on migrant workers. Besides, the regulation of labor protection law is always questionable concerning migrant workers. To effectively operate the worker immigration management, the following steps are recommended; 1) The government should include efforts to educate employers about the rights of migrant workers, establish channels for reporting complaints, prosecute, and abusive employers. And at the same time, the government should provide interpreters to facilitate reporting of complaints by migrant workers as well as provide referrals to legal assistance and protection. 2) The government should provide educational opportunities for migrant workers, such as language classes and regulation of the labor protection law. 3) The government and Community-Based Organizations (CBOs) should play a crucial role in outreaching to non-registered migrant workers, raise awareness of their hidden and isolated realities, identify their critical challenges and introduce them effective action strategies, provide more space and establish supportive environments or organization that stimulate the social networks, social activities, and network management, and make wisely investigate, formulate and implement the international policy for low-skilled workers in the ASEAN countries. 4) All relevant institutions should seek the inclusion of the migrant community in developing policies, practices, and responses to help establish appropriate interventions to reduce the abuse, exploitation, and trafficking of migrant workers, especially it requires a holistic approach and collaboration among departments; economic and social development, education,

public health, and human rights. 6) Finally, every sector should “understand” the flow of migrant workers of the world and Thailand, as well as trying to balance between dependencies on migrant workers and enhancing the use of technology and skills development.

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Administration model of civil state schools to improve the quality of education

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Abstract

The research was to study the conditions, problems, and factors supporting the administration of civil state schools and to develop a model of administration and study the effects of using the model. The research instruments included, the questionnaire, the form for the minutes of the workshop, the form for checking appropriateness and feasibility of the drafted model, drafting the handbook for using the model, the form for evaluating the model's usage, the form for evaluating satisfaction when using the model, the form for recording the reflection on the model's usage.

The population were 88 civil state schools in Chiang Mai Province. The 176 informants in this study consisted of 88 school directors and 88 teachers from each civil state schools. The twelve informants who gave the information for developing the model composed of one deputy director from the Primary Education Service Area Office, one superintendent, ten administrators from civil state schools. The twelve informants who validated the relevancy and feasibility included six directors of the Office of Educational Service Area and six experts. The informants giving information to study the effect of the use were school directors and teachers being responsible for civil state schools and volunteering to take part in using the model and the handbook. The data was analyzed using frequency, percentage, mean, standard deviation, and content analysis.

The findings revealed that the administration of civil state schools had practical feasibility at a high level when presented in a descending order of the mean being the budget administration, the personnel administration, the academic administration, and the general administration, respectively. The supporting factors were at a high-level also, when ranked in a descending mean, being, the administration, the materials, the budget, and the personnel. The civil state school administration model was the principle, the objectives, the system, the mechanism, and operational methods of quality administration along with the PDCA model including Plan, Do, Check, and Act, accessing the guidelines and the success conditions.

The results were at a high level and with satisfaction being the highest. The reflection revealed that the model and its handbook were useful for administering in civil state schools to assure its effectiveness and efficiency. Also, the administrators had knowledge and understanding of the principles and theories of administration and the administration policy of the civil state schools. The teachers and educational personnel, the basic education school board members, the parents, and the community network understood the civil state school administration policy and participated in developing the policy regarding their roles. Additionally, the school administrators used the model and handbook on school administration as a tool to administer their schools with effectiveness and efficiency.

Keywords: administrative model, civil state school administration, civil state school

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1. Introduction

In these times the whole world is in the trend of economic and social changes due to population growth and migration into urban areas. Technological progress and the change of economic structure have stimulated each country to focus on developing human resources to assure their quality. Education has become a crucial mechanism for human development. The public sector alone cannot provide education to

catch up with these changes. There is a need to invite all sectors to take part in providing education. This is congruent with the basic concept of "Civil State" stating that "Every Thai is the nation's member."

Strategy for the civil state then attempts to unite every sector, including the people, the public, businesses, academia, the state, religion, and mass communication to be the driving force in creating the needed changes, to solve the problems, and develop the country in every dimension and aspect in a sustainable way. The civil state could serve as the model and mechanism to push forward the educational re-

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forms necessary to assure the process of good people development, along with the main issues and geosocial conditions of each area.

The Ministry of Education, the agency responsible for the country's educational system has now realized the benefit of collaboration between the public sector and the private sector, to help support the quality of education. The Ministry has created the Office of the Basic Education Commission (OBEC) which is charged with setting up the project on civil state schools, which should be carried out with the civil state cooperation, leading to an MOU, in order to promote the civil state role in basic education and leadership development. These educational changes are needed to assure that we are prepared to develop the human resources needed to cope with the dynamics of the 21st century. This program has 5 objectives and they are as follows.

1. developing and upgrading the educational process in the basic education of teachers and other educational personnel to equip them with the necessary leadership characteristics and competency in school administration to maintain both morality and educational achievement simultaneously
2. setting up and publicizing the school's data and information along with the principles of good governance, transparency, and verifiability
3. promoting, supporting, and developing information and communication technology (ICT) system for education and administration
4. developing the instructional models on active learning and critical thinking, setting up an instructional handbook and extra-curriculum activities to develop the public mind in supporting the community and the society
5. upgrading the school English instruction to a universal level.

Nonetheless, from reviewed data on operational results of civil state schools from the 2016 academic year, it was found that there were only 104 primary schools of the 3,093 schools having their students achieving an O-NET score of 50% and more. The educational management has been the duty of every social sector consisting of the public sector, the private sector and the civil society. This showed that, in the first year, most of the civil state school's education, at the basic education level still had some problems in upgrading their educational processes in basic education. Additionally, in operating the civil state school project, the individuals concerned encountered various problems with curriculum development and in organizing extra-curriculum activities aimed at enhancing students' public mind, to help develop community and society. However, some schools did not achieve the objectives as they still utilized traditional instruction. Most of them were supported and developed to access ICT but they were not able to manage the media to organize the instruction and enhance students'

achievement. Some schools had no partnership among their personnel. They could only complete just certain objectives of the project. Moreover, they had insufficient materials, equipment, and multimedia to be used in the classroom making the instruction not effective as it should be. The computer audio and video systems were different from hardware and software. Therefore, installation was delayed. In case of malfunction, there was no one who had the responsibility for repairing them. All these problems blocked the students' learning opportunities (Regional Education Office No. 1, 2017).

Consequently, the schools along with civil state partnerships should succeed in upgrading the level of educational processes and leadership development. The researcher has become interested in studying the conditions, problems, the guideline for solving the problems, factors facilitating civil state school administration, and learning from knowledge and experience of the process administering the civil state school. Then, the researcher developed the model and handbook on administering civil state school composing of the concepts of participatory administration, good governance, and Deming Quality Cycle (Deming, 1982) with the vital processes in administering schools including Plan – Do – Check – Act so as to encourage the administrators of civil state school to apply and enhance effectiveness and efficiency in educational administration and management.

2. Research Questions

1. What are the conditions, problems, and factors facilitating civil state school administration?
2. What are the developed model and handbooks for using the civil state school administration model? What are the results of their validation?
3. What are the results of using the developed model and handbook for using the civil state school administration model? Are the users satisfied with them?

3. Research Objectives

1. To study the conditions, problems, and factors facilitating the civil state school administration
2. To develop the civil state school administration model
3. To study the effects of using the civil state school administration model

4. Research Population and Sample

The researcher set up the scope of population and informants based on the research procedural steps as follows:

Step 1 – Analyzing the results and studying conditions, problems, and factors facilitating civil state school administrations. The population was made up

of 88 civil state schools in Chiang Mai Province. Of the 176 participants, there were 88 directors of schools taking part in the project and 88 teachers who were responsible for the project on civil state school in Chiang Mai Province from each school.

Step 2 – Developing the civil state school administration model (P: Planning), applying from PAOR process of Kemmis, S and McTaggart, R. (1988) there were two sub-steps as follows:

Sub-step 2.1 – Drafting the model and handbook using the civil state school administration model, the twelve participants included one deputy director of the Chiang Mai Primary Educational Service Area Office 3, one superintendent who is responsible for a civil state school, and ten directors of schools taking part in the civil state school project.

Sub-step 2.2 – Validating the model and handbook using the civil state school administration model, the twelve relevant people of which six were directors/deputy directors of Office of Primary Educational Service Area and six experts.

Step 3 – Studying the effects of using the model and handbook in the civil state school administration model, there were two sub-steps as follows:

Sub-step 3.1 – A: Action Step - Applying the civil state school administration model, there were four civil state schools participating in this research. The eight participants included the school directors and a teacher being responsible for the Project from each school.

Sub-step 3.2 – Evaluating the use of the model and handbook. The reflection on the model and recommendations on using the model and handbook for civil state school administration model consisting of O: Observe and R: Reflect using the same group of informants in Sub-step 3.1

5. Research Operational Steps (Materials and Methods, Area Descriptions, Techniques)

This research used the mixed methods between quantitative research and qualitative research coming up with participatory action research (PAR) proposed by Kemmis, S & McTaggart, R. (Kemmis, S & McTaggart, R. 1988) and PAOR process in constructing the model and handbook for using civil state school administration model which could be concluded in the following chart.

6. Research Results

6.1 *Studying the conditions, problems, and problem-solving guideline for and factors facilitating civil state school administration*

6.1.1 Results of analyzing the condition of civil state school administration revealed that the practice was at high level. When ranking from the highest

mean to the lowest one was the general administration, the academic administration, the personnel administration, and budget administration, respectively.

6.1.2 Results of analyzing problems confronted by the civil state school showed that the problem was at moderate level. When ranking from the most to the least average, the problems were the budget administration, the personnel administration, the academic administration, and the general administration orderly.

6.1.3 Results of analyzing factors facilitating civil state school administration presented that the facilitation was at high level. When ranking from the most to the least, the facilitation was on the administration, the materials, the budget, and the personnel namely.

6.2 *Results of constructing the model for administering civil state school*

6.2.1 Model for administering civil state school composed of main components as follows:

1) Principle: This model was created basing on system approach for administration. Scope of school administration covered four aspects which were the academic administration, the general administration, the personnel administration, and the financial administration utilizing principles of the participatory administration, the good governance, the strategy for developing civil state school, the knowledge and the experience of school administrators and the civil state consolidating with experts' knowledge and experience in administering school.

2) Objective: To serve as the administrative guideline for civil state schools in applying for their administration with effectiveness and efficiency.

3) System and Mechanism

3.1) Inputs:

(1) Current conditions, problems, problem solving guideline, and facilitating factors.

(2) Civil state school administration in five aspects – 1) learners, 2) curriculum, 3) teacher, 4) administrator and 5) participating process

(3) Factors supporting the civil state school administration in four aspects composing of 1) personnel, 2) budget, 3) materials, 4) administration and management

(4) Other administrative factors

(5) Participatory Action Research (PAR)

3.2) Process: Civil state school administration model had four steps which were

Step 1 – Planning (P)

Step 2 – Doing (D)

Step 3 – Checking (C)

Step 4 – Action (A)

3.3) Output: Outcomes of the Model

1) Evaluative results of the model usage

2) Satisfaction with handbook and model usage

3) Reflection results on usefulness and

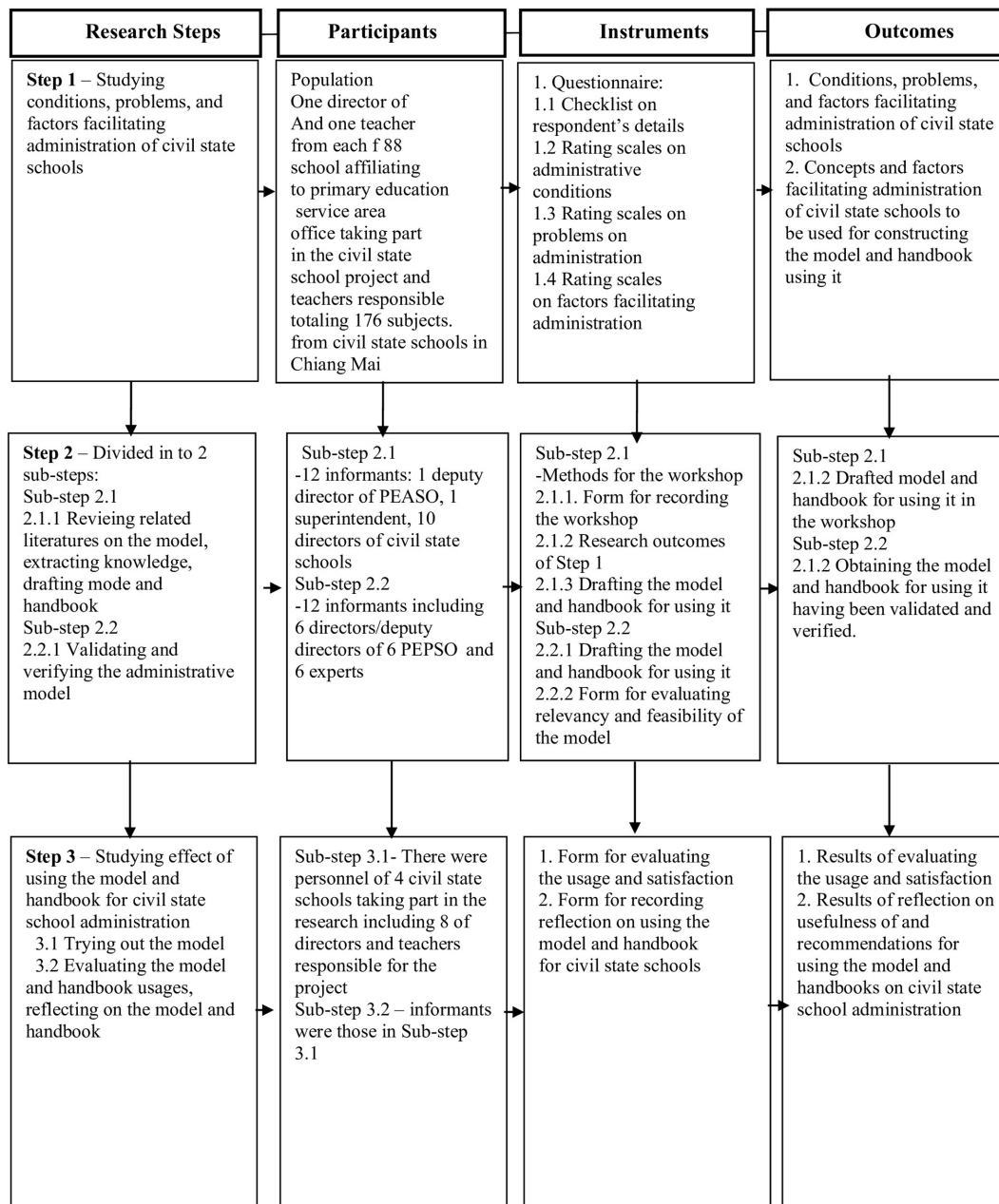


Figure 1: Research procedural steps

recommendations on model and handbook of using.

4) Operational Steps

- Step 1 – Planning (P)
- Step 2 – Doing (D)
- Step 3 – Checking (C)
- Step 4 – Action (A)

5) Assessment Guideline

- 5.1) Operation with PDCA:
 - Planning (P)
 - Doing (D)
 - Checking (C)
 - Action (A)

5.2) Key Performance Indicator (KPI) of factors on five aspects and eleven strategies:

- 5.2.1) Learners
- 5.2.2) Curriculum
- 5.2.3) Teacher
- 5.2.4) Administrator
- 5.2.5) Participating Process

6) Success Conditions: Administrators of the original affiliation agency, network members, and school partners mutually provided to support for the civil state school administration on personnel aspect. Administrator had to realize and focus on participatory administration and management upon the principle of

the good governance, utilizing ICT and digital system in educational administration and management. The teachers had to realize the significance of participation in administering the school and have skills in using ICT and digital network. Members had to cooperate in administering and managing school on continuous basis. In case of the concerning budget, the school had to sufficiently and continuously get the budget supported from the original affiliation agency, and/or network members and school partners. There should also be some extra fund to support the operation on the indicators of civil state school. Concerning materials and facilities, the school had better have classroom, laboratory, special room, and high-speed internet signal to have high quality of media, materials, and equipment being ready to use. And in the concerning of management, the school utilized P-D-C-A quality cycle to accomplish the operation with the administrative principle of the good governance and network. School partners ought to take part in every step of the operation.

Model Handbook - The handbook included instruction of using the handbook

Part 1 – introduction

Part 2 – basic concept on civil state school

Part 3 – civil state school administration model

Part 4 – model using process

Part 5 – evaluating the model and showed in an appendix.

Results of verifying the model and handbook for using it by the experts revealed that the civil state school administration model and handbook were acceptable at high level.

6.3 Results of the study on using the civil state school administration model

6.3.1 Results of evaluating the use of model and handbook for using civil state school administration model presented that the use was at high level. When ranking from the most to the least, the steps were doing (D), Checking (C), Act (A) and ending with Planning (P). 6.3.2 Results of evaluating the satisfaction with using the civil state school administration model, it was found that the satisfaction was at high level. Considered by aspect, the first highest aspect was operational steps of the model (PACA) followed by the system and mechanism of the model, and the principle of model. The aspect with the least mean was the success conditions of model.

6.3.3 Results of evaluating the satisfaction with the handbook on civil state school administration, it was showed that the satisfaction was high level. When considered by aspect, the first one with the highest mean was the model assessment guideline and following with the operational steps of model, and fundamental knowledge on civil state school administration. The aspect with the least mean was appendix.

6.3.4 Results of reflection on usefulness, it was found that administrator, teachers, personnel and the concerned individuals acquired knowledge and understanding relating to the principles and theories of administration on the policy of civil state school administration to function the civil state school to achieve higher effectiveness by administering and managing the five aspects – 1) learners, 2) curriculum, 3) teacher, 4) administrator and 5) participating process. The administrators, teachers, basic education school board members and network members and the concerned individuals took part in developing the school upon their roles with the full capacity, congruent to the policy of civil state school administration which aimed to have every sector to help develop and carry out education. It was the valid, relevant, and feasible school administering innovation particularly comparing with those with similar context. It enabled the civil state school administration to be more effective and efficiency.

7. Discussion

In this research, the researcher found two interesting issues which could be discussed as follows:

7.1 Civil state school administration model had appropriateness, feasibility, and utilities at high level. The civil state school administration model included six parts, 1) principle of model, 2) objectives, 3) factors and operational steps, 4) learning towards practice, 5) outcomes and 6) conditions of the model. The findings were congruent with those proposed by Runcharoen, Teera (2007) who had identified six factors of the model that were 1) principle, 2) objectives, 3) system and mechanism, 4) operational method, 5) assessment guideline and 6) conditions of the model. The appropriateness, feasibility, and usefulness were the process to construct the model being carried out along with the principles, objectives, and systematic steps. Concerning this, the researcher studied and synthesized the concepts on model and model construction including the use of participatory action research (PAR) in constructing the model and model using handbook. The process started from workshop participated by administrators of civil state schools in Chiang Mai Province and having the experts check its appropriateness, feasibility, and validity. The experts related to connoisseurship model to come up with the model that was comprehensive and relevant using as the civil state school administration model.

7. 2 Results of applying the model and handbook for using civil state school administration model, it was found that the results of evaluating the model and its handbook was at high level. The users were satisfied with the use of it at high level and satisfied with the handbook at high level. Moreover, the reflection and recommendations on using the model and handbook for civil state school administration model revealed that the model was beneficial for the civil state

System and mechanism of model: Inputs, Process, Outputs, and Feedback.

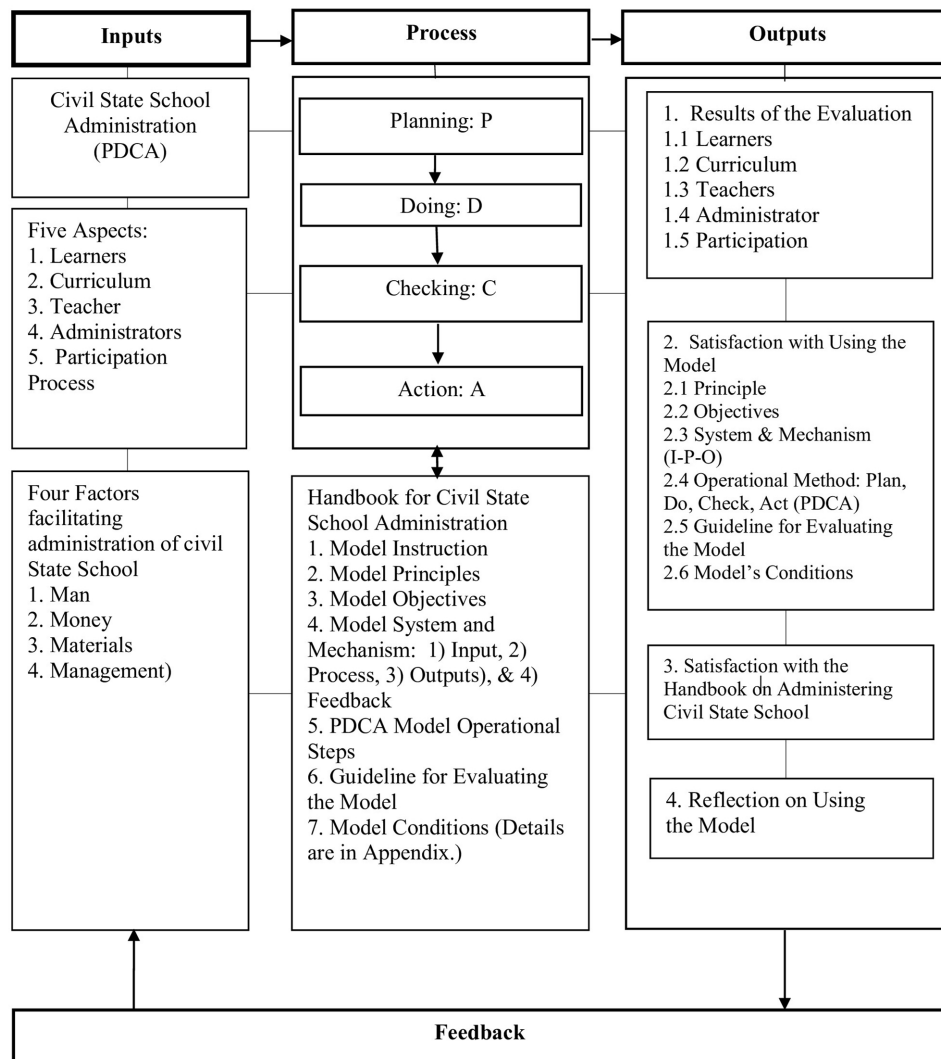


Figure 2: Model mechanism system

school administration assuring its effectiveness and efficiency equipping the administrator with knowledge and understanding on administration principle and theory, policy, and civil state school administration. It helped the teachers and educational personnel, basic education school board members, parents, and community network members understand the policy and civil state school administration and participate in developing the school mutually on their roles with their capacity. Administrators were able to apply the model and handbook as a tool in administering with effectiveness and efficiency based on the policy, objectives, and indicators of the civil state school. This achievement might be in the workshop which had experts on school administration who had carried out the policy and were responsible for the civil state school project coming in to provide knowledge and helping draft and validate the effective model and handbook. Furthermore, during the application of the model and

its handbook, the researcher, and co-researchers from four schools had an opportunity to complete the learning exchange while operation on continuous basis. Besides, the model and handbook used in their research were the results of taking the principles, concepts, objectives, policy, and indicators of civil state school as the operational goals of the research enabling the five aspects of civil state school administration and its eleven strategies enhancing its effectiveness and efficiency. This was congruent to the research findings related to Phanpattanakul, Supat (2011) who had studied the development of administrative model of effective secondary education schools affiliating to Office of the Basic Education Commission (OBEC) and found the administrative model of secondary education schools was effective. It was a system approach of administration and management covering inputs – organizational leadership and focused on human resources, good governance, and school culture. The process in-

cluded the setting up of strategic plan in carrying out the process focusing on the students, parents, and the concerned individuals as well serving as a learning organization. With concerning of the outputs, the process could make the learners smart, good, and happy individually. The inputs were the teachers and educational personnel having quality and standard. They also consisted of the community that was with public mind to lend their hands to the school constantly. Nonetheless, the school had to solve the confronting problems by thinking outside the box in relevance to the everchanging context. Similarly, Sangnet, Niphon (2017) had studied the development of administrative model Sri-Tambons Virtue Schools, promoted by Ministry of Education and found that the Sri-Tambons Virtue School was based on 1) principle. 2) objectives 3) essences of the model and 4) guideline for implementing the model. One year later, Arundee, Kitipat (2018) studied the guideline for operating along the indicators of civil state schools affiliating to Chiang Mai Primary Educational Service Area Office and found that the operation of the indicators of civil state schools with good practice, the school had better have the readiness on basic factors being the center of ICT and digital network, realize the significance of participative operation, have mutual of understanding among them utilizing the operational process of P-D-C-A quality cycle and use technology in publicizing, coordinating, monitoring, following up, measuring and evaluating, and concurrently reporting the operational outcomes. From all these characteristics, shortly, the civil state school administration model could serve as the model focusing on developing the quality and effectiveness of systematic organizational administration with the framework of inputs, process, outputs and feedback in order to lead to the civil state school administration with true effectiveness and efficiency.

8. Conclusion

Leading Model of Civil State Schools into practicing to achieve the objectives by using set model as the guideline for carrying out the learners, curriculum, teacher, administrator and participating process. The board members and network members and the concerned individuals took part in developing the school upon their roles with the full capacity and being congruent to the policy of civil state school administration which aimed to have every sector to help develop and carry out education. It was the valid, relevant, and feasible school administering innovation particularly comparing with those in similar context. It enabled the civil state school administration to be more effective and efficiency.

9. Recommendations

9.1 At the policy level, the original affiliation agency should apply the model and handbook in run-

ning of the civil state school including in the workshop organized for administrators, personnel, and teachers of the school with similar context.

9.2 At operating level, administrators of school with similar context should apply the model and handbook basing on the context and conditions of area.

9.3 Administrators of civil state school or school with similar context ought to apply the model and handbook as the guideline for operating school to enhance its effectiveness and efficiency.

9.4 Office of secondary educational service area is supposed to apply the factors facilitating its service to support civil state school or schools with similar context as the guideline for facilitating the school administration to gain higher effectiveness and efficiency.

10. Recommendations for Further Researches

10.1 There should be a study on the model for academic administration of civil state schools to encourage the civil state enhance their education quality.

10.2 There would be a study on model for developing participation network of civil state schools as the school network or partnership which is an important part in facilitating effective administration of schools in civil state school area and others.

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Disaster management program compliance and problems encountered in two provinces in Central Luzon, Philippines

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Abstract

Disaster management is one area in the field that comes with a heavy burden of administrative functions and compliances. Thus, it is vital to consider among managers to put the best man in the field. The purpose of this study is to find out the disaster management program compliance of participants in two provinces in Central Luzon, Philippines. At the same time, identify the problems encountered during the implementation of the programs. This study used a descriptive design with the survey as a primary instrument in data gathering. 110 participants took part in the survey which came from the two selected provinces. The researcher created a questionnaire for the study which underwent validity and reliability test. This study analyzed the gathered data using SPSS 20 and employed the following statistical tools: frequency, percentage, rank, means, t-test, ANOVA, and Pearson-r. The study found that the respondents “moderately complied” with disaster prevention and mitigation programs and disaster preparedness programs. On the other hand, respondents “complied” with the disaster response programs and disaster recovery and rehabilitation programs. There were no statistical differences in the responses of respondents with different disaster management programs. However, there is a significant relationship between the number of family members and disaster response programs. Based on the results of the study, the researcher recommended pertinent suggestions for the community, policy-makers, and local government units.

Keywords: disaster management, programs compliance, problems encountered, Central Luzon, Philippines

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1. Introduction

A disaster is an inevitable event that can occur anytime, anywhere, and anyplace. Depending on its type and its destructive capacity, it brings great havoc to everyone living in a particular place and condition. Being aware of different types and kinds of disasters can contribute to better and more efficient preparation for the unaccountable and unpredictable changes within the realm of the environment we are living in. In a study about natural hazards knowledge and risk perception, the respondents were worried but prepared to some extent [1]. They also highlighted from a study the important understanding of the risk perceptions and responses of individuals to climate change and natural disasters [2]. Other studies focused on the awareness and perception of disaster [3], estimating the risk of disasters [4] and the relationship between the perception of climate change and socio-demographic characteristics [5].

It is important to understand that preparing for a disaster or any form of calamity is all year round and

not a single event occurrence. There are different aspects to consider in risk reduction strategies [6 – 8] and this includes different perspectives and factors to facilitate varied services from the government and other concerned agencies to the community affected by a disaster. Traditional knowledge about a disaster is an important ingredient for social communication and preparation and such knowledge is very particular on how the community sets up for preparations and management when disaster comes [8 – 12]. We cannot ignore the fact that although not proven, methods in predicting changes in the climate were observed through time.

With the ideas and concepts that pertain to disaster risk reduction and management programs, climate change adaptation, and climate-related disaster risk reduction policies should be brought to light [13]. Another study also discussed risk perception and communication for disaster risk management [14]. Participation is also a must-have in every community vulnerable to the disaster, that is why a framework for measuring social participation among vulnerable groups should be created and implemented [15]. However, sometimes there is a dilemma that a commu-

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Table 1. Profile of the respondents.

Profile	Frequency	Percentage
Provinces		
Province 1	55	50
Province 2	55	50
Sex		
Male	37	34
Female	73	66
Age		
20-30 years old	35	32
31-40 years old	28	25
41-50 years old	24	22
51 above years old	23	21
	Mean: 39.74	SD: 13.00
Number of Family Members		
1-3 members	33	30
4-6 members	65	59
7-9 members	12	11
	Mean: 4.48	SD: 1.71
Total	110	100

nity encounters, in terms of disaster management; community members do not share uniform perceptions [16]. Information from data analysis, indigenous knowledge, and emergency management practices help outline the disaster risk reduction and management schemes of diverse agencies of the government [17]. There are also related studies that discussed the idea of integration, which is also essential in disaster risk reduction management [18, 19]. Community participation is vital for the survival of each individual thus, integration of disaster management programs is important.

This study finds out the disaster management program compliance of respondents in the two provinces of Central Luzon Philippines. The study would like also to find out the distinct problems encountered in implementing the different disaster management programs. From this perspective, the study intends to provide essential recommendations for policy-makers, local government agencies, and non-government organizations.

The outcome of this study is deemed important in policy making and at the same time in strategic management programs of the local government units of the two provinces. Furthermore, the information that can be extracted from this study can also be used as a benchmark for other future studies involving disaster management and other related contexts.

2. Methodology

2.1 Research design

This particular study used a descriptive correlational design with a survey as the major instrument for data gathering. Since the study particularly tries to analyze or describe a certain type of phenomenon or event, the abovementioned design is appropriate.

2.2 Respondents

There were 110 participants who took part in this study. There were two provinces identified by the researcher and determined one community for each province. Then, the researcher used the Slovin's formula to determine the appropriate sample per community. However, because of some unforeseen circumstances and the availability of the respondents, it was difficult to achieve the necessary sample population for the study. This study also used a convenience sampling technique in data gathering. The researcher used this sampling technique for the following reasons: (a) the availability of the respondents during the survey, (b) the area covered by the researcher is mountainous and difficult to navigate, and (c) time constraints. The individuals involved in the study lived within the two chosen provinces in Central Luzon and experienced several types of disasters for the past years.

2.3 Instrument of the study

The researcher created a self-made questionnaire which has been based in the National Disaster Risk Reduction Management Council (NDRRMC) Preparedness Plan of 2015 – 2028. The questionnaire underwent professional critiquing from a panel that is composed of a University Vice President, a University Professor, a college professor, a retired university professor, a professional data analyst, a seasoned researcher, and a grammar expert. It also went into a validity test for internal consistency (Cronbach alpha test) and yielded an overall score of .809, which is above the acceptable level of .70. Furthermore, it also went into a pilot test to individuals who are not part of the survey to test its clarity and for any ambiguous or misunderstood words or terminologies.

2.4 Statistical analysis

This study analyzed the gathered data using SPSS 20. The statistical tools used in this study were: frequency, percentage, rank, means, t-test, ANOVA, and Pearson-r. The alpha significance level of .05 is the benchmark score to accept or reject the null hypothesis for this study. This study also used a Four-point Likert scale for the responses of the respondents. A Likert scale is a rating used to measure the attitude or opinion of an individual. The researcher asked respondents to rate items on the level of their agreement. In this study, the respondents rate unique items on a survey regarding disaster management program compliance.

3. Results

This study finds out the compliance levels of respondents in the different disaster management programs in the two provinces in Central Luzon Philippines. At the same time, find out the distinct problems encountered in the implementations of the disas-

Table 2. Level of compliance on disaster prevention and mitigation programs.

Item	WM	Interpretation
1) Conduct of several risk assessment	2.25	Moderately Complied
2) Development and establishment of several early warning systems	2.61	Complied
3) Development of tools on risk assessment	2.40	Moderately Complied
4) Increasing the involvement of communities and LGUs in disaster risk management	2.03	Moderately Complied
Average	2.40	Moderately Complied

Table 3. Level of compliance on disaster preparedness programs.

Indicators	WM	Interpretation
1) Conduct of disaster reduction and risk researches	2.53	Complied
2) Development and regular review of contingency plans	2.23	Moderately Complied
3) Development of IEC materials	2.16	Moderately Complied
4) Existence of procedures on disaster communication	2.30	Moderately Complied
Average	2.30	Moderately Complied

ter management programs. The following tables below provided a glimpse of the results that this study got.

Table 1 shows the profile of the respondents for this study. As seen, there were equal numbers of respondents from the two provinces. However, there are more female respondents than their counterparts. Most of the respondents were also young adults who belong to the age bracket of 20 – 30 years old. Last, the number of family members falls between 4 – 6 members. The abovementioned information shows the typical respondents that can provide essential information for this study which involves households that voluntarily participated in the data gathering.

Table 2 shows the level of compliance on disaster prevention and mitigation programs. As observed, item 2 got the highest weighted mean with 2.61 which corresponds to the Likert scale interpretation of *complied*. However, item 4 got the lowest weighted mean score of 2.03 which has a corresponding Likert scale interpretation of *moderately complied*. Overall, the average weighted mean is 2.40 with a Likert scale interpretation of *moderately complied*. The information shows that in terms of disaster prevention and mitigation programs, the respondents observe the abovementioned items rarely or infrequently, thus leading them to the idea of moderate compliance.

Table 3 shows the level of compliance on disaster preparedness programs. As indicated, item 1 got the highest weighted mean with a score of 2.53 which is interpreted as *complied* on the Likert scale. Conversely, item 3 got the lowest weighted mean average with 2.16 which corresponds to *moderately complied* on the Likert scale. The average weighted mean for disaster preparedness is 2.30, interpreted as *moderately complied* on the Likert scale. The results show that the respondents deem such a notion since they have little idea or do not observe such a program exist in their neighborhood or community.

Table 4 shows the level of compliance of respondents in disaster response programs. As shown, the

two items got weighted means interpreted as *complied* on the Likert scale. The average weighted mean, which is 2.83 likewise has an interpretation of *complied* on the Likert scale. This means that the respondents observe that when it comes to disaster response, we can assume that they observe the visibility or presence of such a program in their community.

Table 5 shows the level of compliance of respondents in disaster recovery and rehabilitation. As presented, item 2 got the highest weighted mean with 2.72 which corresponds to *complied* on the Likert scale. But item 4 got the lowest weighted mean score which has the same Likert scale interpretation of *complied*. All in all, the average weighted mean is 2.65 which also has an interpretation of *complied*. This means that in terms of disaster recovery and rehabilitation, the respondents can justify their presence and obligation for the community.

Table 6 indicated the independent t-test to compare the compliance level on disaster risk reduction and management programs of respondents and location. As shown, there are no significant differences in the t-computed results of all the four variables based on the Alpha significance value set at .05. The disaster prevention and mitigation program compliance level of the respondents in Province 1 ($M = 2.33$; $SD = 0.95$) and Province 2 ($M = 2.45$; $SD = 0.74$) do not vary that much, since $t(108) = -0.729$, $p = .468$. The disaster preparedness program also got the same result wherein the compliance level of Province 1 ($M = 2.42$; $SD = 1.02$) do not differ that much with Province 2 ($M = 2.19$; $SD = 0.89$), since $t(108) = 1.244$, $p = .216$. For disaster response program, it also has the same outcome for Province 1 ($M = 2.77$; $SD = 0.93$) and Province 2 ($M = 2.89$; $SD = 0.91$) wherein their scores do not deviate too much, since $t(108) = -0.674$, $p = .502$. And for the disaster recovery and rehabilitation program, we observe the same result on Province 1 ($M = 2.59$; $SD = 0.98$) to Province 2 ($M = 2.70$; $SD = 0.83$) where the scores do not contrast too much since $t(108) = -0.654$, $p = .514$. All of the mentioned prob-

Table 4. Level of compliance on disaster response programs.

Indicators	WM	Interpretation
1) Establish an institutional mechanism for disaster response operations	2.85	Complied
2) Improve skills in search, rescue, and retrieval operations	2.81	Complied
Average	2.83	Complied

Table 5. Level of compliance on disaster recovery and rehabilitation programs.

Indicators	WM	Interpretation
1) Conduct of post-disaster assessments	2.65	Complied
2) Integration of DRR into post-disaster recovery and rehabilitation processes	2.72	Complied
3) Incorporating DRR elements in the planning and management of human settlements	2.65	Complied
4) Mainstreaming of DRR in social, economic, and human settlements development plan	2.56	Complied
Average	2.65	Complied

Table 6. Comparison of the compliance level on disaster risk reduction and management programs of respondents when grouped according to location.

	Province 1 (n=55)		Province 2 (n=55)		<i>t</i> -computed	<i>p</i> -value
	M	SD	M	SD		
Disaster Prevention and Mitigation	2.33	0.95	2.45	0.74	-0.729	.468
Disaster Preparedness	2.42	1.02	2.19	0.89	1.244	.216
Disaster Response	2.77	0.93	2.89	0.91	-0.674	.502
Disaster Recovery and Rehabilitation	2.59	0.98	2.70	0.83	-0.654	.514

$p > .05$

ability values were higher than the Alpha significance level of .05, thus, there are no significant differences in the compliance level scores of the respondents in the disaster risk and reduction management programs when grouped according to their location.

Table 7 shows the independent *t*-test to compare the compliance level on disaster risk reduction and management programs of respondents and sex. As displayed there are no significant differences in the *t*-computed results of all the four variables based on the Alpha significance value set at .05. For the disaster prevention and mitigation program compliance level of the respondents, the score of male ($M = 2.35$; $SD = 0.92$) do not vary that much with the female ($M = 2.42$; $SD = 0.85$), since $t(108) = -0.387$, $p = .700$. For the disaster preparedness program, it also got the same result wherein the compliance level of males ($M = 2.30$; $SD = 1.06$) do not differ that much with the females ($M = 2.30$; $SD = 0.91$), since $t(108) = -0.004$, $p = .997$. For the disaster response program, it also has the same outcome for males ($M = 2.92$; $SD = 0.99$) and females ($M = 2.79$; $SD = 0.88$) wherein their scores do not deviate too much, since $t(108) = 0.708$, $p = .481$. And for the disaster recovery and rehabilitation program, we observe the same outcome for males ($M = 2.78$; $SD = 0.94$) and for the females ($M = 2.58$; $SD = 0.89$) where the scores do not contrast too much since $t(108) = 1.120$, $p = .265$. All of the mentioned probability values were higher than the Alpha significance level of .05, thus, there are no significant differences in the compliance level scores of the respondents in the disaster risk and reduction management programs regardless of their sex.

Table 8 shows the Analysis of Variance for significant differences in the compliance levels on disaster risk reduction and management programs of respondents when grouped according to age. (Please see to Table 1 for the age range for each group). We observe that there are no significant differences in the *F* values of the different disaster risk reduction and management program variables. This is so because for disaster prevention and mitigation programs the computed result includes $F(3, 106) = 0.518$, $p = .671$. The *F* value is higher than the Alpha significance level of .05 which means there is no significant difference in the level of compliance of the respondents. For the disaster preparedness program, the result is $F(3, 106) = 0.791$, $p = .501$, wherein the *F* value is also higher than the Alpha significance level of .05. For the disaster response program, we have $F(3, 106) = 1.103$, $p = .351$, where the *F* value is higher than the .05 Alpha significance level. And for the disaster recovery and rehabilitation program, we have $F(3, 106) = 1.454$, $p = .231$, wherein the *F* value is also higher than the .05 Alpha significance level. This only means that there are no significant differences in scores of the respondents regardless of the age bracket that they belonged to.

Table 9 shows the Analysis of Variance for significant differences in the compliance levels on disaster risk reduction and management programs of respondents when grouped according to the number of family members. (Please see to Table 1 for the age range for each group). We discerned that there are no significant differences in the *F* values for the different disaster risk reduction and management pro-

Table 7. Comparison of the compliance level on disaster risk reduction and management programs of respondents when grouped according to sex.

	Male (n=37)		Female (n=73)		<i>t</i> -computed	<i>p</i> -value
	M	SD	M	SD		
Disaster Prevention and Mitigation	2.35	0.92	2.42	0.82	-0.387	.700
Disaster Preparedness	2.30	1.06	2.30	0.91	-0.004	.997
Disaster Response	2.92	0.99	2.79	0.88	0.708	.481
Disaster Recovery and Rehabilitation	2.78	0.94	2.58	0.89	1.120	.265

$p > .05$

Table 8. Comparison of the compliance levels on disaster risk reduction and management programs of respondents when grouped according to age.

		SS	Df	MS	<i>F</i> computed	<i>p</i> -value
Disaster Prevention and Mitigation	Between Groups	1.133	3	0.378	0.518	.671
	Within	77.290	106	0.729		
	Total	78.423	109			
Disaster Preparedness	Between Groups	2.202	3	0.734	0.791	.501
	Within	98.346	106	0.928		
	Total	100.548	109			
Disaster Response	Between Groups	2.774	3	0.925	1.103	.351
	Within	88.865	106	0.838		
	Total	91.639	109			
Disaster Recovery and Rehabilitation	Between Groups	3.553	3	1.184	1.454	.231
	Within	86.359	106	0.815		
	Total	89.912	109			

$p > .05$

gram variables. This is so since the disaster prevention and mitigation program has the computed result of $F(2, 107) = 1.259, p = .288$. The F value is higher than the Alpha significance level of .05 which means there is no significant difference in the level of compliance on the different disaster risk reduction and management programs. For the disaster preparedness program, the result is $F(2, 107) = 1.261, p = .287$, wherein the F value is also higher than the Alpha significance level of .05. For the disaster response program, we have $F(2, 107) = 2.958, p = .056$, where the F value is higher than the .05 Alpha significance level. And for the disaster recovery and rehabilitation program, we have $F(2, 107) = 2.510, p = .086$, wherein the F value is also higher than the .05 Alpha significance level. This only means that there are no significant differences in the scores provided by the respondents regardless of the number of family members.

Table 10 shows the correlation matrix between the profile of the respondents and the disaster risk reduction and management program level of compliance. For the profile of the respondents, the input data were location, sex, age, and the number of family members. On the other hand, the input data for disaster risk reduction and management programs were disaster prevention and mitigation disaster preparedness, disaster response, and disaster recovery and rehabilitation. As seen from the table, there was a low-negative relationship between the number of family members and disaster response, $r = -.213, n = 110, p = .026$. This means that the higher the number of family members,

the lower the disaster response and vice versa. Other variables like location, sex, and age in the study did not produce a substantial result that will correlate with other disaster risk reduction management programs.

Table 11 shows the top five (5) problems encountered by the respondents in the implementation of disaster risk reduction and management programs. Based on the responses, delayed program/project and low compliance got the highest number of answers with 66 each. The search and rescue units/team are not full-mission capable followed next with 64 responses and insufficient information dissemination and limited capacity in terms of staff, equipment, and other logistics tied at 62 responses which complete the top five (5) problems encountered in the implementation of disaster risk reduction and management programs as perceived by the respondents.

4. Discussion

This study finds out the disaster management program compliance of respondents in the two provinces of Central Luzon Philippines. At the same time, the study would like also to find out the distinct problems encountered in implementing the different disaster management programs.

The overall findings of this study found moderate compliance with disaster prevention and mitigation and disaster preparedness. On the other hand, respondents complied with disaster response and disaster recovery and rehabilitation.

Table 9. ANOVA for significant difference in the compliance levels of respondents when grouped according to the number of family members.

		SS	Df	MS	<i>F computed</i>	<i>p-value</i>
Disaster Prevention and Mitigation	Between Groups	1.803	2	0.902	1.259	.288
	Within	76.620	107	0.716		
	Total	78.423	109			
Disaster Preparedness	Between Groups	2.316	2	1.158	1.261	.287
	Within	98.232	107	0.918		
	Total	100.548	109			
Disaster Response	Between Groups	4.801	2	2.401	2.958	.056
	Within	86.837	107	0.812		
	Total	91.639	109			
Disaster Recovery and Rehabilitation	Between Groups	4.029	2	2.015	2.510	.086
	Within	85.883	107	0.803		
	Total	89.912	109			

$p > .05$

Table 10. Correlation between the profile and the disaster risk reduction and management programs compliance levels.

	1	2	3	4	5	6	7	8
Location	1							
Sex	.019 (.842)	1						
Age	-.202* (.035)	-.021 (.828)	1					
Number of Family Members	-.223* (.019)	-.097 (.316)	.154 (.108)	1				
Disaster Prevention & Mitigation	.070 (.468)	.037 (.700)	.073 (.448)	-.140 (.144)	1			
Disaster Preparedness	-.119 (.216)	.000 (.997)	.127 (.185)	-.083 (.386)	.733** (.000)	1		
Disaster Response	.065 (.502)	-.068 (.481)	.056 (.558)	-.213* (.026)	.563** (.000)	.600** (.000)	1	
Disaster Recovery & Rehabilitation	.063 (.514)	-.107 (.265)	.123 (.265)	-.184 (.055)	.564** (.000)	.706** (.000)	.748** (.000)	1

* $p < .05$; ** $p < .01$

Concerning the current study, a related study pointed out that incorporating local knowledge in disaster risk reduction programs can be a daunting task [20]. However, another study justified the result of the current study and showed that the non-response behavior of individuals can affect the overall perception of safety to disaster [21]. Another literature also exposed that several factors can prevent effective institutional preparedness and response to emergencies [3]. Another study also showed agreement and support to the result stating that the community can facilitate emergency management, risk reduction, and community resilience [22]. Furthermore, disaster education at school contributes to constant learning and makes the children and students be effective agents to share the information with the family and communities [8]. Nevertheless, another conflicted result, and against this the study, showed the necessity to delineate strategies of risk communication as a core of disaster risk reduction and management [14]. However, the reluctance of individuals in disaster recovery and rehabilitation needs validation since the procedures and functions in the disaster risk management system leads to problems in associating information

and transfer to the local level [18].

On the other hand, inferential statistics reveal that the responses of the participants are uniform regardless of the profiles designated in the study. The result of the current study at hand is almost parallel to the context of another study that revealed no statistical difference in gender-based disaster knowledge, readiness, awareness, and risk perception [23]. However, there is one interesting finding in the study, a low-negative relationship between the number of family members and the disaster response program. In contrast, another study presented that demographic profiles associates with climate change and climate hazard perception [5]. It was further verified that risk perception, the experience of severe disaster, and community disaster preparedness predict the participants' disaster preparedness behavior [7].

Based on the survey, there are five (5) identified problems encountered in implementing disaster risk reduction and management programs, namely: delayed program/project; low compliance; search and rescue units/team are not full-mission capable; insufficient information dissemination; and limited capacity in terms of staff, equipment, and other logistics.

Table 11. Problems encountered in the implementation of disaster risk reduction and management programs.

Problems	Frequency	Rank
Delayed program/ project	66	1
Low compliance	66	1
Search and rescue units/ team are not full-mission capable	64	2
Insufficient information dissemination	62	3
Limited capacity in terms of staff, equipment, and other logistics	62	3

A study from the country of Cameroon found out that there was no national disaster management structure and a national platform for disaster risk reduction [24]. This disagrees with our current national situation wherein the government provided a strong national platform and law for disaster management for the country. Mindfulness and discernment, financial and technical resources, policy, institutional arrangements, leadership, and human resources avert effective and timely institutional preparedness and responses to disaster [3]. These ideas complement the context of policy-making and possible community participation from such innovative and legal parameters of disaster management.

5. Conclusion

Based on the aforementioned results of the study, the researcher concludes the following ideas:

1. For the disaster prevention and mitigation program and disaster preparedness program, they got a moderately complied answer from the respondents.
2. For the disaster response program and disaster recovery and rehabilitation programs, they got a complied answer from the respondents.
3. There are no significant differences in the different disaster risk reduction and management programs when grouped according to the profile of the respondents.
4. There is a low-negative correlation between the number of family members and the disaster preparedness programs.
5. The top five (5) problems encountered in the implementation of disaster risk reduction and management programs include: delayed program/ project; low compliance; search and rescue units/ team are not full-mission capable; insufficient information dissemination; and limited capacity in terms of staff, equipment, and other logistics.

6. Recommendations

Based on the findings and conclusion of the study, the following recommendations are hereby submitted:

1. Further, increase/ raise the level of awareness of individuals through consistent enhancement seminars, training, and drills.
2. Raise the compliance level of the community on disaster awareness programs of the government since

the majority of the indicators have moderately complied to complied rate. This can be done through constant monitoring, monthly visitation, and performance evaluations in the area.

3. Active participation of key players and stakeholders through proper coordination and collaboration to enhance the relationship and community involvement.

4. Active involvement of the key players like the LGUs and NGOs in the process of monitoring and evaluating the compliance levels.

5. Leadership training and seminars pertinent to disaster management to key core groups through capability enhancement and development.

6. Monthly disaster drills in the community participated by all including the young and old.

7. Transparency in the project/ program proposals especially in the financial aspect. Auditing is a must.

8. The researcher also endorses possible future researches to follow up previously studied concepts regarding this area of research and at the same time gather more substantial data for future use.

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Evaluation of water footprint of Phitsanulok-2 rice yield under alternate wetting and drying cultivation in dry season

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Abstract

The objective of this research was to assess the Water Footprint (WF) of rice cultivation in Phitsanulok Province, Thailand. In this research, the data were collected by the field research technique in order to access WF in the rice fields for water saving without affecting the yield using Phitsanulok-2 rice. The implementation of two water management strategies under Alternate Wetting and Drying Method (AWD) was tested in comparison with Continuous Flooding Method (CF). The experiment was conducted during the dry season in 2016 and 2017 in the irrigated fields of Irrigation Water Management Experiment Station (Phitsanulok). From the results, it was found that the water delivery to the plots with both AWD techniques used less water than the continuous water supply method at approximately 33.64% in 2016 and about 18.26% in 2017 in the dry seasons and maintaining grain yield. The average WF of AWD1, AWD2 and CF was 883.35 m³/ton, 912.90 m³/ton and 1,150.45 m³/ton of paddy, respectively. Therefore, the less water cultivation by AWD1 and AWD2 are the appropriate water management strategy for cultivation of irrigated rice and it is an effective way to reduce WF of water used in the agricultural sector for Thailand.

Keywords: water footprint, irrigation, Phitsanulok-2 rice, alternated wet and dry, paddy yield

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1. Introduction

Rice is the most important grown of all crops under irrigation, with as much as 80% of all freshwater resources in Asia dedicated to irrigation, and 90% of the irrigation water is used for rice produce [1]. As a result of climate change, as well as the demands of urbanization and the need for water to maintain industrial production, it is increasingly difficult to maintain the supply for agriculture. It is anticipated that within 5 years, up to 20 million hectares in Asia will be experiencing a severe lack of water [2]. In farming rice, water is necessary to address the issue of evapotranspiration. Water is lost from farms due to seepage or percolation, and this water simply leaves the farm without ever coming into contact with the irrigated crop. Reducing the amount of irrigation water would lead to an improvement in water use efficiency.

Rice agriculture occupies 21.3% of cultivated land in Thailand and production reached 31.9 million tons from 108,960 km² of rice paddy during 2016 [3]. Rice cultivation demands a large amount of water usage, while the process generates wastewater which can have a detrimental effect on the environment. In recent

decades, attempts have been made to increase yields while reducing water usage in the rice-growing sector. Various innovations have sought to help farmers to avoid water shortages and to manage scarce resources [4, 5]. One approach which has been used across Asia is AWD, which was first employed by the International Rice Research Institute (IRRI) more than twenty years ago. However, AWD techniques have not been widely adopted by Thailand farmers because of constraints in effectiveness and reliability.

The water footprint (WF) concept was initiated by Hoekstra and Hung (2002) and then was developed by Hoekstra and Chapagain (2008), and which serves to assess the way humans use freshwater resources, whether directly or indirectly, and in the capacity of production or consumption. WF therefore can be applied as a tool in managing the use of water in terms of its energy impact, especially when assessing the impact of water usage upon global warming. There are three elements which comprise the WF: blue, green, and grey water. Green water WF describes the rain-water which is evaporated as the rice crop grows. Blue water WF describes the water on and beneath the surface in the specified area which evaporates as the crops grow. Grey water WF shows how much freshwater is

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needed for pollutant assimilation and will depend on the concentrations which occur naturally as well as the ambient water quality [6 – 9].

The aim of this study was to calculate the WF when rice is grown in Thailand using water-saving methods under AWD, making comparisons of the 2015 – 2016 and 2016 – 2017 seasons. The study considers blue, green, and grey WF, and the findings can be used in planning the future usage of water resources and the formulation of policy controlling rice production and the use of water.

2. Materials and Methods

2.1 Experimental site

The field experiment was conducted over two consecutive years (2016, 2017) at irrigation fields of Irrigation Water Management Experiment Station, Phitsanulok Province in the northern region of Thailand. The location of the site chosen for this study is given by 17° 03' 05" N and 100° 13' 29" E. The site elevation above mean sea level stands at 47.5 m. Soil samples were drawn from a depth of around 30 cm and analyzed to determine the pH, texture, organic matter content, permanent wilting point, and field capacity, as indicated by the data in Table 1.

Table 1. Soil characteristics in the studied fields. (Depth 0-30 centimeters).

Property of soil analysis	2016	2017
Sand (%)	8.6	8.8
Silt (%)	11.0	10.3
Clay (%)	80.4	80.9
Texture Class	Clay	Clay
pH	5.0	5.3
Organic Matter (%)	2.5	4.6
Field Capacity	40.8	40.8
Permanent Wilting Point	28.7	27.4
Available P (ppm)	2.4	3.0
Total Extractable K (ppm)	40.0	38.0

Qualification Test by office department of research and development, Royal Irrigation Department

2.2 Treatments of irrigation

The experiment was repeated over seasons using randomized complete block design with three water treatments. The water treatments were: 1) AWD1, in which the paddy plot underwent flooding to 5 cm. Then when the water level declined to 5 cm beneath the ground level, the plot was flooded again for the remainder of the season to 5 cm, although irrigation ceased two weeks prior to harvesting; 2) AWD2, in which the paddy plot received 5 cm of water immediately after transplanting, which was maintained until 25 or 45 days later. If the water level fell to 15 cm beneath the ground level, flooding would once again take

place to 5 cm for the remainder of the season, although irrigation ceased two weeks prior to harvesting; 3) A continuous flooding approach (CF), with pond depth of 5 cm for the duration of the season, ceasing irrigation two weeks prior to harvest. The design of the treatments allowed the planting of Phitsanulok-2 by taking rice seedlings aged 21 days and transplanting sections measuring 20 × 25 cm. For each of the treatments, if a single plot required irrigation, all of the three plots for each treatment received irrigation. The plots measured 10 m × 22 m and were separated by a pathway of width 1.0 m. The water was unable to flow laterally due to the construction of 30 cm dikes which were covered with a black plastic film extending 30 cm below the surface of the ground.

In each of the two seasons, the irrigation commenced ten days after transplanting. During those initial ten days, the depth of the water was maintained at 5 cm to allow the plants to consolidate and to prevent the growth of weeds. After this, the water level under the soil surface was checked constantly using perforated field water tubes. Under continuous flooding, this 5 cm depth was sustained for a period from 15 days prior to harvesting. For AWD1 and AWD2, irrigation timings were dependent on the records of water depth obtained from the field water tubes.

The research also recorded the total water input levels (m³/ha), including both irrigation sources and rainfall. For each season, the amount of water input from irrigation to each plot was measured using a flow meter installed in the irrigation pipeline, whereas rainfall data were collected from irrigation water management experiment station (Phitsanulok).

2.3 Water footprint (WF) assessment

WF is defined as a water resources use indicator, which could be expressed as the water volume used to produce a unit of product (m³/ton). The total WF (m³/ton) of crop cultivation is calculated by the sum of green, blue and grey components, as shown below:

$$WF_{\text{Crop}} = WF_{\text{Blue}} + WF_{\text{Green}} + WF_{\text{Grey}} \quad (1)$$

Where, WF_{Blue} is the blue WF, refers to the fresh surface and ground water used for production purpose, ground water has not been calculated in this study; WF_{Green} is the blue WF, refers to the volume of rain water used for crop cultivation; WF_{Grey} is the grey WF; grey WF is the water needed to dilute with the pollution. The green and blue WFs can be calculated using the Equation (2) and (3)

$$WF_{\text{Blue}} = CW_{\text{Blue}}/Y \quad (2)$$

$$WF_{\text{Green}} = CW_{\text{Green}}/Y \quad (3)$$

Where, CW (m³/ton) is the crop water use of blue or green, CW_{Blue} is the amount of the water from the irrigation and CW_{Green} is the precipitation consumption. Y (ton/ha) is the crop yield. In the case of grey WF, the

Table 2. Summary of water consumption and paddy yield.

Treatments	Water consumption (m ³ /ha)			Yield (ton/ha)
	Irrigation water	Precipitation	Total	
AWD1-2016	4,357.5	735.0	5,092.5	6.5
AWD2-2016	4,926.9	735.0	5,661.9	6.9
CF-2016	6,995.6	735.0	6,995.6	6.6
AWD1-2017	4,843.5	395.0	5,238.5	5.7
AWD2-2017	4,980.1	395.0	5,375.1	5.7
CF-2017	6,008.8	395.0	6,403.8	6.0

calculations were based on the use of nitrogen fertilizers using the application rate given in Equation (4):

$$WF_{Grey} = [(\alpha \times AR)/(C_{max} - C_{naure})]/Y \quad (4)$$

When, α is times the leaching fraction, assumed 10% for nitrogen fertilizers. AR indicates the rate of chemical application for each hectare (kg/ha), while Y is the yield quantity of paddy (ton/ha), C_{max} indicates the highest permissible concentration (kg/m³) and C_{naure} represents the pollutant's natural concentration (kg/m³) [6, 7]. The fraction for leaching runoff (α) was 5 mg/l [10], which was the equivalent of the greatest acceptable level of nitrate-nitrogen in the surface water and groundwater on the basis of the water quality standards employed in Thailand. This assumed that in the bodies of water into which this runoff flowed, there was zero natural nitrogen content [7]. The type of soil used will affect the requirements for nitrogen fertilizer, with around 100 kg/ha needed for loam, sandy loam, or sand, while clay or clay loam will require just 50 kg/ha [11].

3. Results and Discussion

3.1 Water usage and paddy yields

In 2016 growing season, water consumption for the CF treatment was 6,995.6 m³/ha. The AWD1 and AWD2 treatments, water consumption were 5,092.5 m³/ha and 5,661.9 m³/ha, respectively. The precipitation or rainfall received 735.0 m³/ha (73.50 mm). In 2017 growing season, CF, AWD1, AWD2 and precipitation received 6,403.8 m³/ha, 5,238.5 m³/ha, 5,375.1 m³/ha and 395.0 m³/ha (39.50 mm), respectively. There were significant differences in the way the irrigation water was used when comparing between the approaches ($p < 0.01$). This is presented in Table 2. The total amount of water required for integration was closely dependent on the influence of the water management techniques used in each case ($P < 0.01$). Those plots which were continuously flooded (CF) required the greatest water input level for both seasons under investigation. AWD1 and AWD2 were able to reduce the amount of water required by plots maintained under CF had the highest total water input in both rice growing seasons. The AWD1 and AWD2 irrigation reduced total water input by 30.40% and 21.30% respectively in comparison to CF

for 2016, while the reduction was 19.39% and 17.12% respectively when compared to CF in 2017. The AWD technique for saving water was able to reduce the water input required in both years.

When comparing irrigation approaches in 2016 and 2017, the grain yields showed significant differences ($p < 0.01$) as shown in Table 2, with 2016 producing a yield superior to that of 2017. The greatest yield for 2016 was on AWD2 at 6.9 ton/ha, which was higher than AWD1 at 6.5 ton/ha and CF at 6.6 ton/ha. In 2017, the high grain yield was observed in CF at 6.0 ton/ha, which was higher than AWD1 at 5.7 ton/ha and AWD2 at 5.7 ton/ha, respectively. When AWD1 treatments were applied, the average grain yield declined relative to AWD2 and CF, with the yields under the AWD1 treatments declining by 3.17% when compared with AWD2 and CF, respectively. Meanwhile, for 2017, the AWD1 and AWD2 treatments reduced yields by 5.0% when compared to CF. In average yields, a similar trend was observed, with significant decreases found for all AWD1 treatments ($p < 0.01$), ranging from 0.0 – 0.4 ton/ha to 0.1 – 0.3 ton/ha, in comparison to AWD2 and CF covering the two experimental periods. However, it is also known that AWD can reduce rice yields if not implemented correctly and the drying conditions in AWD is the most important factor affecting yield. This might be due to different soil type and other site specific characteristics [12, 13]. Importantly for AWD process, the soil matric potential threshold for triggering the AWD irrigation might be dependent on soil type, management practices and factors related to the local climatic conditions [14]. Even in the same region, the effects of AWD vary with time and intensity of rainfall, type and amount of fertilizer.

3.2 Water footprint of rice production

The WF of rice cultivation in 2016 – 2017 was calculated in this study. Data from Table 3 showed the average total WF of treatments, which can be divided into blue, green and grey, respectively. All treatments, the blue WF was higher than green and grey, which implied that there was a large section of water used for irrigation. In order to reduce the blue proportion in rice cultivation, an alteration to the water-saving technologies was suggested. The result of the average WFs of rice production in experimental site was calculated based on Equation (2 – 4). The results in

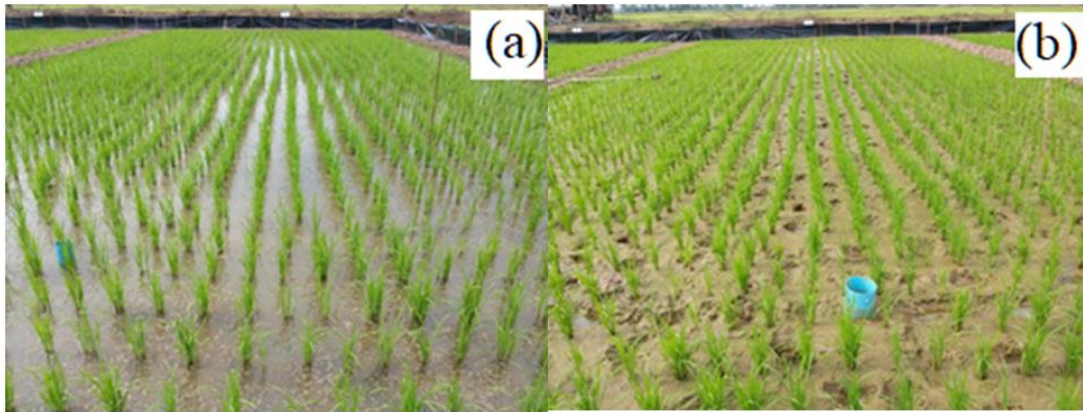


Figure 1: Experimental site of the individual plot of (a) CF period and (b) AWD period.

Table 3. Summary of water footprint.

Treatments	Water Footprint (m ³ /ton)			
	Blue Water	Green Water	Gray Water	Total
AWD1-2016	670.4	113.1	29.9	813.4
AWD2-2016	714.0	106.5	28.3	848.8
CF-2016	1,059.9	111.4	29.6	1,200.9
AWD1-2017	849.7	69.3	34.3	953.3
AWD2-2017	873.7	69.3	34.0	977.0
CF-2017	1,001.5	65.8	32.7	1,100.0

Table 4. Previous studies of the water footprint (m³/ha) for rice cultivation in Thailand.

Treatments	Water Footprint (m ³ /ton)			
	Blue Water	Green Water	Gray Water	Total
AWD [15]	1,193.9	24.4	198.9	1,417.1
AWD [16]	711.3	54.5	200.0	965.8
CF [17]	600.0	1,678.0	585.0	3,209.0
CF [18]	1,283.0	11.0	397.0	1,691.0
CF [19]	1,470.3	0.0	788.4	2,258.8

2016 showed the maximum WF in CF-2016 of 1,200.9 m³/ton with the blue, green and grey WF at 1,059.9, 111.4 and 29.59 m³/ton respectively which was higher than AWD2-2016 at 848.8 m³/ton and AWD1-2016 at 813.4 m³/ton, respectively. Results in 2017 also showed the maximum WF in CF-2017, consisting of blue, green and grey WF of 1,001.5, 65.8 and 32.68 m³/ton respectively resulting in a total WF of 1,100.0 m³/ton which was higher than AWD2-2017 at 977.0 m³/ton and AWD1-2017 at 953.3 m³/ton, respectively. It was found that WF was significantly higher under CF than AWD in both growing seasons. The average values of WF for CF were higher than AWD1 and AWD2 treatments about 23.22% and 20.65%, respectively. The range of the total WF of rice cultivation in CF were 1,100.0 – 1,200.9 m³/ton, AWD1 were 813.4 – 953.3 m³/ton and AWD2 were 848.8 – 977.0 m³/ton.

From tables 2 – 3, the treatment of AWD1-2016 yielded the lowest WF of 813.4 m³/ton and the AWD1-2017 WF was 953.3 m³/ton, while maintaining similar grain yield and the yield was relatively high almost up to CF technique. This implies that an AWD irrigation technique delivers enough water for crop wa-

ter requirement. From all treatments, the different climatic conditions, water level control, dry period duration and cultivation practices could cause variation of WF.

From the results, both AWD systems reduced irrigation water use during AWD cycle. AWD was a water management technique that reduced irrigation water requirement in paddy field. In the Phitsanulok field, the total amount of water used in AWD was slightly less than CF. Results indicated that AWD might be an effective mean for water saving. Other studies showed a more effective impact of AWD on water saving such as the studies on Table 4. Results of this study showed that the blue component was higher than the green and grey components. Most interactions between rice variety and fertilizer were not significant.

For Paddy, which needs relatively high water inputs, especially irrigation water in dry season, the irrigation efficiency of water use during the growing period is therefore essential to the regions with limited irrigation water. Water productivity of paddy can be improved by developing water management and improving agronomic management, i.e., improving fer-

tilizer management and pest control to enhance yields. Moreover, as the water management practices during the first two weeks from planting are essential to enhance weed suppression, the early flooding of wet seeded rice and the intermittent flooding by AWD method during crop growing can help to reduce water use.

Generally, the water used in rice cultivation from absorbing water in the soil through plant roots. The amount of water that the rice absorbed is only a low quantity of irrigation water for rice. Most of the water is lost from an irrigated field by transpiration, evaporation and percolation. The transpiration and soil water evaporation, collectively known as evapotranspiration, are controlled by the solar radiation or sunshine, temperature, atmospheric humidity and wind, which are factors that depend on the topography factor. In this study, factors that cause differences in irrigated water requirement and yield are climatic condition and water management. The important variables affecting WF are the water level control of flooding in rice cultivation and climatic conditions.

4. Conclusions

This study not only proved the feasibility of assessing WF of rice production with field experiments, but also provided a method for WF calculation based on field water processes. The calculation was made using the methodology proposed in The Water Footprint Assessment Manual, according to which the WF of rice represented the relation between the water saving irrigation techniques and the field productivity.

The AWD is a comparatively new and easy-to-use technique developed for Asian farmers to reduce water input while maintaining yield in irrigated rice production system. Some studies have observed decreased or even increased grain yield under AWD compared with CF [20,21]. In this study, this water saving irrigation technique could be a feasible option in reducing total water input and maintaining grain yield for soil and weather conditions comparable to the present study. By assessing the water footprint of rice cultivation, it could be seen that the input of blue water was lower, while WF was also lower under AWD in comparison to CF. If the period of cultivation could be moved to a time of year which offered slightly higher rainfall, the need for water supplied could be reduced. Alternatively, using a systematic approach of wet and dry farming rather than maintaining a flooded environment might also serve to lower the overall water consumption levels. While the use of green water in the cultivation of rice is not currently a major environmental concern, it is probably the case that in order to reduce the use of blue water, the green water footprint should be cut where possible. The use of green water suggests that rainfall alone is insufficient to generate the required rice yields, and therefore irrigation is nec-

essary. The effects of the WF for green and grey water in rice cultivation will vary with the growth stage and levels of rainfall. The findings report should be of use to those responsible for paddy management with regard to water resources allocations and water supply management practices. By using the concept of the water footprint in the analysis of paddy water usage, it is possible to make savings in terms of blue water, while using green water more efficiently [22]. It is hoped that further studies will be encourage which will examine alternative regions and crops in order to limit the usage of blue water in agriculture in the future.

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The development of life and family curriculum according to theory of reasoned action in association with active learning concept

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Abstract

This research aimed to 1) study the actual state and the desirable state preparing for the development of life and family curriculum, 2) develop life and family curriculum according to theory of reasoned action in association with active learning concept, and 3) study the implementation results. Instruments used in this research were questionnaires, lesson plans, evaluation form, and an achievement test. Data were analyzed by percentage, mean, standard deviation, and content analysis. Results of the research were found that most of informants agreed for curriculum development of life and family curriculum for lower secondary school students. There were 16 lesson plans that consisted of learning management activities, active learning management, and theory of reasoned action. Moreover, it was indicated that the curriculum efficiency was overall at 85.20/77.52 passing the determined criteria 70/70. After implementing life and family curriculum, the average scores after learning were higher than the average scores before learning life and family curriculum for lower secondary school level; 581 lower secondary school students were satisfied with learning management at a high level in the learning atmosphere, learning management activities, and the benefits; and 3 health education teachers were satisfied with the components of the developed curriculum in overall at a high level.

Keywords: Life and family, curriculum, theory of reasoned action, active learning

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1. Introduction

Due to National Education Act B.E. 2542 (1999) [17] stipulated in section 23 to define education to give emphases to knowledge, morality, learning process, and integration of the following, depending on the appropriateness of each level of education in terms of knowledge about oneself and the relationship between oneself and society, namely: family, community, nation, and world community. In accordance with the Basic Education Core Curriculum B.E. 2551 (A.D. 2008) [2], determined the management of school curriculum with the learning standards which had prescribed eight learning areas, and health and physical education was one of learning area identifying that health or state of health to define the human condition with full development in all respects-physical, mental, social and intellectual or spiritual. Health or state of health was therefore important, as it was linked to all dimensions of life; all should learn about health

for acquisition of knowledge, accurate understanding with proper attitude, morality and appropriate values, as well as practical skills in health for acquiring hygienic habits, resulting in the achievement of a society of quality.

Curriculum was assumed a reflection of social surrounding. Therefore, the curriculum development must be based on the social change. It was clear that health education had met the challenges same as any programs in school. Thus, Taba introduced notions of multiple educational objectives and four distinct categories of objectives (basic knowledge, thinking skills, attitudes and academic skills). This approach allowed Taba to relate specific teaching / learning strategies to each category of objectives. International Bureau of Education, UNESCO [12].

Regarding the active learning concept, Cambridge International Education Teaching and Learning Team [7] mentioned concerning the benefits of active learning, active learning helped students to become 'life-long learners'. In an active learning approach, learning was not only about the content, but was also about

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the process. Active learning developed students' autonomy and their ability to learn. Active learning gave students greater involvement and controlled over their learning. Encouraging active learning helped students to achieve higher grades, based on their enhanced skills and understanding. Moreover, J. B. Cynthia [13] quickly guided that active learning activities in-person courses started with short activities that posed low risk for both instructors and students, required limited change to your current instructional methods, and provided an opportunity for students to organize and clarify their thinking, teachers asked students a question that engaged higher-order thinking skills (analysis, evaluation, and synthesis), encourage students to think briefly about an answer, then discussed their responses with a peer and shared responses with the group and discuss.

Likewise, concerning the theory of reasoned action in association, F. Martin [9] suggested that a person's behavior was determined by their intention to perform the behavior and that this intention was, in turn, a function of their attitude toward the behavior and subjective norms. The best predictor of behavior was intention or instrumentality (belief that the behavior would lead to the intended outcome). Instrumentality was determined by three things: their attitude toward the specific behavior, their subjective norms, and their perceived behavioral control. The more favorable the attitude and the subjective norms and the greater perceived control, the stronger the person's intention to perform the behavior.

Besides, L. Nicole [14] explained that many theories in health education and health promotion sought answers to the fundamental question of why people behaved the way they did. More specifically, theories were used to try to understand and predicted how and why people changed their unhealthy behaviors to healthier ones. In line with H. Curt and S. Bengt [10] studied health education in schools from information to empowerment models, it was summarized that school was considered to be a very important arena for health education among children and adolescents. Within the field of health education in school, there were nowadays manifold methods

As these results of the study mentioned above, the researcher considered the development of life and family curriculum should be based on the theory of reasoned action in association with active learning concept for lower secondary school students in line with the curriculum of health and physical education that met the needs of lower secondary school students and society especially, the learning area of life and family to response the learners' learning concerning the learners' values, life skills, and those of their families.

2. Research Questions

2.1 What are the actual state and the desirable state preparing for the development of life and family curriculum?

2.2 What is the development of life and family curriculum according to theory of reasoned action in association with active learning concept?

2.3 What are the implementation results of life and family curriculum according to theory of reasoned action in association with active learning concept?

3. Research Objectives

3.1 To study the actual state and the desirable state preparing for the development of life and life family curriculum.

3.2 To develop and family curriculum according to theory of reasoned action in association with active learning concept.

3.3 To study the implementation results of life and family curriculum according to theory of reasoned action in association with active learning concept.

4. Materials and Methods

The research process was divided into three phases as follows:

Phase 1: Study the actual state and the desirable state preparing for the development of life and family curriculum. Informants consisted of 33 school administrators, 33 health education teachers, 550 students from grade 10 (Mathayom Suksa 4), and 550 student parents. The instrument used was a questionnaire with reliability at 0.96 was divided into 2 parts: Part 1.1: The contents focused on life and family curriculum for lower secondary school students in aspects of self-appreciation, family, sex education, and life skills. Part 1.2: the development of life and family curriculum. Data were analyzed by percentage.

Phase 2: Develop life and family curriculum according to theory of reasoned action in association with active learning concept, the researcher divided into 3 parts as follows:

Part 2.1: Design lesson plans based on the content of life and family curriculum according to theory of reasoned action in association with active learning concept consisting of 3 components as follows: learning management activities, active learning management, and theory of reasoned action. Each lesson plan was divided by 4 steps 1) step of introduction; 2) step of learning management activities; 3) step of conclusion; and 4) step of evaluation. Key informants were the researcher and 2 health teachers. Instrument used was components of lesson plans. Data were analyzed by content analysis.

Part 2.2: Study the efficiency of life and family curriculum according to theory of reasoned action

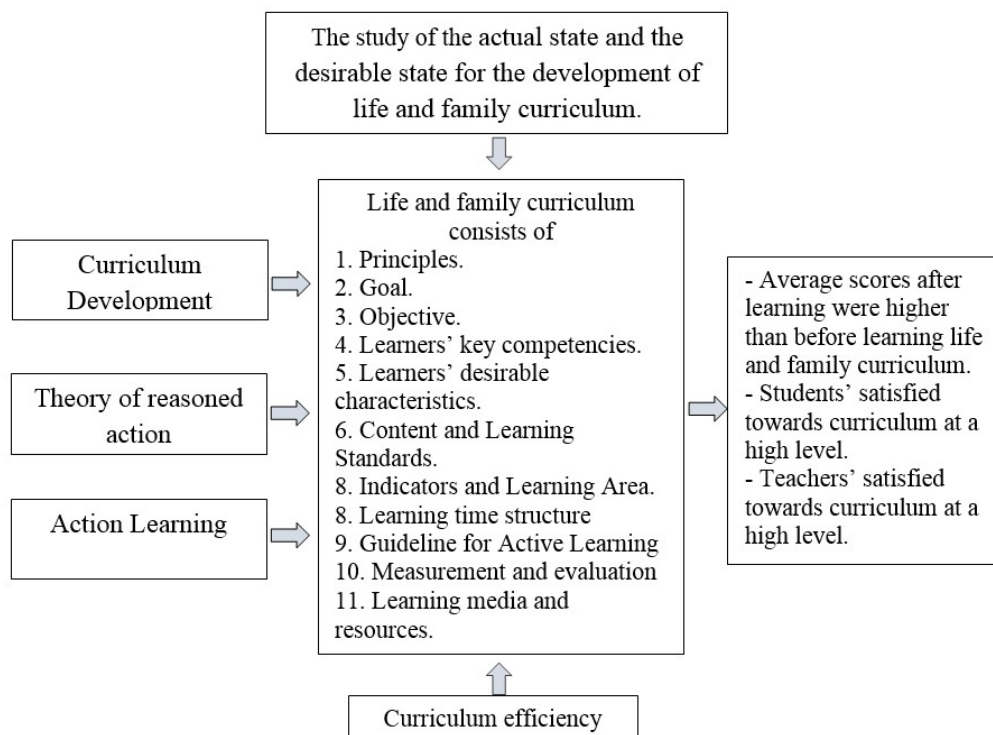


Figure 1: Research framework.

in association with active learning concept, the determined criteria was 70/70. Instrument used was an evaluation form applying the theory of reasoned action in association with active learning concept for the steps of learning management activities with reliability at 0.93. Informants consisted of the researcher and 2 health teachers. Data were analyzed by percentage.

Phase 3: Study the implementation results of life and family curriculum according to theory of reasoned action in association with active learning concept were as follows:

Part 3.1: Study the average scores of learning outcomes for lower secondary school students. Instrument used was an achievement test for evaluation that was verified by 5 experts, the Index of Item Objective Congruence (IOC) was at 1.00. Data were analyzed by percentage.

Part 3.2: Study the students' satisfaction towards learning management of life and family curriculum according to theory of reasoned action in association with active learning concept. Instrument used was a questionnaire with reliability 0.85 in terms of learning atmosphere students, learning management activities, and benefits. Informants were 581 lower secondary school students. Data were analyzed by mean and standard deviation.

Part 3.3: Study the teachers' satisfaction towards life and family curriculum according to theory of reasoned action in association with active learning concept for lower secondary school students in terms of 1) principles, 2) goal, 3) objective, 4) learners' key

competencies, 5) learners' desirable characteristics, 6) learning time structure, 7) learning areas, 8) learning management activities, 9) learning measurement and evaluation, 10) learning media and resources. Informants consisted of the researcher and 2 health teachers. Data were analyzed by mean and standard deviation.

The research framework was as shown in Figure 1.

5. Results and Discussion

The results of this research were as follows:

Phase 1: The actual state and the desirable state preparing for the development of life and family curriculum. Informants consisted of 33 school administrators, 33 health education teachers, 550 students from grade 10 (Mathayom Suksa 4), and 550 student parents were divided into 2 parts as follows:

Part 1.1 Informants expressed opinions concerning the contents focusing on life and family curriculum for lower secondary school students as shown in table 1.

From Table 1, 13 school administrators, 175 students from grade 10 (Mathayom Suksa 4) and 275 student parents from grade 10 (Mathayom Suksa 4) expressed opinions concerning the contents focusing on life and family curriculum for lower secondary school students in terms of self-appreciation at the highest numbers of 39.39, 31.82 and 50.00 percent, respectively; and 10 health education teachers expressed opinions in terms of life skills at the highest numbers

Table 1. Percentage of the contents focusing on life and family curriculum for lower secondary school students.

Life and family curriculum	School administrators		H.E. teachers		Grade 10 students		Student parents	
	Numbers	Percent	Numbers	Percent	Numbers	Percent	Numbers	Percent
1. Self-appreciation.	13	39.39	8	24.24	175	31.82	275	50.00
2. Family.	12	36.37	8	24.24	100	18.18	103	18.73
3. Sex education.	3	9.09	7	21.22	120	21.82	18	3.27
4. Life skills.	5	15.15	10	30.30	155	28.18	154	28.00
Total	33	100	33	100	550	100	550	100

of 30.30 percent in accordance with the Basic Education Core Curriculum B.E. 2551 (A.D. 2008) [2] stipulated students to understand, accept and are able to adjust themselves to changes in various respects-physical, mental, emotional; sexual feelings; gender equality; create and maintain relationship with others, and make decisions for solving life problems with appropriate methods.

Part 1.2 Informants expressed opinions concerning the development of life and family curriculum for lower secondary school students as shown in table 2.

From Table 2, most of informants agreed with the development of life and family curriculum. All school administrators agreed concerning the development of life and family curriculum at the highest numbers of 100.00 percent; 24 health education teachers agreed at the highest numbers of 72.72 percent, 487 students from grade 10 (Mathayom Suksa 4) agreed at the highest numbers of 68.54 percent, and student parents agreed at the highest numbers of 92.72 percent. Certainly, the curriculum should be adjusted consistent with A. Onthanee [1] who studied the perspectives on Curriculum Development through the National Scheme of Education B.E. 2560 – 2579', it was found that an importance of putting the policies into practice was developing an appropriate curriculum should consist with current contexts, solved problems and met social needs. The curriculum based on the National Scheme of Education B.E.2560-2579 emphasized on integrated knowledge. Designing to help students prepare their life in the real world. Focus on lifelong education. Learn to construct knowledge. The students improved their skills and positive attitudes, have a confidence and self-respect. Moreover, R. Witawat, W. Kritsadarat, and T. Surat [17] studied to revise the curriculum and teaching style to prepare marketers for the Thailand 4.0 era', it was found that at present, there had been many changes to students' behaviors from their ability to search for information in the digital world that was highly accessible as well as industries' need's with regards to talents joining their companies that had immensely changed from what they have previously expected of graduates.

Phase 2: The development of life and family curriculum according to theory of reasoned action in association with active learning concept, the researcher divided into 3 parts as follows:

Part 2.1: The life and family curriculum were

defined into 11 components: 1) principles, 2) goals, 3) objectives, 4) learners' key competencies, 5) learners' desirable characteristics, 6) content and learning standards, 8) indicators and learning area, 8) learning time structure, 9) guideline for active learning, 10) measurement and evaluation, 11) learning media and resources. The lesson plans based on the content of life and family curriculum according to theory of reasoned action in association with active learning concept. There were 16 lesson plans for lower secondary school students consisting of 3 components as follows: learning management activities, active learning management, and theory of reasoned action. Each lesson plan was divided by 4 steps 1) step of introduction consists of: 1.1) learners are eager to study and research from google.com using their own mobile phone, 1.2) learners watch VDO clip, 1.3) learners read questioned issues from web board, 1.4) learners share opinions from answering questions, and 1.5) learners write to describe the reasons; 2) step of learning management activities consists of: 2.1) learners are divided into groups and discussion, 2.2) learners share opinions from answering questions, 2.3) learners share analyzing, 2.4) learners present the task, 2.5) learners cooperate in searching information, and 2.6) learners tell stories; 3) step of conclusion consists of: 3.1) learners share conclusion in writing, 3.2) learners present the analysis results and express group opinions; and 4) step of evaluation consists of: learners have self-evaluation by writing feelings after participating activities, such as telling what they have learned in this hour, learners and friends participate in group activity, such as comments, learners are very satisfied with the learning because the learners gain learning and the obtained knowledge was used to benefit for family and society.

Similarly, Cambridge International Education Teaching and Learning Team [7] mentioned concerning the benefits of active learning, in an active learning approach, learning was not only about the content, but was also about the process. Active learning developed students' autonomy and their ability to learn. Active learning gave students greater involvement and control over their learning. Encouraging active learning helped students to achieve higher grades, based on their enhanced skills and understanding. Moreover, J. B. Cynthia [13] guided that active learning activities in-person courses provided an opportunity for stu-

Table 2. Percentage of the development of life and family curriculum.

The development of life and family curriculum	School administrators		H.E. teachers		Grade 10 students		Student parents	
	Numbers	Percent	Numbers	Percent	Numbers	Percent	Numbers	Percent
1. Agree.	33	100	24	72.72	487	68.54	510	92.72
2. Disagree.	0	0	9	27.27	63	31.46	40	7.28
Total	33	100	33	100	550	100	550	100

dents to organize and clarify their thinking, teachers asked students a question that engages higher-order thinking skills (analysis, evaluation, and synthesis), encouraged students to think briefly about an answer, then discussed their responses with a peer and share responses with the group and discuss. Additionally, S. Sittipong [18], studied the development of active learning management ability in the 21st century for high school students, the research finding were most students had the active learning ability to learn proactively in fair level, and the students studied with the developed learning model had the ability in the used of active learning ability and learning achievement higher than the students studied with usual instruction.

Regarding the theory of reasoned action in association was included in steps of learning management activities, when learners was believed that the learning content was useful and good for the learners to apply, learners would show good behavior in daily life. When learners believed that whatever were important to make family members love, respect and cooperation to live together happily and teachers and friends desire the learners to have a good attitude in family, they could accept and adapt, and effect to the learners to express good behaviors. Similar to F. Martin. [9] suggested the theory of reasoned action (TRA) that a person's behavior was determined by their intention to perform the behavior and that this intention was, in turn, a function of their attitude toward the behavior and subjective norms. The best predictor of behavior was intention or instrumentality (belief that the behavior would lead to the intended outcome). Instrumentality was determined by three things: their attitude toward the specific behavior, their subjective norms, and their perceived behavioral control. The more favorable the attitude and the subjective norms and the greater perceived control, the stronger the person's intention to perform the behavior.

Part 2.2: The efficiency of life and family curriculum according to theory of reasoned action in association with active learning concept, the determined criteria was 70/70 as shown in table 3.

From table 3, the total evaluation scores during implementing life and family curriculum according to theory of reasoned action in association with active learning concept were 85.20 and after implementing life and family curriculum according to theory of reasoned action in association with active learning concept for lower secondary school students were

77.52, higher than the determined criteria 70/70. it was indicated that the curriculum efficiency was used to apply for lower secondary school students similar to C. Singha, W. Aimutcha, and S. Suchart Somprayoon [5], who had studied of the development a health and physical education curriculum for Buddhist novices at the seventh grade students of Pharapariyat-tidhamma Schools, the experiment revealed that mean scores of knowledge, attitude and practices of the experimental group before and after the experiment evaluation showed significant differences at the .05 level; the effectiveness of the curriculum was scored 78.50/74.73 showed higher than determined standard scores (70/70). Besides, S. Ubonrat Sirisukpoca and S. Paisan Simalaotao. [19], evaluated to increase student achievement of students in third grade by teaching media with the application of local wisdom on geographical maps and the content offered through augmented reality, the results showed that assessing the consistency of content from experts with an average of 0.88, media teaching efficiency criteria was 89.15/88.45, an achievement test scores of the students were learning and teaching materials. On the other hand, C. Nuchanat, A. Somsak, and W. Mongkol [4], who evaluated performance of the developed teaching process by implementing in professional experience course to train pre-service teachers The performance (E1/E2) of the developed learning model was found to equal 72.35/81.15 which performance (E1) was lower than the standard criterion of 80/80.

Phase 3: Study the implementation results of life and family curriculum according to theory of reasoned action in association with active learning concept were as follows:

Part 3.1: The average scores of learning outcomes for lower secondary school students from the achievement test.

From table 4, the average scores of learning outcomes for lower secondary school students concerning knowledge, attitudes, and practices after learning life and family curriculum were higher than average scores before learning life and family curriculum and more than 50 percent. Correspondingly, I. Anchalee, C. Banyat, and C. Nuansri, [11 studied a development of additional course curriculum on life skills usage for grade 8 students, the results of the study were as follows: 1) The developed additional course curriculum on life skills were consisted of rationale, objectives, contents, curriculum aims, constructing of curriculum, activity process and evaluation. The quality

Table 3. The efficiency of life and family curriculum according to theory of reasoned action in association with active learning concept for lower secondary school students.

Lower secondary school level	Evaluation scores during implementing life and family curriculum (40 scores)	Evaluation scores after implementing life and family curriculum (40 scores)	The efficiency of life and family curriculum
Grade 7	34.89	28.44	87.22/71.10
Grade 8	33.39	30.79	83.47/76.97
Grade 9	33.98	33.80	84.95/84.50
Total	34.08	31.01	85.20/77.52

Table 4. Percentage of learning outcomes concerning knowledge, attitudes, and practices for lower secondary school students.

Lower secondary school level	Average scores before learning life and family curriculum (40 scores)	Average scores after learning life and family curriculum (40 scores)
Grade 7 (Mathayom Suksa 1)	26.97	28.44
Grade 8 (Mathayom Suksa 2)	30.09	30.79
Grade 9 (Mathayom Suksa 3)	31.90	33.80

of curriculum which was assessed by experts revealed that curriculum was appropriate at a very high level. 2) After training, grade 8 students had had more life skills such as communication skill, decision making skill and health lifestyle skills than before. In addition, C. Kasem, W. Aimutcha, and U. Tumrong [3] studied a proposed model of health education learning management using collaborative learning and knowledge management to enhance cognitive skills', the results of the effectiveness of the health education learning management model using collaborative learning and knowledge management to enhance cognitive skills were found that mean scores of cognitive skills were higher significantly than before experiment and mean scores of health education achievement (knowledge, attitudes, and practice) were higher significantly than before experiment.

Besides, L. Nicole [14] explained that many theories in health education and health promotion sought answers to the fundamental question of why people behave the way they did. More specifically, theories were used to try to understand and predicted how and why people changed their unhealthy behaviors to healthier ones.

Part 3.2: Study the students' satisfaction towards learning management of life and family curriculum according to theory of reasoned action in association with active learning concept for lower secondary school students in terms of learning atmosphere students, learning management activities, and benefits at a high level in line with C. Wanwisa and P. Aree [6] developed a supplementary course in the learning area of occupations and technology, the lesson course manual and lesson plans were suitable high positive and students were satisfaction in supplementary course on high positive. Similarly, S. Sittipong [18] developed of active learning management ability in the 21st century for high school students, the satisfactions of learning with the developed learning model were rated at a 'much' level.

Part 3.3: Study the teachers' satisfaction towards life and family curriculum according to theory of reasoned action in association with active learning concept for lower secondary school students in terms of 1) principles, 2) goal, 3) objective, 4) learners' key competencies, 5) learners' desirable characteristics, 6) learning time structure, 7) learning areas, 8) learning management activities, 9) learning measurement and evaluation, 10) learning media and resources.

Accordingly, E. Pearly [8], stated that the components of curriculum was divided into four major components or elements of curriculum consisting of curriculum aims, goals and objectives; curriculum content or subject matter; curriculum experience, instructional strategies and methods; and curriculum evaluation. Moreover, C. Singha, W. Aimutcha, and S. Suchart [5] developed a health and physical education curriculum for Buddhist novices at the seventh grade students of Pharapariyattidhamma schools, it was found that the curriculum was developed with the components of school vision, concepts, goals, desired characteristics, strands, curriculum content, learning standard, indicators, additional areas of learning, extra curriculum content, learning time structure, learning management guidelines, evaluation method and media and resources including learning teacher 21 activities. Similarly, P. Saowarose and W. Montree [15] studied the development curriculum for sixth grade science teachers in learning management based on education 4.0', it was found that there were 6 components of the curriculum development, course objectives, course content, teacher development process, course materials, measurement and evaluation. Whereas the activities for developing teachers was based on workshop, practice learning, mentoring, supervision, reflection and lesson learner, which was a very suitable teacher development curriculum. And consistent in every item.

Another point of this, C. Kasem, W. Aimutcha, and U. Tumrong Udonpjitkul [3] found the proposed

model of health education learning management using collaborative learning and knowledge management to enhance cognitive skills consisted of 4 components: i.e., 1) principles and concepts, 2) objectives, 3) learning process, and 4) learning assessment and the learning process steps were composed of 8 steps: 1) group working 2) mixed ability segmentation 3) cooperation 4) activities focus on responsibility and collaboration 5) thinking and group working 6) organizing knowledge resources for the most benefit 7) managing the processes of creating and knowledge collection and 8) valuable the knowledge resources.

6. Conclusion

It could be concluded that the development of life and family curriculum according to theory of reasoned action in association with active learning concept for lower secondary school students was able to be applied for the teaching and learning management of health and physical education curriculum in strand 2: Life and family learning area in addition to the Basic Education Core Curriculum B.E. 2551 (A.D. 2008) under Ministry of Education. The research had developed curriculum according to the various steps, it was found that 1) there were 11 curriculum components consisted of: 1.1) principles, 1.2) goals, 1.3) objectives, 1.4) learners' key competencies, 1.5) desirable characteristics, 1.6) learning standards, 1.7) indicators and learning areas, 1.8) learning time structure, 1.9) active learning concept, 1.10) measurement and evaluate guidelines, 1.11) learning media and resources; and 2) Lesson plans consisted of: 2.1) overview, 2.2) learning objectives, 2.3) learning area / content, 2.4) learning management activities, 2.5) learning media / learning resources, and 2.6) measurement and evaluation.

7. Recommendations

Regarding the development of life and family curriculum according to theory of reasoned action in association with active learning concept for lower secondary school students, the researcher summarized the concepts and proposed recommendations for the research results as follows:

7.1 The result of the research showed that life and family curriculum according to theory of reasoned action in association with active learning concept for lower secondary school students causing learners at lower secondary school level had higher scores of learning outcomes. Therefore, health education teachers of schools under the St. Gabriel Foundation should use this developed curriculum as a guideline for organizing learning processes in the learning areas of health and physical education in addition to the Basic Education Core Curriculum B.E. 2551 (A.D. 2008),

in order to develop learners to increase more learning outcomes and promoting a better life and family.

7.2 The active learning management that proposed in the lesson management plan was only one method that the researcher had analyzed and synthesized. Therefore, health education teachers could change the style of active learning management appropriate with the learners and the context of each school.

7.3 Changing behavior of students' attitudes and practices required a long time to change behavior. Therefore, learning evaluation in terms of attitudes and practices, should take long time enough to indicate that learners had changed behavior according to life and family curriculum according to theory of reasoned action in association with active learning concept for lower secondary school students more clearly.

8. Recommendation for Further Research

8.1 Life and family curriculum should be developed according to theory of reasoned action in association with active learning concept for lower secondary school students in order to develop learners to get higher learning outcomes and promoted better life and family

8.2 There should be a study of the effect of using life and family curriculum according to theory of reasoned action in association with active learning concept for lower secondary school students towards other variables, such as student competencies, etc.

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The model of integrated learning management to develop learning in the 21st century for students of Northeast Sports School

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Abstract

This paper aimed to study and develop 21st century learning of sport students in the Northeast of Thailand. Integrated learning management model was created and verified through research and development design. The findings revealed that the integrated learning management model for developing 21st century learning acquired along the open system approach for administration with the unitary integration of factors, namely, factors to facilitate the success 1) Inputs which included desirable characteristics of learners in 21st century, teacher's leadership, curriculum, media and technology, and education quality management and assessment, 2) Process including step 1- creating knowledge framework, step 2 - putting into practice, step 3 - outcome assessment, 3) Output - the success along the factors, and 4) Feedback - the reflection on problems and recommendations for operating in each step. The integrated learning management model for developing 21st century learning concerned individuals had satisfaction with it at most levels.

Keywords: integrated learning, sport student, sport school, learning skills integrated learning

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1. Introduction

The knowledge-based economy and society have a deep root in producing and selling knowledge for creating intellectual innovation turning the tide on education. The world has increasingly demanded humans with high capacity, creativity, academic excellence, and life-maintaining skills. Thailand has rushed out the education reform to get ready for declaring the 11th National Economic and Social Development Plan to set up the strategy for developing people towards learning society all over their life in a sustainable way and creating their immunity for the change. The process is via developing curriculum and adjusting the instruction organizing process to facilitate the learner development holistically to enable the new era of children to know along with the 21st century skills which are important factors to assure the success in the future world and move up the country's economic status. Article 23 of B.E. 2542 Education Act and B.E. 2553 3rd Amendment has stated that in setting up any education system, the concerned individuals have to realize the significance of knowledge, morality, learning process, and their integration in relevant to each

educational level and the effort to rush up the education reform to create the opportunity, equality, and participation by increasing three times resources and budgets. Their achievement was still low resulting in unequal education quality and the inappropriate learning organization system for the context of 21st century, particularly their learning skills and innovation which served as the mechanism for creating the student's learning readiness were indicated by the level of capacity in the world competition (Office of the Education Council [ONEC], 2014) which found that, in general, average achievement in every aspect of student had decreased. Moreover, the Program for International Student Assessment (PISA) to assess the 21st century skills revealed that Thailand was almost at the bottommost.

In the United States of America, educators had noted that the school educational system had not facilitated the development of skills needed for working and life maintaining. They then proposed the partnership for 21st century skills conceptual framework for 21st century learning by integrating 3 factors, namely, 1) core courses and main concepts in 21st century, 2) 21st century skills such as learning and innovative skills, information and technology, and life and working skills, and 3) system to support 21st century educa-

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tion including standards of assessment on curriculum and instruction, professional development, and environmental maintenance. They insisted that 21st century skills were the forces to build up the country's wealth. All these had led to the change of the learning paradigm for promoting 21st century skills. ONEC, (2014) had proposed the policy for reforming learning in the 21st century by designing the curriculum in an integrative and interdisciplinary way focusing on problem-based instruction or projects towards creating the workpiece to holistically solve the problem and apply it to everyday life. The findings revealed that the process could help developing the student's academic achievement, their realization of the value in searching for knowledge, developing high-level thinking skills, building up a good habit of systematic work, and happily co-existing in the society. Another educator, Panich, (2011) had viewed that "The thing to be firstly done is the education reform including administration which is like the giant mechanism to lead others to move forward too. Otherwise, the budget allocated in the old system would be a waste." The main target of new era education administrators in the development of learners to achieve the goals of the B.E.2542 Education Act, a popular conceptual framework to achieve sustainable quality is the open system theory. It could be concluded that the operation to achieve the organization's goals had a unitary set of factors systematically interrelated. These are inputs, transformational processes, outputs, feedback, and the environment. From reviewing the related researches, it was found that the crucial factors to facilitate the success in developing 21st century learning came up in 5 factors. These are learner's quality, teacher's leadership, curriculum, media and technology, administration and management, and school quality assessment system.

According to data analysis of the problem in learning management to develop learning in 21st century for students in Northeast sports school, it was found that learning and innovative skills which were considered to be the most important and necessary skills for further study as well as for working in the future were totally at the lowest level. As the education quality development of the education reform guideline in 21st century, it was needed to have well management system. From literature review, the researcher discovered the approach for learning development by applying open system theory. Lunenburg & Ornstein (1996) including education reform approach and external education quality assessment of sports school. To facilitate the success, a unitary set of systematically interrelated factors included 1) Inputs which lead to the achievement of integrated learning management, 2) Process for integrated learning management, 3) Outputs which were learning and innovation skills in 21st century, and 4) Feedback which was the satisfaction and learning process and development. In order to

accomplish the model of integrated learning management to develop learning in 21st century for students related to local context, the researcher sincerely expected that this study will be advantageous for those who were interested in and be prototype innovation for integrated learning management in accordance with the guideline for education reform in 21st century in order to drive human abilities to further competition in the future.

2. Research Objective

1. To study the conditions, problems, and factors facilitating integrated learning management for developing the 21st century learning of Northeast sports school
2. To construct and validate the integrated learning management model for developing 21st century learning of sports schools in the Northeast region utilizing participatory action research
3. To implement an integrated learning management model for developing 21st century learning of learners of Northeast sports school

3. Research Methodology

This research utilized mixed methods both quantitative and qualitative research. The research area was in Northeast sports schools in Khon Kaen, Ubon Ratchathani, and Si Sa Ket along with the 3 steps as follows:

Phase 1 To study the conditions, problems, and factors facilitating integrated learning management to develop learning in the 21st century of Northeast sports school, the researcher had divided this phase into 3 steps as following:

Step 1.1 - Studying the conditions, problems, and factors facilitating success by reviewing literature and researches related to integrated learning management for developing 21st century learning

Step 1.2 - Constructing the instruments for studying the conditions, problems, and factors facilitating success The results gained from step 1 were used to create a questionnaire and had its quality validated by experts in the aspects of content validity utilizing the item-objective congruence index (IOC). Afterward, the items with IOC between 0.8-1.00 were selected out to be tried out with the 30 subject-sample coming up with reliability of .82 via Cronbach's approach (Cronbach, 1974).

Step 1.3 - Concluding the conditions, problems, and factors facilitating success. In this step, the researcher used the research instruments to collect data from the target group and analyze them in terms of mean, standard deviation, content analysis on the conditions, problem, and factors facilitating the success of integrated learning management to develop learning in the 21st century.

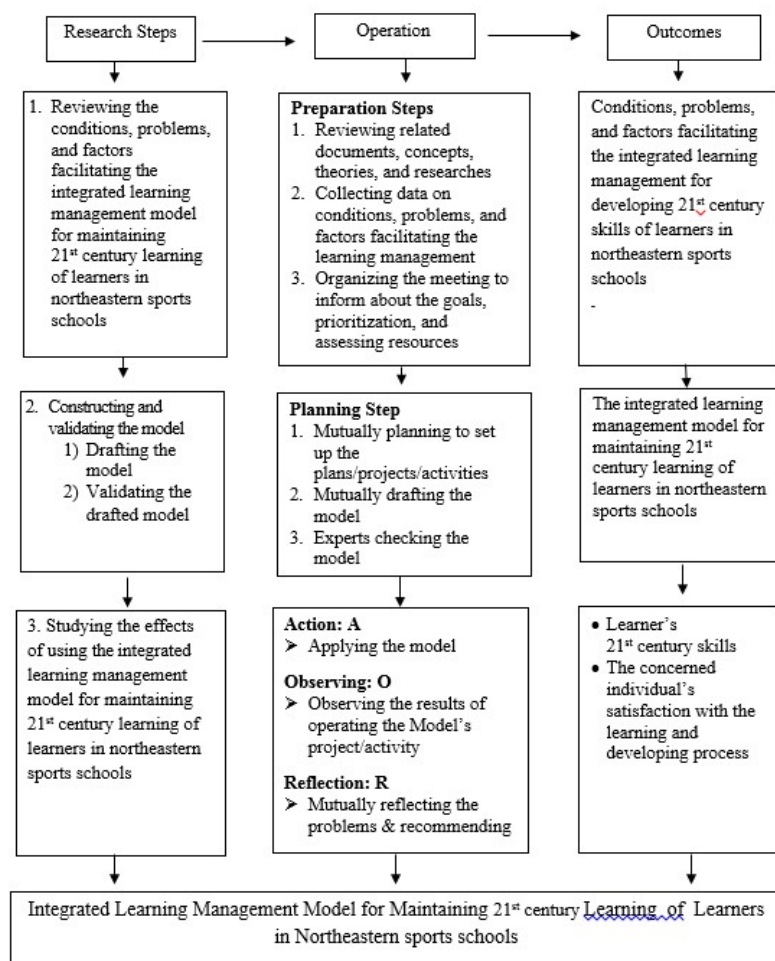


Figure 1: Research operational steps.

Phase 2 - Constructing and validating the integrated learning management model to develop the 21st century learning of Northeast sports school

In this step, the researcher studied by brainstorming with research subjects including school directors, deputy school director for academic affairs, head of the concerned divisions, and teachers teaching general subjects of sports school in Ubon Ratchathani totaling 16 subjects and representatives from sports schools in Si Sa Ket and Khon Kaen totaling 4 subjects for 20 subjects altogether. The subjects were selected via purposive sampling from the subjects who had working experience in sports school for 10 and up to collectively construct the model, along the 4 brainstorming main issues, namely, 1) factors, 2) indicators, 3) development process, and 4) plans/projects/activities used in the development. Data was analyzed utilizing content analysis. The researcher had operated along with the 2 steps as following:

Step 2.1 Drafting integrated learning management model to develop learning in the 21st century

2.1.1) Planning along with the following 2 steps:

1) Based on the data having been col-

lected, the researcher had concluded the conditions, problems, and, factors facilitating success by documenting the concluded data to be presented in the brainstorming session.

2) A form for recording the brainstorming was created in order to collect data on the conditions, problems, and factors and data on the success factors and indicators.

Step 2.2 Operating - along with the following 2 steps:

2.1.2) The brainstorming session taken part by the research subjects was organized in order to collectively review the conditions, problems, and success factors in addition to those having been collected in the first phase and working together to set up the operational plan, projects, and activities significant for and relevant to the guideline for developing education quality in the 21st century.

2.1.3) Two research assistants helped record the opinion of research subjects using the brainstorming recording form collecting the data from the research subjects in such a workshop. Phase 3 - The integrated learning management model was implemented to develop learning in the 21st century of

northeast sports school.

3.1 Applying the model in cooperation of the personnel of Ubon Ratchathani sports school along the process of the model

Firstly, the plan step (P) starts from organizing the focus group to collectively set up the operational plan, projects/activities along with the success indicators and operational calendar and sharing the responsibility. Secondly, the action step (A) was carried out to create integrated learning management model along the projects/activities of (1) workshop for developing the integrated curriculum, (2) analyzing the integrated curriculum, learning units, and learning calendar, (3) setting up the integrated learning plans, (4) carrying out the classroom research, (5) supervising the instruction, and (6) setting up the forum for displaying the operational outcomes and learning exchange. Thirdly, the observe step (O) was carried out to display the development outcomes by monitoring and evaluating during each activity of the process. Fourthly, the reflect step (R) was to display the progress and collectively check the operational outcomes along with the factors by learning exchange and reflecting on the operational outcomes, problems, and recommendations.

3.2 Studying the results of using the model

Firstly, the success of integrated learning management for developing 21st century learning along with the factors, in general, was most level. The highest mean was on administration and management which was at most level. The second one was on learner's quality, teacher's leadership, curriculum, media, and technology, and school quality assessment. Secondly, the satisfaction of the concerned individuals, in general, was at most level. The knowledge and development included ability in analyzing the curriculum, organizing the curriculum in an integrated way along with the standards, designing the operational calendar and problem-based integrated learning organization, carrying out the integrated learning program along problem-based approach and authentic measurement and evaluation along the classroom research to solve the problems and promote professional learning exchange.

4. Research Instrument

1. In studying the conditions, problems, and factors facilitating the success, the instrument was the five-point rating scale questionnaire.

2. In constructing and validating the integrated learning management model for developing 21st century learning, the instrument was the form for recording the brainstorming and the form for validating the model with five-point rating scales.

3. In studying the results of using integrated learning management model for developing 21st century learning, the instrument was the form for assessing

satisfaction with the success along five aspects of factors using a five-point rating scales questionnaire.

5. Materials and Methods

This research utilized the method participatory action research (PAR) as proposed by Kemmis & McTaggart (1988) and utilized PAOR process in constructing the administration model and the integrated learning management to develop learning in the 21st century for students of northeast sports school and came up with the results as shown in the following chart:

6. Conclusion

The research study was carried out and determined with the outcomes as follows:

Phase 1 Outcomes of developing the integrated learning management model for developing the 21st century learning of Northeast sports school could be concluded as follows:

1.1 In general, the practice was a little level with the one on learner's quality at was at the least level. Their practices ranked from the least to the most were teacher's leadership, media, and technology, and administration and management, each of which was a little level. Problems were at many levels with the one on learner's quality was at the most level, followed by the teacher's leadership, curriculum, media, and technology, and administration and management, respectively.

1.2 Concerning the significance of the success factor, it was found that, in general, the success factor was at most level. Considering by aspect, it was found that the one on educational administration and management had the highest mean, followed by curriculum, media, and technology, learning process and evaluation, teacher's leadership, and school quality assessment, respectively.

Phase 2 Results of constructing and validating the integrated learning management model to develop 21st century learning utilizing participatory action research having been conducted are as follows:

2.1 The model having been developed via an open system approach for administration with the factors interrelated to one another covered the following components:

2.1.1 Inputs are the factors facilitating success consisting of (1) curriculum, media, and technology, (2) learning and evaluation processes, (3) teacher leadership on instruction, (4) educational administration and management system, and (5) school quality assessment.

2.1.2 The process is the integrated learning management to develop the 21st century learning consisted of 3 steps as follows:

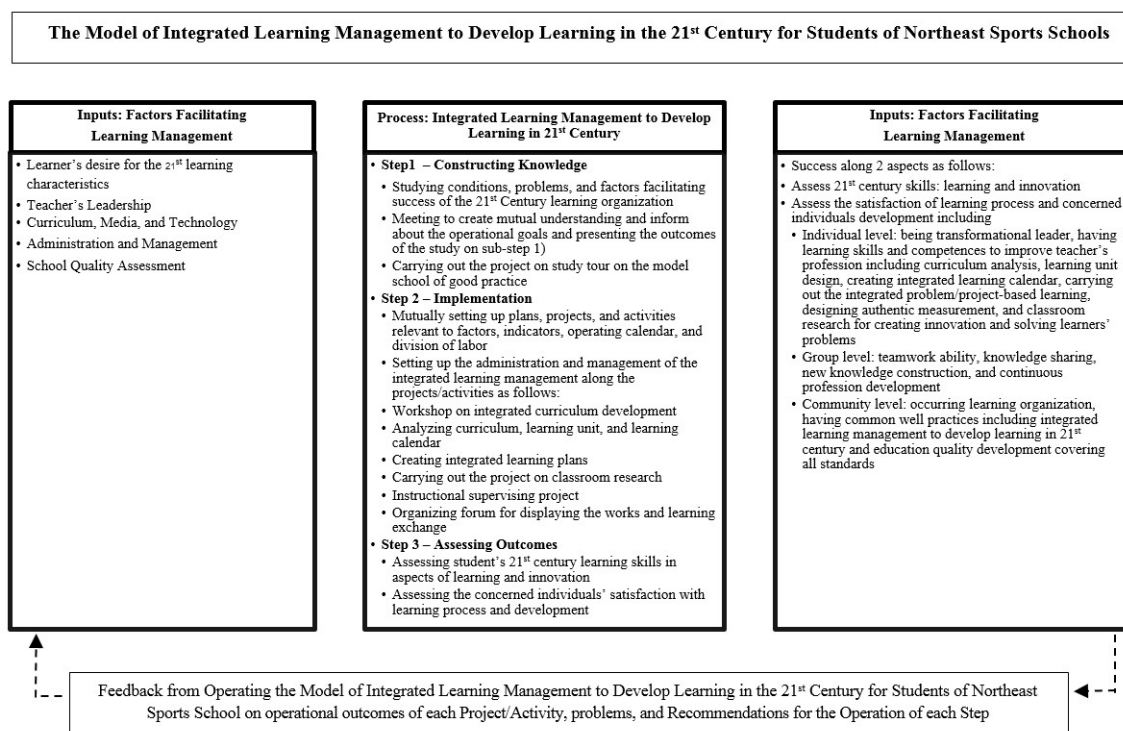


Figure 2: The Model of Integrated Learning Management to Develop Learning in the 21st century for Students of Northeast Sports Schools

Step 1 - Constructing knowledge by 1) reviewing the conditions, problems, and factors facilitating success in administration and management for 21st century learning, 2) holding a meeting to build up understanding and informing the operational goals and present the outcomes of the study on conditions, problems, and factors facilitating success, and, 3) carrying out the study tour to the school with best practice to open up the worldview of the concerned individuals

Step 2 - Implementing by 1) collectively set up the operational plan, and projects/ activities relevant to each factor, success indicators, operational calendar, and division of responsibility, 2) carrying out the integrated learning management along the project/activity of (1) workshop for developing the integrated curriculum, (2) analyzing the curriculum, integrated learning units, and learning calendar, (3) creating integrative learning organizing plans, (4) carrying out the classroom research training, (5) carrying out the instructional supervision, and (6) organizing the forums for presenting the operational outcomes and learning exchange

2.1.3 Outputs The success of applying the model was as follows: 1) 21st century learning skills on learning and innovation, 2) satisfaction and learning and developing processes of the concerned individuals at individual and community levels.

2.1.4 Feedback The process was carried out to mutually monitor along components of the model reflecting if the model had succeeded, the problems and obstacles, new body of knowledge, and recommendations for each operational steps to serve as the

data for setting up the plans further on.

Step 3 - Evaluating the operation composed of 1) evaluating the 21st century skills of the target group individuals, and, 2) evaluating satisfaction with the learning process and development of the concerned individuals.

2.2. Results of the model constructions revealed that the model having been developed is the model that has reached the standards on validity, appropriateness, and feasibility. It also is relevant to the context and able to be used for developing the quality of learners in Northeast sports school to cope with 21st century learning effectively. This might be because the model has been systematically constructed and validated along with the concerned principle.

2. Results of using integrated learning management model for developing the 21st century learning of Northeast sports school revealed the following implications:

2.1 The success of the integrated learning management model for developing 21st century learning, in general, was at most level. The aspect that was rated with the highest mean is administration and management which was at most level. The aspects whose success was rated at most levels respectively are learner's quality, teacher's leadership, and curriculum, media, technology, and school quality assessment.

2.2 Satisfaction with the use of integrated learning management model to develop the 21st century learning of the concerned individuals, in general, was at most level with the highest level of satisfaction with the display of student's works and learning exchange,

followed equally by study tour at the model school with good practice and workshop to develop integrative curriculum and facilitate learning process and development as follows:

2.2.1 At an individual level - the satisfaction was with leadership for the change, having skills in learning for self and teaching professional development with knowledge and ability to analyze the curriculum and design learning units, create the integrative learning calendar, design the learning integrated and problem/project-based instruction with an authentic measurement and evaluation reflecting the 21st century skills, create the instructional innovation, and conduct the research to develop the learner's learning.

2.2.2 At the group level - the satisfaction was with the team working, good interaction in the operation, learning exchange, and mutually creating new knowledge, continuously promoting professional development, such as carrying out curriculum and integrated learning units, maintaining the integrated learning calendar, utilizing media and innovation, and conducting classroom research of learning development.

2.2.3 At the community level, the learning of the community had improved. Teachers and students had practice time together, to develop education quality, covering all the standards, all of the learner's quality, process of administration and management, and instruction organizing process coming up with the product of innovation leading to integrated learning management to develop learning in the 21st century fitting the context along the founding philosophy of the sports school's founding and joining the guideline for education reform in the 21st century

7. Discussion

In researching the administration model and integrated learning management model for developing 21st century learning of sports schools in the Northeast region, the researcher would like to discuss along with the three issues as follows:

Phase 1 Outcomes of studying conditions, problems, and factors facilitating integrated learning management to developing learning in the 21st century of northeast sports schools are as follows:

1.1 Conditions, in general, showed that the practice was a low level with that on learner's quality was at the least level. The practices, ranging from the least to the most were teacher's leadership, curriculum, media, technology, and administration and management, each of which was at a low level. The problem, in general, was at a high level, leading by the one on learner's quality which was at most level. Others, ranked by mean, were on teacher's leadership, curriculum, media, and technology, and administration and management each of which was at many levels. This might be because the students in sports school had to learn

both academic and sports subjects to achieve the educational goals. Such requirements had burdened the students with responsibilities. Some schools changed the teachers during the terms resulting in discontinuity. The teachers concentrated on teaching the course to finish all the course contents as required by the curriculum lacked a true understanding of the goals of providing education in the 21st century including the context of sports school resulting in the irrelevant instruction failing to lead to sustainability. With a similar realization, Prabudhanitisarn, (2014) had stated that the factors leading to the true practicality were the teachers had to understand the nature of the complicated problems. They then had to get to work together to mutually solve the problems systematically with the instruments to be used in the learning process to assure the sustainable solution of the problems.

1.2 Concerning factors facilitating integrated learning management to developing learning in the 21st century of the northeast sports school, it was found that, in general, factors were significant at most levels. Considering by aspect, it was found that the educational administration and management had the highest mean of significance, followed by curriculum, media, and technology, learning process and evaluation, teacher's leadership, and school quality assessment, respectively. Every factor had an impact on education quality development. Nonetheless, the researcher had reviewed literature related to education quality development along with the guideline for education reform in the 21st century and found five factors relevant to the research goals facilitating the effort to develop education quality. Meanwhile, other agencies and authors (OBEC, 2008; Uppamaiathichai, 2014; Duangkaew, 2013) had similarly identified 4 main factors for education reform to develop the learners to reach universal standards and assure real, continuous, and sustainable change. These are (1) instructional process reform, (2) curriculum reform in which school set the desirable characteristics of learners and created and developed local curriculum in relevant to the learners, their community, and country with variety of learning plans, (3) teaching profession reform and development and educational personnel development to become the quality working team to collectively push forward for real education development, and, (4) administration and management process reform. This is congruent to Bryk. (1999) who stated that after the professional congruent lism and norm occurred in school, there would be an atmosphere for development occurring in the school. Such an atmosphere would stimulate the school teachers and personnel to try to find the new instructional method and trying it out along the system whose structure was compatible with other organizations. The process also required other operational structures such as community and planning, etc. (Forde, McMahon, McPhee, Patrick, 2006)

Phase 2 Results of constructing and validating integrated participatory administration and management model to develop learning in the 21st century via participatory action research are as follows:

2.1 The Model was congruent with the open system approach for administration which included the following factors:

2.1.1 Inputs - These are factors facilitating the learning administration and management covering 1) curriculum, media, and technology, 2) learning and evaluation processes, 3) teacher leadership on instruction, 4) educational administration and management system, and 5) school quality assessment.

2.1.2 Process - This is the integrated learning management to develop the 21st century learning covering 3 steps as follows:

Step 1 - This step included 1) studying the conditions, problems, and factors facilitating success, 2) organizing the forum to inform about the goals and present the results of studying on conditions, problems, and factors, and, 3) carrying out the study tour to learn from the model school with good practice to open up the worldview.

Step 2 The implementation was composed of 1) mutually setting up the plans, and projects/activities relevant to the factors and indicators of success, operational calendar, and division of labor, 2) integrating learning management plans along the following 6 activities - (1) organizing the workshop for developing integrative curriculum, (2) analyzing the integrated curriculum, learning units, and learning calendar, (3) setting up the integrative learning plans, (4) training for classroom research, (5) carrying out instructional supervision, and (6) setting up the form for displaying the work and promoting learning exchange.

Step 3 - Assessment included 1) evaluating the learner's 21st century skills on learning and innovation, and, 2) assessing satisfaction with the learning process and development of the concerned individuals

2.1.3 Outputs The success of applying the model is as follows: 1) 21st century learning skills on learning and innovation, 2) satisfaction and learning and developing processes of the concerned individuals at individual and community levels.

2.1.4 Feedback The process was carried out to mutually monitor along components of the model reflecting if the model had succeeded, the problems and obstacles, new body of knowledge, and recommendations for each operational steps to serve as the data for setting up the plans further on.

2.2 Results of validating the model of participatory integrated administration and management to develop learning in the 21st century revealed that the model having been developed is with standards on validity, feasibility, and relevancy to the context and could be used to effectively develop the quality of

learners in northeast sports schools to develop learning in the 21st century as the model had been systematically constructed and validated along technical principles.

Phase 3 Results of using the integrated learning management model to develop the 21st century learning of sports schools in the Northeast region revealed that:

3.1 The success of the assessment on integrated learning management for developing 21st century learning along with the factors, in general, was at most level. The aspect with the highest mean was administration and management which was at most level. The aspects ranked by success from the most to the least were learner's quality, teacher's leadership, curriculum, media and technology, and school quality assessment.

3.2 Satisfaction with using the integrated learning management model for developing the 21st century learning of the concerned individuals, in general, in every aspect was at most level. The aspect with the highest satisfaction was the display of student's work and learning exchange, followed by 2 aspects which had the same mean, namely, study tour to the model school with good practice, and the workshop for integrative curriculum development. This might have been because the person had traveled to study in the areas other than school. Such places were new to them and could open their worldview on learning and motivation for developing the instruction. They had been trained via the integrated learning program by the national level resource persons who had ability in transmitting knowledge and experience, facilitating teachers to put into practice to obtain knowledge and ability in applying them for developing instruction to carry out the learning and developing processes as follows:

3.1.1 At Individual Level - the trainees were to be the leader of change with operational skills to develop themselves and the teaching profession. They had knowledge and ability to analyze the curriculum and design the learning units, create integrative learning calendar, design integrated learning organization plans along with problem/project-based approach, and authentic measurement and evaluation reflecting 21st century skills, and create media and innovation, and carry out the research to develop the learner's learning.

3.1.2 At Group Level - the trainees had learned together and continuously develop their profession, team working, exchange learning, and mutually create new knowledge such as curriculum and integrated learning units, integrated learning calendar, media and innovation, and classroom research on learning development.

3.1.3 At community Level - personnel of the school had learned together to mutually carry out good practice, develop education quality covering all standards, namely, learner's quality, the process of admin-

istration and management, and learner-centered instructional process. They had obtained the integrated learning management model for developing the 21st century learning of sports schools in the Northeast region.

While Na Lampoon (2019) revealed that the integrated administration model for enhancing quality of world class standard schools was composed of principle, objectives, system, mechanism and operational methods. The model follows PDCAI cycle: Plan-Do-Check-Act-Improve. The results of the model assessment represented that the model effectiveness and satisfaction of the users were at the highest levels. The feedback showed that the school administrators should promote learning organization to actualize the school's vision along with the operational plan, evaluation method, good practice and benchmarks to assure desirable outcomes, efficiency and effectiveness.

This might have been because of the processes of developing the model and participatory action research in which they could mutually plan, conceptualize, practice, reflect and recommend resulting in the projects/activities. Learning from working together in small groups including the research process had also opened for interaction among individuals and groups. Similarly, Kemmis & Wilkinson (1998, cited in Karomprach, 2004) had proposed the basic principle of participation contending that it was the process of social change and personal development. Participation emerged from the interaction of people in society, aiming at understanding the problem, studying good practice, and learning via a practical process. Knowledge from the research process could come up with the cycle of research procedural steps along the process of criticism and reflection both before and after practice. Congruently, Smith (1997, cited in Sutthinarakorn, 2014) had proposed the principle of creating learning experience at individual and group levels to lead to self-development and change of the situation toward the goal one. The essence is the interaction among individuals and groups in the research process could facilitate the learning of individuals, groups, and organizations.

8. Recommendations

8.1 This research could be used to set up the strategy for teacher development of sports schools affiliating with Thailand National Sports University, Ministry of Tourism and Sports, along the collective process of studying the guideline in carrying out and facilitating sports school to be able to develop the 21st century learning along with the context of each area.

8.2 There should be some research and development on integrated learning management models for developing 21st century learning suitable for teachers of other types such as those affiliating to the Office of the Basic Education to lead to the development of

learner's quality along with guidelines for education reform covering all the target groups.

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