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Contents

Volume 18, No. 4, July – August 2023

Editorial Note

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 17 Number 6 (November – December 2022). This issue contains of four interesting articles in multidisciplinary fields: (1) Assessing street greenery using imagery of Google Street View, (2) The process of teaching and learning to create students' identity, (3) Local government involvement in post-pandemic development initiatives for the Lao Khrang Ethnic Group of Nakhon Pathom Province, and (4) Bachelor of Technical Teacher Education versus Bachelor of Technical-Vocational Teacher Education: A comparative analysis of technical teacher education curricula.

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
Editor
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Carbon Footprint Assessment and Actions to Promote Green University of Rajabhat Universities in Southern Thailand

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Abstract

This research aims to assess the carbon footprint of the organization and to study the action to promote the green university of Rajabhat Universities in Southern Thailand. Data was collected from the greenhouse gas (GHG) emission and absorption activities of the operations of the five Rajabhat Universities, namely, Surat Thani Rajabhat University, Phuket Rajabhat University, Nakhon Si Thammarat Rajabhat University, Songkhla Rajabhat University, and Yala Rajabhat University The average results of the carbon footprint assessment of Southern Rajabhat Universities found that the amount of GHG emissions from Scope 2 was the highest, accounting for 88.70%, followed by Scope 1 and Scope 3, accounting for 7.99% and 3.31%, respectively. In addition, the results study of the implementation of green university promotion found that Southern Rajabhat Universities had included such operations in the university's master plan. The effectiveness of quantitative and qualitative operations is consistent with participation in the World Green University Ranking.

Keywords: Carbon Footprint, Organizational Footprint, Green University, Rajabhat University

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1. Introduction

It is estimated that by 2050, climate change could cause global economic losses of at least 10%. The current world value, the major contributing factor to climate change is greenhouse gases (GHG) [1]. Thus, the global community has come together to find ways and build cooperation to reduce GHG emissions and mitigate the impact of climate change. UNFCCC [2] was formed and the solution appear concrete in the Kyoto Protocol when member countries had commitments to reduce GHG emissions [3]. At the same time, to achieve such concepts, the SDGs have been set. Goal 13 is taking urgent action to combat climate change and its impacts by emphasizing policies and supporting mechanisms for coping with and adapting to climate change. This includes integrating climate change measures into national policies. Thailand has given importance to such issue. This can be seen from the inclusion of the aforementioned issue into the 20-year National Strategic Plan and the 12th National Economic, and Social Development Plan, and transmission of such plans to the provincial level. Public and private organizations in Thailand are also in the process of preparing a draft Climate Change Act to support the assessment of GHG emissions. GHG reduction and reporting can be encouraged by measuring, reporting, and verifying standards in line with international obligations [4]. Educational institutions contribute to GHG emissions from activities such as paper consumption, electricity consumption, water consumption, use of air conditioning, and traveling inside the university. As reported, the greenhouse gas emissions in the Faculty of Engineering, Kasetsart University [5], College of Energy and Environment, Phayao University [6], Department of Environmental Engineering, Chulalongkorn University [7], Faculty of Environment and Resource Studies, Mahidol University [8], and University of the Thai Chamber of Commerce [9] were equal to 3,627.53 tonCO_2e, 76.62 tonCO_2e, 138.6 tonCO_2e, 1,091.85 tonCO_2e, and 24,252.17 tonCO_2e, respectively. Valuing educational institutions as a contributor to environmental impact [10], while being a visionary and knowledgeable organization with capable role and power in reducing potential impacts on the environment to achieve sustainable development, a policy is recognized as one of the biggest social challenges of the 21st century [11]. Therefore, the source of carbon footprint assessment and action studies to promote a green university is necessary. Consequently, the aims of this study were to assess the carbon footprint and to study the operation to promote the green university status of Rajabhat Universities in Southern Thailand.

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In addition to knowing the amount of GHG emissions, it can also be used for environmental management planning and creating a policy to reduce GHG emissions, promoting the green university status of Rajabhat Universities in Southern Thailand. Furthermore, the carbon footprint can be used as information for communication and creating an atmosphere of environmental conservation. Encourage students and staff to have a sense of social and environmental responsibility as one of the organizations in the country that promote a green university. Create a low-carbon society according to national plans and policies.

Figure 1: Carbon Footprint Assessment Process

2. Materials and Methods

2.1 Carbon Footprint Assessment

The organization's carbon footprint assessment has based on the methodology of Thailand Greenhouse Gas Management Organization (Public Organization) as in Figure 1 [12]. Collected data from the activities that emit and absorb GHG from the operations of the 5 Rajabhat Universities in Southern Thailand, namely, Surat Thani Rajabhat University, Phuket Rajabhat University, Nakhon Si Thammarat Rajabhat University, Songkhla Rajabhat University, and Yala Rajabhat University in the fiscal year 2020 from October 2019 to September 2020. The greenhouse gas emissions are divided to 3 categories: scope 1 direct emissions and absorption of greenhouse gases by the organization, consisting of traveling inside and outside the university by corporate vehicles, and the use of refrigerant in air conditioners within the organization (R-22); scope 2 indirect emission and absorption of greenhouse gases from energy consumption, e.g., the electricity consumption purchased from outside; and scope 3 emission and absorption of greenhouse gases includes all other indirect emissions that occur in a university's value chain, e.g., using tap water and using white A4 paper 80 gsm. The tool used for assessing the carbon footprint of the university is the "Carbon Footprint Assessment Data Collection Form", consisting of part 1 general information, i.e., area size, number of students, and number of personnel; Part 2 information, i.e., the number of activities that take place in 3 scopes of GHG emission activities, that is, traveling inside and outside the university-by-university vehicle, use of air conditioner refrigerant R-22, use of electricity purchased from outside, use of water supply, and use of paper; Part 3 activities to promote a green university, including various policies that promote a green university. The details of GHG emission and absorption sources used in this study to calculate the carbon footprint of the organization are shown in Table 1.

2.2 Actions to Promote a Green University

The purposive sampling in conjunction with Snowball Sampling was used to selected those who were assigned to take any action to promote the green university status in each 5 Southern Rajabhat Universities. The research tool was a "semi-structured questionnaire", constructed to collect data that can be used to analyze the current state of the organization from university policies. Questions for the interview were divided into 2 parts. Part 1: the implementation from past to present according to the components of being a green university was divided into 6 subcategories according to the criteria and indicators for the assessment of the UI Green Metric Guidelines 2020, consisting of setting and infrastructure, energy and climate change, waste, water, transportation, and education [13]. Part 2 included problems and obstacles from the implementation to reduce the number of greenhouse gases and success factors. The information obtained from the interviews is presented in a "contextual" manner, showing the current state of affairs regarding the factors involved in the implementation of green university promotion.

3. Result and Discussion

3.1 Carbon Footprint Assessment

The amount of greenhouse gas emissions of Rajabhat Universities in Southern Thailand compared according to population proportion found that Phuket Rajabhat University had the highest GHG emission rate per person, equal to 266.56 $kgCO_2e$/person/year, followed by Nakhon Si Thammarat Rajabhat University, Surat Thani Rajabhat University, Songkhla Rajabhat University, and Yala Rajabhat University, equal to 262.21, 236.32, 200.50 and 187.68 $kgCO_2e$/person/year, respectively. Yala Rajabhat University uses groundwater, while Nakhon Si Thammarat Rajabhat University uses natural water from the mountains, which does not have a meter showing the amount of water used each month. Therefore, there is no result for calculating the amount of GHG emissions from water supply activities, classified as scope 2 GHG emissions. Surat Thani Rajabhat University does not use R-22 refrigerant because it has switched to Split scope air conditioners to save energy in air conditioning systems. Therefore, there is no calculation of GHG emissions from refrigerant of R-22 air

Table 1. Source of emission and absorption of greenhouse gases and greenhouse gas emissions for the carbon footprint assessment of Rajabhat Universities in Southern Thailand.

Scope	Activity		Unit	EF (kgCO2e/unit)	Reference
Scope 1	Traveling inside and outside the campus by corporate vehicle.	Diesel	liter	2.7403	TGO CFO EF update, October 2020
		Gasoline	liter	2.2373	TGO CFO EF update, October 2020
	Use of refrigerants in air conditioners within the organization	Electricity from the Provincial Electricity Authority Refrigerant	kWh	0.4999	TGO CFO EF update, April 2020
Scope 2	Use of electrical energy purchased from outside	R-22 (HCFC-22)	kg	1,760	TGO CFO EF update, April 2020
Scope 3	Use of tap water	Tap water from the Provincial Waterworks Authority	m3	0.2843	TGO CFO EF update, March 2021
	Use of paper	White A4 paper 80 gsm	kg	2.1020	TGO CFO EF update, March 2021

conditioners within the organization, classified as a GHG emission source from activity scope 1. As the Carbon Footprint of Southern Rajabhat Universities, the amount of GHG emissions from Scope 2 was the highest, accounting for 88.70%, followed by Scope 1 and 3, accounting for 7.99% and 3.31%, respectively as shown in Table 2.

From Table 2, the results of data analysis to compare the difference in the amount of greenhouse gas emissions per year (kgCO2eq/year) classified by Universities with ANOVA statistics showed that GHG emissions per year (kgCO2eq/year) of all 5 Southern Rajabhat Universities were not significantly different as shown in Table 3.

Electrification is the activity that produces the most amount of greenhouse gas emissions. Consistent with the previous research reports on the carbon footprint assessment of educational institutions both in the country and abroad [14-20]. The use of electricity contributes to the highest carbon footprint, as every university uses electricity for teaching and administration. In addition, the increasing number of buildings in universities results in facilities that require more electricity, such as air conditioners and light bulbs, as well as changes in learning styles to use electrical devices, e.g., notebooks and tablets. The results of this research study provide information that GHG inventories will help university administrators to assess and formulate strategies for reducing GHG emissions, particularly in the electricity sector, such as converting electrical equipment to greener products and energy management according to ISO 50001.

3.2 Actions to Promote a Green University

Rajabhat Universities in Southern Thailand has a common characteristic, namely, the implementation of the Master Plan of the University, which is related to the 20-year National Strategy (2018-2037), National Economic and Social Development Plan The 20-Year Long-Term Higher Education Plan (2018-2037), and 20-Year Strategy of Rajabhat University (2017-2036). The Strategy of Rajabhat University consists of 4 strategic issues: local development, teacher Production and Development, enhancing the quality of education, and management system development. Strategy 4 Management System Development has two goals: Rajabhat University must be recognized nationally and internationally as a local educational institution that strengthens the country, and Rajabhat University must have an efficient and flexible administrative system. Focus on building good governance readiness and ability to adapt effectively and efficiently to the status of an autonomous university, the development of such a management system resulted in the determination of issues "Developing the university to be a green university or taking action to promote the green university" is in the master plan of each university. Each Southern Rajabhat University has undertaken quantitative and qualitative aspects of the projects and activities that promote the green university status at all levels, both at the policy level and in practice by setting indicators, in line with its participation in the UI Green Metric World University ranking and participation in the Times Higher Education Impact ranking, which assesses universities against the United Nations Sustainable Development Goals (SDGs). Evidence that clearly shows the achievement of the operation can be seen from the performance reports according to the government action plans of each university. An important factor contributing to success is the importance of administrators who include the green university in the university's master plan and transform that into a concrete practice with details of how to do so and assigning any person or organization to take action to achieve the set goals. There is empirical evidence of success that can be monitored and tracked. The re-

Table 2. Comparison of greenhouse gas emissions of Rajabhat Universities in Southern Thailand

Rajabhat University	Amount of GHG ($kgCO_2e$)	Population	GHG Emission Percentage ($kgCO_2e$/year)			Emission Amount ($kgCO_2e$/person/year)
			Scope 1	Scope 2	Scope 3	
Yala	1,726,268.54	9,198	9.33	84.72	5.95	187.68
Songkhla	2,409,463.79	12,017	12.91	82.93	4.16	200.50
Phuket	2,380,104.79	8,929	4.08	93.98	1.94	266.56
Nakhon Si Thammarat	2,466,089.86	9,197	10.74	88.64	0.62	262.21
Surat Thani	3,193,408.78	13,513	2.87	93.25	3.89	236.32
Average	**2,435,067.15**	**10,571**	**7.99**	**88.70**	**3.31**	**230.65**

F-Test = 0.061, p = 0.992

Table 3. Comparison of greenhouse gas emissions per year ($kgCO_2eq$/year) classified by Rajabhat Universities in Southern Thailand

Variance Source	df	SS	MS	F	p
Between Groups	4	360705432974.93	90176358243.73	0.061	0.992
Within the Group	10	14786789016787.60	1478678901678.76		
SUM	**14**	**15147494449762.50**			

F-Test = 0.061, p = 0.992

sults of the study of the implementation to promote the green university based on the requirements of UI Green Metric World University revealed that: 1) Setting and infrastructure are taken into consideration in increasing green areas. The guidelines for developing or increasing green areas are following the geographical location of each university. The similar activity that has been carried out continuously is having students and staff participate in planting forests and plant species in the forest or garden area of the university. If there is no forest area in the university, it is encouraged to create a garden or arrange a shady garden. There is a budget allocated for the establishment of infrastructure systems to promote a green university, including the projects or activities with the name directly or indirectly specified the implementation of the green university. For example, projects or activities that develop and improve the environment, landscape, traffic system, safety, energy, waste management, annual maintenance of water supply systems or air conditioning, etc. 2) Energy and Climate Change: Traditional equipment are replaced by energy-saving devices. It was found that every university has changed to use LED energy-saving light bulbs. Moreover, there is an effort to choose other energy-saving devices to replace traditional devices, especially inverter air conditioners. For the use of solar energy, it was found that every university had installed solar panels on the cover way. However, the unique characteristics of each place affected the suitability of installing the panels. Even though solar cells are unable to fully operate, efforts have been made to adopt such alternative energy. Air conditioner and solar cell are evidence that all of them work together with external agencies, both in the public and private sectors. There are many scopes of operations such as cooperation and knowledge support through mentoring or lecturers, survey and audit to plan for energy management in the university, electrical equipment or the budget to support the operation or installation of equipment, as well as the electrical appliance maintenance which is considered as another way to reduce energy consumption or saving electricity expenses of the university. The maintenance of electrical equipment has been included in the university's operational plan every year. 3) Waste: There is an administration to encourage students and staff to access and participate in waste management and waste separation easily and conveniently. Implementation of the 3R principle is promoted to reduce waste to zero. Announcements have been made by the university about measures to reduce and stop using plastic, foam, and paper, and campaigns have been carried out in many channels by continuously publicizing through various forms of media. Additionally, the university may request cooperation from shops within the university to refrain from using plastic or foam; encourage the organization of meetings and communication via online platform; use the e-Document system to send and receive documents; and promote the reuse of one-side used paper. In terms of waste management, organic waste should be recycled. Scraps of leaves, twigs, and grass, including waste from the cafeteria, can be decomposed into fertilizer. 4) Water: Traditional devices are being replaced by water-saving and environmentally friendly devices such as water-saving toilets and faucets. Awareness of water-saving and recognition of water value is created and promoted through various channels, e.g., putting up signs and stickers. Conventional water conservation and storage practices are implemented, for example, in some buildings, there are water tanks in the same way as household water tanks. Water conservation and storage are implemented according to the specific characteristics of each area, such as digging ponds, dredging reservoirs, and getting rid of water hyacinths, as well as exploring water resources and investing in utilization of natural water sources, e.g., water from waterfalls, water treatment to the quality close to tap water, and water storage in

concrete reservoirs in case of water supply problems. 5) Transportation: Most of the personnel and students of the Southern Rajabhat Universities travel from their residences to the university by private vehicles that use gasoline and diesel fuel. Traffic within the university is divided into 2 scopes according to the condition of the shuttle bus within the university. For university that has enough buses to shuttle students and personnel, most students and staff choose to use the university's free shuttle service, mostly electric cars. But in the case of a university that does not have a shuttle service, students generally choose to walk because every university provides covered walkways in case of short distance. As for personnel, they often use motorcycles to commute to receive and deliver documents within the university. 6) Education: Teaching and learning are organized under the name of the curriculum on the environment and set-up courses with details related to "energy conservation and the environment" included in the general education subjects that require all students to enroll. Regarding research funding, there is no specific grant for green university-related research, which is consistent with the small number of green university-related research outputs. In addition, every Southern Rajabhat Universities have established a student club related to natural resources and environmental conservation.

The research result revealed that a key factor contributing to the success of the green university promotion operation was the importance of administrators. It can be seen from the consideration to include a green university in the university's master plan and transform that plan into official action with details of implementation and the commitment of any person or unit to have a duty to achieve the clearly defined goals. Empirical evidence of success should be traced and tracked. According to the findings of Isiaka Adeyemi Abdul-Azeez et al. (2015) [21] who studied the realization of low-carbon emissions in universities for energy sustainability, a case study of Universiti Teknologi Malaysia (UTM), it is found that achieving a low carbon and sustainable university requires sustainable energy planning as well as other relevant factors, i.e., research analysis, planning, and determining policy outcomes, in particular, policy emphasis in the form of statements, strategies and plans to direct that plans or policies of such universities. In addition, the findings from the research in terms of quantity and quality of projects and activities showed that each Southern Rajabhat University has undertaken to promote a green university. This is consistent and in the same direction as participating in The UI Green Metric World University ranking and the Times Higher Education Impact ranking, which assesses the university against SDGs. If a university has participated in that ranking, it needs to follow the indicators to meet the specified criteria, which cover all factors that affect GHG reduction in both abstract terms, e.g., education and awareness creation, as well as concrete aspects, e.g., planting trees and creating a Cover Way. This corresponds to the research results of Emad Mushtaha, et al. (2022) [22], studying the management of the infrastructure system of the University of Sharjah, United Arab Emirates Toward a sustainable and liveable campus. The university has participated in the UI Green Metric World University Rankings since 2017 and in the last three years, it has succeeded in being among the best 150 universities in the Setting and Infrastructure category. The Sustainability Office of the university has used the results from the assessment to analyze the indicators and propose an action plan for continuous improvement. Two KPIs that can be improved: sustainability efforts and the total area covered in plants. Moreover, the research result is aligned with the results of the research of Okan Pala (2021) [23], who studied the innovative approach to sustainability, a case study of the University of Ozyegin, Turkey. The criteria and conditions of SDGs were studied and linked to the situation and context of the University of Ozyegin to develop and organize the university's structure towards sustainability. The approach that the university has taken is the establishment of Sustainability Clusters, which are structures that are unique and appropriate to the context of the university. That will be the starting point for the development of the university towards sustainability and the establishment of sustainability platform. Both of which are created by dedicated personnel to coordinate and carry out work on sustainable university development and academic efforts in promoting research and teaching, multidisciplinary, including creating cooperation and creating engagement with various departments, professors, staff, and students within the university as well as government and private agencies both nationally and internationally. The research also indicated that SDGs are productive tools. There is a clear description of criteria and conditions that the university can use for self-assessment to improve its performance toward becoming a sustainable university.

4. Conclusions

Based on the study, electrification is the major factor of university activities that emits greenhouse gases. If electricity is sustainably managed, it can significantly reduce overall greenhouse gas emissions and save university money for electricity fares. Regarding the past results of promoting the green university of Southern Rajabhat Universities and collecting data according to the indicator framework of the UI Green Metric World University in all six aspects, universities can use such data to verify the completeness of performance in each area or issues that is needed for improvement. Consequently, the university is ready to become a green university or join the UI Green Metric World University Ranking and to show the green uni-

versity identity and create a good image for the university in another way.

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Effectiveness of Online Lessons on English Sound System and Pronunciation for University Students

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Abstract

The objectives of this research were 1) to determine the effectiveness of online lessons on the English sound system and pronunciation for undergraduate students, and 2) to compare the learning achievement of undergraduate students before and after studying through the online lessons on the English sound system and pronunciation. The participants consisted of 30 non-English major undergraduate students enrolled in the Fundamental English course provided by the Language Institute at a university in Nakhon Pathom Province, Thailand in the first semester of the academic year 2022. The participants were selected using the purposive sampling technique. The research instruments included online lessons, an achievement test, and an assessment form to evaluate the quality of the online lessons, which were completed by experts. The statistical analysis included percentage, mean, standard deviation, and dependent sample t-test. The findings revealed that the effectiveness of the online lessons was determined to be 75.55/78.44. Furthermore, the learners' achievement after studying through online lessons was significantly higher than before, with a significant difference at the .05 level.

Keywords: effectiveness, online lessons, English sound system and pronunciation, university students

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1. Introduction

In the current era, technological advancements have facilitated rapid and convenient communication between countries worldwide. As a result, English has become a crucial language for Thai individuals and people across the globe. To effectively utilize English for communication purposes, learners should possess the ability to pronounce English accurately, enabling them to better comprehend both English speakers and listeners. The importance of pronunciation in language cannot be overstated, as it significantly influences the effectiveness of human communication. Hence, it is crucial for English language learners, whether in a second or foreign language context, to comprehend the phonological system of the language. Supporting this notion, Hewings (2004) highlighted the significance of pronunciation in both speaking and listening skills [1]. When it comes to speaking, clear and accurate pronunciation is vital for intelligibly conveying and interpreting the intended meaning of speech. Consequently, mastering the pronunciation of consonants and vowels in English holds paramount importance in language learning.

According to several scholars, including Tantanis (2012) [2], Ur (1999: 52-58) [3], and Wei You Fu Zhou Ya Lun (1999) [4], extensive research has been conducted on the challenges faced by Thai learners in English pronunciation. These studies have identified various factors contributing to the difficulties experienced by Thai individuals in pronouncing English accurately. One prominent issue arises from the absence of certain consonant and vowel sounds in the Thai language that are present in English. Additionally, the stress patterns and emphasis on syllables and words differ between the two languages. English words may have primary, secondary, or no stress on any syllables, whereas most Thai words have stress placed on the final syllable. Moreover, Thai learners encounter challenges in pronouncing final consonants due to the Thai language's lack of final consonant diphthongs and the presence of only eight consonants spelled at the end of words, leading to less precise pronunciation in such contexts. Blending Thai sounds with English sounds further compounds the problem, as identified by the studies [2, 3, 4].

At the present time, the utilization of online lessons through internet networks has revolutionized teaching and learning by providing students with unrestricted access to educational materials. Clark Carlson (1982) have defined teaching on the Internet as an individualized teaching process that relies on the Internet, accessible through web browsers [5]. Moreover, innovative educational technologies play a crucial role in the modern era. Regardless of their geographical location, individuals with internet access can search for and access the necessary information, thereby engaging in online teaching and learning. This concept aligns with

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the definitions provided by Allen Seaman (2011) [6] and Shelton Saltsman (2005) [7], who describe online education as a form of distance education that utilizes computers and the internet as the primary delivery mechanism [6, 7].

Based on the mentioned reasons, the researcher made the decision to incorporate technology into the language classroom by creating online lessons on the English sound system and pronunciation for undergraduate students. This initiative aims to support learners who are studying English as a foreign or second language. Achieving accurate and effective English pronunciation will instill learners with confidence in their English communication skills and enable them to apply this knowledge in their professional lives, thereby enhancing their overall potential. Thus, the primary objective of this research is to enhance learners' English pronunciation skills. To accomplish this, the online lessons place significant emphasis on reading and writing the English phonetic alphabet, while also focusing on extensive practice of English pronunciation based on the phonetic system.

2. Research Objectives

The objectives of this research were as follows:

1) To determine the effectiveness of online lessons on the English sound system and pronunciation for undergraduate students, and

2) To compare the learning achievement of undergraduate students before and after studying through the online lessons on the English sound system and pronunciation

3. Research Questions

The research questions for this study were as follows:

1. How effective are the online lessons on the English sound system and pronunciation for undergraduate students?

2. To what extent do online lessons on the English sound system and pronunciation help improve undergraduate students' learning achievement?

4. Literature Review

4.1 The Importance of English Pronunciation

Pronunciation holds significant importance and is a crucial skill to acquire. If learners are unable to pronounce words correctly, it can lead to various challenges and difficulties in their learning journey. Thai scholars have identified several English consonant sounds that are absent in the Thai language. Additionally, there are certain sounds in English that bear similarities to Thai sounds. As a result, Thai individuals tend to substitute Thai sounds for English sounds, which is an incorrect approach. The usage of Thai sounds instead often leads to misunderstandings or, at times, alters the meaning of words entirely. Mathayomchan (1997) [8] emphasized that Thai people, when learning English as a foreign language, often face difficulties in achieving fluency in speaking. This challenge primarily arises because English is typically taught in educational institutions using Thai as the primary medium of instruction. The ability to speak English fluently is contingent upon an individual's knowledge, practice, and opportunities to directly engage with native speakers and practice pronunciation. Accordingly, Kanoksilpathum (2016:2) [9] stated that to effectively communicate, speaking and listening skills must be employed simultaneously. If the speaker's pronunciation is unclear, the listener will not comprehend or understand the message accurately. Consequently, effective communication may be hindered or may not occur at all.

4.2 Problems with English Pronunciation among Thai Speakers

Thailand encounters various challenges and obstacles in the process of studying English. One significant issue is the proper pronunciation of English, particularly in achieving a native-like accent. Thai speakers often face difficulties in pronouncing certain English sounds. Tantanis (2012) conducted a study and identified the pronunciation problems among Thai students, which ranked as follows in descending order: the initial consonant positions of //, //, /v/, /r/, /z/, //, //, //; the final consonant positions of //, //, //, //, //, /z/, //, //, /l/; and vowel sounds of //, //, //, //, //. These difficulties arise due to the absence of these sounds in the Thai language system. Consequently, students tend to substitute Thai sounds, influenced by their native language, in place of these English sounds [2]. According to Wei You Fu Zhou Ya Lun (1999) English pronunciation problems among Thai speakers arise from the assimilation of Thai sounds into English sounds. Despite learning English, most Thai individuals are not provided with a thorough understanding of the English sound system [3].

As a result, language learners often imitate English pronunciation based on the pronunciation model provided by Thai teachers. Ur (1999: 52-58) stated that learners often mispronounce certain sounds due to their absence in their native language. Consequently, learners tend to substitute similar sounds from their native language, such as the /d/ or /z/ sounds instead of // when pronouncing the word "that." This difficulty in differentiating phonemes can lead to incorrect pronunciation, resulting in altered meanings, as seen in the examples of /I/ and /i/ in the words "ship" and "sheep." Proper usage of these sounds must be based on contextual clues. If a learner has never encountered a particular sound, no amount of effort will enable them to pronounce it accurately [4]. Based on these points, it can be concluded that English pronunciation holds great

significance and is essential for learners of English as a foreign language. It aids in the development and enhancement of their English language skills, particularly in terms of reading aloud new words and building readers' confidence. Additionally, it plays a crucial role in improving communication efficiency.

5. Research Methodology

5.1 Research Design

The research was pre-experimental, a quantitative research study. According to Best (1977), the type of study was a pre-experimental design for the one-group dependent pretest-posttest method [10].

5.2 Participants

The participants were 30 undergraduate students volunteering to participate in this study. All of them were non-English major students from various faculties in a university in Nakhon Pathom province. All of them enrolled in the Fundamental English Course, provided by the Language Institute during the first semester of the academic year 2022.

6. Research Instruments

The research instruments being applied in this study consisted of online lessons on the English sound system and pronunciation for undergraduate students, the assessment form to evaluate the online lessons, the online lessons, and an achievement test. The following details developed the research instruments.

6.3.1 An assessment form to evaluate the online lessons to be filled in by the experts. The assessment form to examine the quality of the online lessons on the English sound system and pronunciation for undergraduate students. The quality of the online lessons is assessed by three experts in educational technology and English teaching. The experts assessed the quality of online lessons using an 18-item 5-level assessment scale, covering 3 aspects: content and presentation, usability, and benefits of the online lessons. As approved by the experts, the quality was at a good level (mean 4.26, and standard deviation 0.32). The details of the questions are shown in Table 1.

6.3.2 The online lessons on English sound system and pronunciation for the generic person Based on the objectives of this research, the focus is on learners practicing reading and writing the International Phonetic Alphabet, as well as improving their pronunciation of consonants and vowels, accentuation, intonation, and the ability to connect words and syllables according to phonetic principles. Consequently, the lessons are structured into six parts: 1) International Phonetic Alphabet (IPA), 2) Vowel Sounds, 3) Consonant Sounds, 4) Word Stress, 5) Sentence Stress, and 6) Linking Sounds. Furthermore, the quality of the online lessons was assessed by educational technology experts, and the content was reviewed by English language teaching professionals to ensure its suitability for learners before implementation. Following the assessment, the researcher conducted a pilot study, recruiting participants from undergraduate students who had previously taken the Fundamental English Course. Ten students voluntarily participated in the pilot study, which aimed to evaluate the suitability of the online lessons for learners' proficiency level and assess whether they found the lessons easy or challenging to follow independently. Subsequently, thirty samples were selected to participate in the study, using online lessons on the English sound system and pronunciation to determine their effectiveness. The result of the study revealed that the online lessons exhibited an efficiency rating of 75.55 out of 78.44, surpassing the threshold of 75/75.

6.3.3 An achievement test on the learners' learning achievement A pre-and post-learning achievement test using online lessons on the English sound system and pronunciation for the generic person. The test was multiple-choice questions with four options, 30 items and 30 points. The test time was 50 minutes. Overall, the test difficulty (p) was between 0.25-0.75, discriminating power (r) was between 0.25-0.75, and reliability was 0.79. Three experts in testing and evaluation validated the content and accuracy of word choice in each item of the developed test. The index of item-objective congruence (IOC) was equal to 1.00. The test was revised following the experts' comments. The revised test was pilot tested by 30 Nakhon Pathom Rajabhat University students who previously participated in the Fundamental English course. The obtained scores were analyzed for the quality of each test item by the SPSS program to determine the difficulty (p) and the discrimination (r) by examining the difficulty items (p) according to the criterion between 0.20-0.80. According to the criteria, the power of discrimination (r) should be from 0.20 and above. Then the confidence (reliability) of the test was analyzed using Kuder-Richard's Formula 20 (KR-20) (Kuder and Richardson, 1937) [11]. The test confidence value should be 0.70 or higher. The developed test got a confidence value of 0.79 [11].

7. Procedures

This research was conducted in 2022, following a series of steps. Firstly, the researcher coordinated with the Language Institute of Nakhon Parthom Rajabhat University to seek assistance from their personnel who conducted online teaching. The online lessons focused on the English sound system and pronunciation for undergraduate students. Additionally, a sample group was selected based on specific criteria, and their consent was obtained. Subsequently, the researcher provided an explanation of the research project and in-

Table 1. The assessment of the online lessons on the English sound system and pronunciation for undergraduate students.

Statement	Mean	S.D.	Level of Effectiveness
Contents and presentation			
1. The contents are consistent with the expected learning.	4.00	1.00	Very good
2. The contents are accurate and precise.	4.66	0.57	Excellent
3. The contents are appropriate in rank.	4.66	0.57	Excellent
4. The contents are clearly described.	4.33	0.57	Very good
5. The amount of content in each lesson is appropriate.	4.66	0.57	Excellent
6. The language used in the online lesson is easy to understand	4.33	0.57	Very good
7. The pictures are presented appropriately and consistently.	4.00	1.00	Very good
8. The order of the presentation is proper.	4.33	0.57	Very good
Average	**4.25**	**0.26**	**Very good**
Usability			
9. Font style, color, and size are appropriate.	4.00	1.00	Very good
10. Screen elements are suitable.	4.33	0.57	Very good
11. Sound effects are suitable.	4.00	0.00	Very good
12. Screen graphic design is relevant to the content.	4.40	0.90	Very good
13. The connection of each part is convenient.	4.60	0.50	Excellent
Average	**4.20**	**0.36**	**Very good**
Benefits			
14. The online lessons provide helpful knowledge and information to learners.	4.00	0.00	Very good
15. The online lessons are appropriate to use as a learning innovation.	4.33	0.57	Very good
16. The online lessons can support language learning as a source of information.	4.33	0.57	Very good
17. The online lessons can help develop the language proficiency of learners.	4.00	0.00	Very good
18. The online lessons can be studied and reviewed at any time.	5.00	0.00	Excellent
Average	**4.33**	**0.32**	**Very good**
Overall	**4.26**	**0.32**	**Very good**

structed the participants on how to access the online lessons, allowing them to study at their convenience over a 30-day period. The participants were enrolled in online lessons using the Moodle program. Following this, the researcher administered a pre-test to the sample group using the online lessons. The participants engaged in self-directed learning, studying the content, and completing activities in the online lessons until they had completed six lessons. Throughout the study, the researcher monitored the participants' progress and addressed any difficulties or obstacles encountered when using the online lessons developed by the researcher. The feedback was used to improve the online lessons. After the completion of the six lessons, the participants were asked to complete a post-test to assess their learning achievements. At the end of the 30-day period, the participants thoroughly studied the online lessons. The researcher examined the assessment forms collected during the course and analyzed the data. Consequently, the scores obtained from the achievement test conducted after studying with the online lessons were used for data analysis.

8. Data Collection and Data Analysis

The data collection procedure was divided into three stages. The first stage was before the development of the online lessons, during the implementation, and after implementation. The statistics used to analyze data from this study were the basic statistics such as percentage, mean, and standard deviation. The pre-test and the post-test data were analyzed by t-test and the evaluation of the effect size. Quantitative data were processed in SPSS, and according to Promwong, Netbprasert, Linsagun (1977) [12] E1/E2, the efficiency of course materials was analyzed at 75/75 [12].

9. Findings

This section presents the findings based on the research questions as follows:

RQ1. How effective are the online lessons on English sound system and pronunciation for undergraduate students?

The current study revealed that the effectiveness of the online lessons was estimated at 75.55/78.44. The result showed that the overall scores participants earned during the study were 75.55%, thus reflecting the efficiency of the teaching and learning process in E1. The E2 showed that the scores of the achievement post-test were 78.44% which reflected their knowledge and ability after learning through the online lessons.

As verified by the experts, the quality of the online lesson on the English sound system and pronunciation was very good (mean 4.26, and standard deviation 0.32). In addition, the experts assessed the quality of online lessons in 18 items, shown in Table 1, using a 5-level assessment scale, covering three aspects: content and presentation, usability, and benefits of the online lessons. Overall, the quality was at a very good level

Table 2. Effectiveness of the online lessons on English sound system and pronunciation of the sample group

Target group	n	Score	Mean	S.D.	Effective score
E1	30	60	45.33	2.26	75.55
E2	30	30	23.53	2.37	78.44

(mean 4.26 and standard deviation 0.32), which consisted of the benefits of the online lessons (mean 4.33 and standard deviation 0.32), content and presentation (mean 4.25 and standard deviation 0.26), and usability (mean 4.20 and standard deviation 0.36), respectively.

RQ2. How does using online lessons on English sound system and pronunciation for undergraduate students affect the learners in terms of learning achievement?

The comparison of learners' learning achievement before and after learning through online lessons on the English sound system and pronunciation for the generic person. The findings illustrated that the learner's achievement in the English sound system and pronunciation from the post-test was significantly higher than before at 0.05.

10. Discussions and Conclusion

The creation of online lessons on the English sound system and pronunciation for undergraduate students uses the teaching management system via the Moodle program. It has effectively organized the content and activities across six comprehensive lessons. Each lesson encompasses specific learning goals, lesson files for in-class study exercises, and a subsequent quiz to reinforce comprehension. These lessons have been carefully developed with the input of experts in the field, ensuring their efficacy. Furthermore, the content of the activities is regularly updated based on expert recommendations. The quality of these online lessons has been evaluated by experts in educational technology and English language instruction, affirming their effectiveness. In addition, the researcher also experimented with the lessons to determine their effectiveness with non-sample learners before being used. The effectiveness of online lessons was 75.55/78.44, which is related to the research findings of LUO (2017), who developed online instruction on the pronunciation of Chinese Pinyin for Matayom 1 students, Assumption College Sriracha. The results illustrated that online lessons are effective according to the criteria, and the subjects were satisfied with the online instruction on the pronunciation of Chinese Pinyin at the most satisfactory level [13].

Based on our thorough analysis of background data, the online lessons on the English sound system and pronunciation for undergraduate students have been developed utilizing the Learning Management System (LMS) with the Moodle program. This approach enables learners to conveniently access the online lessons at their preferred time and location, benefiting both facilitators and students alike. Accordingly, Laohacharasang T. (2002:1) emphasized that the Learning Management System in E-Learning serves as an effective tool for managing lessons, organizing learning activities and groups, fostering interactive communication between teachers and learners, and creating quizzes for assessing and evaluating learners' progress. Simultaneously, the online lessons offer a diverse range of activities, including practice exercises designed to reinforce learners' knowledge after completing each sub-content section. These activities are specifically designed to empower learners to independently review their understanding throughout the learning process [14].

The present study revealed that the online lessons on the English sound system and pronunciation for undergraduate students achieved a high level of effectiveness (mean 4.26, standard deviation 0.32). These online lessons underwent rigorous evaluation by educational technology experts to ensure their quality. The content was revised by English language teaching professionals to optimize suitability for learners prior to implementation. Additionally, quality monitoring of the lessons focused on assessing computer-based instruction, specifically examining the integration of content and instructional techniques within the digital environment. The outcomes of this evaluation are expected to provide substantial benefits to the students. Likewise, the Moodle program on the Internet provides lecturers with the capability to create diverse systems, including content and activity management. Moreover, the online lessons incorporate a range of assigned activities aimed at fostering independent knowledge review by learners. In a related study, Nakthung, Suwandecha, and Triwankul (2017) investigated the development of English phonology and phonetics lessons to enhance learners' attitudes toward English and their pronunciation abilities. The research findings revealed a positive impact on the English pronunciation accuracy and overall development of pronunciation skills of the experimental group [15].

In addition, this study conducted a comparative analysis of the participants' pre-test and post-test scores following their completion of the online lessons on the English sound system and pronunciation. The results indicated a significant improvement in scores for the general population, demonstrating enhanced knowledge acquisition as a result of the study. The findings further revealed that learners were able to effectively engage with the content and activities provided through the online system, promoting self-directed learning. Moreover, the online lessons offered the advantage of flexible scheduling, enabling

Table 3. Mean, S.D., and t-test of learners' achievement on English sound system and pronunciation

Test	n	Score	Mean	S.D.	t	Sig.
Pre-test	30	30	13.33	3.20	15.218*	0.00
Post-test	30	30	23.53	2.37		

Note: *significant level of .05 (P .05)

learners to attend classes at their convenience, regardless of time or location. Therefore, learners who engage in independent study tend to achieve higher outcomes when using online lessons. This aligns with the research conducted by Nithiwaraphakun, Buasam-Ang, and Chumnumnawin (2020), who developed an innovative approach to improving the pronunciation of English alphabet sounds among first-year students at Phranakhon Rajabhat University. The study demonstrated a significant improvement in pronunciation skills after the intervention, with statistical significance at the .05 level [16]. These findings are also consistent with the research conducted by Chuensombat, Thanamai, and Phumrat (2021). Their study explored the use of web applications based on a teaching and learning model rooted in brain-based learning principles and phonics instruction to enhance the pronunciation abilities of students at Kasetsart University. The results indicated a significant improvement in pronunciation skills in post-study, with statistical significance at the .05 level [17].

11. Limitations of this research

Based on the teaching and learning conducted through the online system, this study encountered limitations related to internet connectivity during the teaching process. This issue affected learners while they were engaging with the online lessons. Moreover, the insufficient efficiency of the internet network could potentially diminish the effectiveness of a well-designed lesson. Additionally, it is important to note that the participants in this study consisted of 30 undergraduate students from Nakhon Pathom Rajabhat University. Therefore, it is necessary to exercise caution when generalizing the findings to other learners.

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Bootstrap Methods for Estimating the Confidence Interval for the Index of Dispersion of the Zero-Truncated Poisson-Amarendra Distribution

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Abstract

The zero-truncated count data is of primary interest in several areas such as biological science, medical science, demography, ecology, etc. Recently, the zero-truncated Poisson-Amarendra distribution has been proposed for such data. However, the confidence interval estimation of the index of dispersion has not yet been examined. This paper examined confidence interval estimation based on percentile, simple, biased-corrected, and accelerated bootstrap methods in terms of coverage probability and average interval length via Monte Carlo simulation. The results indicate that attaining the nominal confidence level using the bootstrap methods was not possible for small sample sizes regardless of the other settings. Moreover, when the sample size was large, the performances of the methods were not substantially different. However, the percentile bootstrap and the simple bootstrap methods provided the shortest average lengths for small sample sizes. Last, the bootstrap methods were used to calculate the confidence intervals for the index of dispersion of the zero-truncated Poisson-Amarendra distribution via two numerical examples, the results of which match those from the simulation study.

Keywords: interval estimation, count data, Amarendra distribution, Bootstrap interval, simulation

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1. Introduction

The Poisson distribution is a discrete probability distribution that measures the probability of an event occurring a certain number of times within a given interval of time or space [1-2]. Data such as the number of orders a firm will receive tomorrow, the number of defects in a finished product, the number of customers arriving at a checkout counter in a supermarket from 9 to 11 AM., the number of births per day, etc. [3], follow a Poisson distribution.

The probability mass function (pmf) of a Poisson distribution is defined as

$$p(x;\lambda)=\frac{e^{-\lambda}\lambda^{x}}{x!},\ \ x=0,1,2,...,\ \lambda>0, \qquad (1)$$

where e is a constant approximately equal to 2.71828 and λ is the shape parameter which indicates the mean number of events within a given interval of time or space. This probability model can be used to analyze data containing zeros and positive values that have low occurrence probabilities within a predefined time or area range [4]. However, probability models can become truncated when a range of possible values for the variables is either disregarded or impossible to observe. Indeed, zero truncation is often enforced when one wants to analyze count data without zeros. David and Johnson [5] developed the zero-truncated (ZT) Poisson (ZTP) distribution, which has been applied to datasets of the length of stay in hospitals, the number of fertile mothers who have experienced at least one child death, the number of children ever born to a sample of mothers over 40 years old, and the number of passengers in cars [6]. A ZT distribution's pmf can be derived as

$$p(x;\theta)=\frac{p_0(x;\theta)}{1-p_0(0;\theta)},\ \ x=1,2,3,...,$$

where $p_0(x;\theta)$ and $p_0(0;\theta)$ are the pmf of the un-truncated distribution for any value of x and $x=0$, respectively. Shanker [7] defined the pmf of the Poisson-Amarendra (PA) distribution as

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$$p_0(x;\theta)=\frac{\theta^4}{(\theta^3+\theta^2+2\theta+6)}\frac{\left(x^3+(\theta+7)x^2+(\theta^2+5\theta+15)x+(\theta^3+4\theta^2+7\theta+10)\right)}{(\theta+1)^{x+4}},\ x=0,1,2,...,\theta>0. \quad (2)$$

The mathematical and statistical properties of the PA distribution for modeling biological science data were established by Shanker [7]. The PA distribution arises from the Poisson distribution when parameter λ follows the Amarendra distribution proposed by Shanker [8] with probability density function (pdf)

$$f(\lambda;\theta)=\frac{\theta^4}{\theta^3+\theta^2+2\theta+6}\left(1+\lambda+\lambda^2+\lambda^3\right)e^{-\theta\lambda},\ \lambda>0,\theta>0. \quad (3)$$

Shanker [8] showed that the pdf in (3) is a more suitable model than the exponential, Lindley [9] and Sujatha distributions [10] for modeling lifetime data from biomedical sciences and engineering. Several distributions have been introduced as an alternative to the ZTP distribution for handling over-dispersion in data, such as ZT Poisson-Lindley (ZTPL) [11], ZT Poisson-Sujatha (ZTPS) [12] and ZT Poisson-Akash (ZTPAk) distributions [13].

Shanker [14] proposed the ZT Poisson-Amarendra (ZTPA) distribution and its properties, such as the moment, coefficient of variation, skewness, kurtosis, and the index of dispersion. The method of moments and the maximum likelihood have also been derived for estimating its parameter. Furthermore, when the ZTPA distribution was applied to real data, it was more suitable than the ZTP, ZTPL, and ZTPS distributions.

The index of dispersion [15], like the coefficient of variation, is a normalized measure of the dispersion of a probability distribution. It is a measure used to quantify whether a set of observed occurrences are clustered or dispersed compared to a standard statistical model. It is defined as the ratio of the population variance σ^2 to the population mean μ; σ^2/μ. This index should typically only be used for data measured on a ratio scale. It is sometimes used for count data. If the count data follows a Poisson distribution, then the mean and variance should be equal and the index of dispersion is 1. If the counts follow a geometric or negative binomial, then the index of dispersion should be greater than 1. If the counts follow a binomial distribution, the index of dispersion should be less than 1 [16].

The relevance of the index of dispersion is that it has a value of 1 when the probability distribution of the number of occurrences in an interval is a Poisson distribution. Thus, the measure can be used to assess whether observed data can be modeled using a Poisson process. When the index of dispersion is less than 1, a dataset is said to be under-dispersed, this condition can relate to patterns of occurrence that are more regular than the randomness associated with a Poisson process. For example, regular, periodic events will be under-dispersed. If the index of dispersion is larger than 1, a dataset is said to be over-dispersed [16].

To the best of our knowledge, no research has been conducted on estimating the confidence interval for the index of dispersion of the ZTPA distribution. It is essential to note that the score function of ZTPA distribution is complicated, and the maximum likelihood estimator has no closed form. Therefore, likelihood-based, score, and Wald-type confidence intervals have no closed forms. In such cases, finding these confidence intervals can be challenging; alternative methods, such as numerical techniques or resampling methods like the bootstrap method, can be utilized. Bootstrap methods for estimating confidence intervals provide a way of quantifying the uncertainties in statistical inference based on a sample of data. The concept is to run a simulation study based on the actual data for estimating the likely extent of sampling error [17]. Therefore, the objective of the current study is to assess the efficiencies of three bootstrap methods, namely, the percentile bootstrap (PB), the simple bootstrap (SB), and the bias-corrected and accelerated bootstrap (BCa) methods, to estimate the confidence interval for the index of dispersion of the ZTPA distribution. In addition, none of the bootstrap confidence intervals will be exact (i.e., the actual confidence level is exactly equal to the nominal confidence level $1-\alpha$) but they will all be consistent, meaning that the confidence level approaches $1-\alpha$ as the sample size gets large [18]. In light of the impossibility of a theoretical comparison of these bootstrap confidence intervals, we conduct a simulated study to evaluate their relative merits.

2. Theoretical Background

To obtain novel probability distributions, compounding of probability distributions is an innovative approach to fit data sets inadequately fit by common distributions. As there is a need to find more suitable model for analyzing statistical data, Shanker [7] proposed a new compounding distribution by compounding Poisson distribution with Amarendra distribution [8]. The pmf of the PA distribution is given in Eq. (3).

Let X be a random variable which follows the ZTPA distribution with parameter θ, it is denoted as $X \sim \text{ZTPA}(\theta)$. Using Eqs. (2) and (3), the pmf of ZTPA distribution can be obtained as

$$p(x;\theta)=\frac{\theta^4}{\begin{pmatrix}\theta^6+5\theta^5+14\theta^4+41\theta^3+\\ 45\theta^2+26\theta+6\end{pmatrix}}\frac{\begin{pmatrix}x^3+(\theta+7)x^2+(\theta^2+5\theta+15)x+\\ (\theta^3+4\theta^2+7\theta+10)\end{pmatrix}}{(\theta+1)^x},\ x=1,2,3...,\ \theta>0.$$

The plots of the pmf of the ZTPA distribution with some specified parameter values θ as shown in Figure 1.

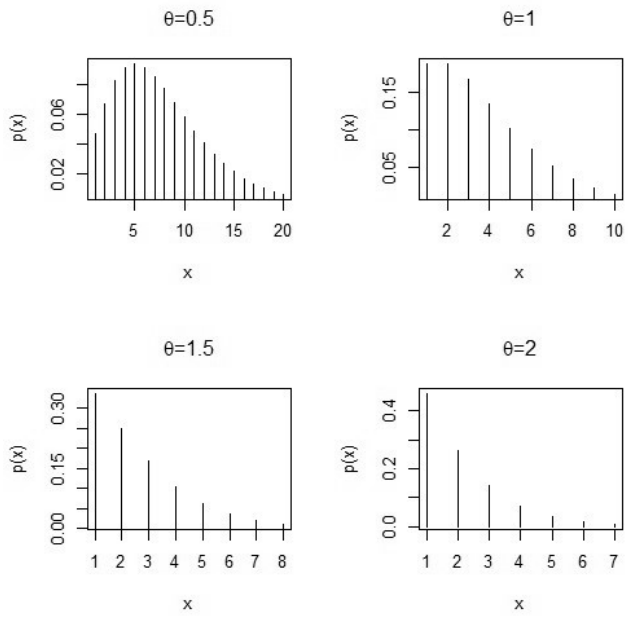

Figure 1. The plots of the pmf of the ZTPA distribution with $\theta = 0.5,\ 1,\ 1.5$ and 2.

The expected value, variance and index of dispersion of X are as follows:

$$E(X)=\frac{\theta^7+6\theta^6+20\theta^5+64\theta^4+141\theta^3+170\theta^2+102\theta+24}{\theta(\theta^6+5\theta^5+14\theta^4+41\theta^3+45\theta^2+26\theta+6)},$$

$$\text{var}(X)=\frac{\begin{pmatrix}\theta^{13}+12\theta^{12}+79\theta^{11}+420\theta^{10}+1749\theta^9+5486\theta^8+13461\theta^7+24780\theta^6+\\ 31990\theta^5+27898\theta^4+16176\theta^3+6108\theta^2+1392\theta+144\end{pmatrix}}{\theta^2(\theta^6+5\theta^5+14\theta^4+41\theta^3+45\theta^2+26\theta+6)^2},$$

and

$$ID(X)=\kappa=\frac{\begin{pmatrix}\theta^{13}+12\theta^{12}+79\theta^{11}+420\theta^{10}+1749\theta^{9}+5486\theta^{8}+13461\theta^{7}+24780\theta^{6}+\\ 31990\theta^{5}+27898\theta^{4}+16176\theta^{3}+6108\theta^{2}+1392\theta+144\end{pmatrix}}{\theta\begin{pmatrix}\theta^{6}+5\theta^{5}+14\theta^{4}+41\theta^{3}+\\ 45\theta^{2}+26\theta+6\end{pmatrix}\begin{pmatrix}\theta^{7}+6\theta^{6}+20\theta^{5}+64\theta^{4}+141\theta^{3}+\\ 170\theta^{2}+102\theta+24\end{pmatrix}}. \quad (4)$$

The point estimator of θ is obtained by maximizing the log-likelihood function $\log L(x_i;\theta)$ or the logarithm of joint pmf of $X_1,...,X_n$. Thus, the maximum likelihood (ML) estimator for θ of the ZTPA distribution is derived by the following processes:

$$\frac{\partial}{\partial\theta}\log L(x_i;\theta)=\frac{\partial}{\partial\theta}\left[\begin{array}{l} n\log\left(\frac{\theta^4}{\theta^6+5\theta^5+14\theta^4+41\theta^3+45\theta^2+26\theta+6}\right)-\sum_{i=1}^{n}x_i\log(\theta+1)\\ +\sum_{i=1}^{n}\log\left[x_i^3+(\theta+7)x_i^2+(\theta^2+5\theta+15)x_i+(\theta^3+4\theta^2+7\theta+10)\right]\end{array}\right]$$

$$=\frac{4n}{\theta}-\frac{n\begin{pmatrix}6\theta^{5}+25\theta^{4}+56\theta^{3}+\\ 123\theta^{2}+90\theta+26\end{pmatrix}}{\begin{pmatrix}\theta^{6}+5\theta^{5}+14\theta^{4}+41\theta^{3}\\ +45\theta^{2}+26\theta+6\end{pmatrix}}-\frac{n\bar{x}}{\theta+1}+\sum_{i=1}^{n}\frac{x_i^2+(2\theta+5)x_i+(3\theta^2+8\theta+7)}{\begin{pmatrix}x_i^3+(\theta+7)x_i^2+(\theta^2+5\theta+15)x_i\\ +(\theta^3+4\theta^2+7\theta+10)\end{pmatrix}}.$$

Solving the equation $\frac{\partial}{\partial\theta}\log L(x_i;\theta)=0$ for θ, we have the non-linear equation

$$\frac{4n}{\theta}-\frac{n\begin{pmatrix}6\theta^{5}+25\theta^{4}+56\theta^{3}+\\ 123\theta^{2}+90\theta+26\end{pmatrix}}{\begin{pmatrix}\theta^{6}+5\theta^{5}+14\theta^{4}+41\theta^{3}\\ +45\theta^{2}+26\theta+6\end{pmatrix}}-\frac{n\bar{x}}{\theta+1}+\sum_{i=1}^{n}\frac{x_i^2+(2\theta+5)x_i+(3\theta^2+8\theta+7)}{\begin{pmatrix}x_i^3+(\theta+7)x_i^2+(\theta^2+5\theta+15)x_i\\ +(\theta^3+4\theta^2+7\theta+10)\end{pmatrix}}=0,$$

where $\bar{x}=\sum_{i=1}^{n}x_i/n$ denotes the sample mean. Since the ML estimator for θ does not provide the closed-form solution, the non-linear equation can be solved by the numerical iteration methods such as Newton-Raphson method, Ragula-Falsi method, and bisection method. In this paper, we use maxLik package [19] with Newton-Raphson method for ML estimation in the statistical software R.

The point estimator of the index of dispersion κ can be estimated by replacing the parameter θ with the ML estimator for θ shown in Eq. (4). Therefore, the point estimator of the index of dispersion κ is given by

$$\hat{\kappa}=\frac{\begin{pmatrix}\hat{\theta}^{13}+12\hat{\theta}^{12}+79\hat{\theta}^{11}+420\hat{\theta}^{10}+1749\hat{\theta}^{9}+5486\hat{\theta}^{8}+13461\hat{\theta}^{7}+24780\hat{\theta}^{6}+\\ 31990\hat{\theta}^{5}+27898\hat{\theta}^{4}+16176\hat{\theta}^{3}+6108\hat{\theta}^{2}+1392\hat{\theta}+144\end{pmatrix}}{\hat{\theta}\begin{pmatrix}\hat{\theta}^{6}+5\hat{\theta}^{5}+14\hat{\theta}^{4}+41\hat{\theta}^{3}+\\ 45\hat{\theta}^{2}+26\hat{\theta}+6\end{pmatrix}\begin{pmatrix}\hat{\theta}^{7}+6\hat{\theta}^{6}+20\hat{\theta}^{5}+64\hat{\theta}^{4}+141\hat{\theta}^{3}+\\ 170\hat{\theta}^{2}+102\hat{\theta}+24\end{pmatrix}},$$

where $\hat{\theta}$ is the ML estimator for θ.

3. Bootstrap Methods

In this paper, we focus on three most common bootstrap methods for estimating the confidence interval for the index of dispersion that are most popular in practice: percentile bootstrap, simple bootstrap, and bias-corrected and accelerated bootstrap methods. The computer-intensive bootstrap methods described in this study provide alternative for constructing approximate confidence intervals for the index of dispersion without having to make an assumption about the underlying distribution [20].

3.1 Percentile Bootstrap (PB) Method

The percentile bootstrap confidence interval is the interval between the $(\alpha/2)\times 100$ and $(1-(\alpha/2))\times 100$ percentiles of the distribution of κ estimates obtained from resampling or the distribution of $\hat{\kappa}^*$, where κ represents a parameter of interest and α is the level of significance (e.g., α=0.05 for 95% confidence intervals) [21]. A percentile bootstrap confidence interval for κ can be obtained as follows:

1) B random bootstrap samples are generated,

2) a parameter estimate $\hat{\kappa}^*$ is calculated from each bootstrap sample,

3) all B bootstrap parameter estimates are ordered from the lowest to highest, and

4) the $(1-\alpha)100\%$ percentile bootstrap confidence interval is constructed as follows:

$$CI_{PB}=\left[\hat{\kappa}^*_{(r)},\hat{\kappa}^*_{(s)}\right], \tag{5}$$

where $\hat{\kappa}^*_{(\alpha)}$ denotes the α^{th} percentile of the distribution of $\hat{\kappa}^*$ and $0\le r<s\le 100$. For example, a 95% percentile bootstrap confidence interval with 2,000 bootstrap samples is the interval between the 2.5 percentile value and the 97.5 percentile value of the 2,000 bootstrap parameter estimates.

3.2 Simple Bootstrap (SB) Method

The simple bootstrap method is a method as easy to apply as the percentile bootstrap method. It is sometimes called the basic bootstrap method. Suppose that the quantity of interest is κ and that the estimator of κ is $\hat{\kappa}$. The simple bootstrap method assumes that the distributions of $\hat{\kappa}-\kappa$ and $\hat{\kappa}^*-\hat{\kappa}$ are approximately the same [20]. The $(1-\alpha)100\%$ simple bootstrap confidence interval for κ is

$$CI_{SB}=\left[2\hat{\kappa}-\hat{\kappa}^*_{(s)},2\hat{\kappa}-\hat{\kappa}^*_{(r)}\right],$$

where the quantiles $\hat{\kappa}^*_{(r)}$ and $\hat{\kappa}^*_{(s)}$ are the same percentile of empirical distribution of bootstrap estimates $\hat{\kappa}^*$ used in Eq. (5) for the percentile bootstrap method.

3.3 Bias-Corrected and Accelerated (BCa) Bootstrap Method

The BCa bootstrap method corrects for both bias and skewness of the bootstrap parameter estimates by incorporating a bias-correction factor and an acceleration factor [22-23] to overpower the over coverage cases in percentile bootstrap confidence intervals [22]. The bias-correction factor $\hat{z}_0$ is estimated as the proportion of the bootstrap estimates less than the original parameter estimate $\hat{\kappa}$,

$$\hat{z}_0=\Phi^{-1}\left(\frac{\#\{\hat{\kappa}^*\le\hat{\kappa}\}}{B}\right),$$

where Φ^{-1} is the inverse of the standard normal cumulative distribution function (e.g., $\Phi^{-1}(0.975)\approx 1.96$). The acceleration factor $\hat{a}$ is computed through jackknife resampling (i.e., "leave one out" resampling), which associates generating n replicates of the original sample, where n is the number of observations in the sample. Firstly, we obtain the first jackknife replicate by leaving out the first case $(i=1)$ of the original sample. Secondly, the second jackknife replicate is obtained by leaving out the second case $(i=2)$, and so on, until n samples of size $n-1$ are obtained. $\hat{\kappa}_{(-i)}$ is obtained for each of the jackknife resamples. The average of these estimates is

$$\hat{\kappa}_{(\cdot)}=\frac{\sum_{i=1}^{n}\hat{\kappa}_{(-i)}}{n}.$$

Then, the acceleration factor $\hat{a}$ is estimated as follow,

$$\hat{a} = \frac{\sum_{i=1}^{n}\left(\hat{\kappa}_{(\cdot)} - \hat{\kappa}_{(-i)}\right)^3}{6\left\{\sum_{i=1}^{n}\left(\hat{\kappa}_{(\cdot)} - \hat{\kappa}_{(-i)}\right)^2\right\}^{3/2}}.$$

With the values of $\hat{z}_0$ and $\hat{a}$, the values α_1 and α_2 are computed,

$$\alpha_1 = \Phi\left\{\hat{z}_0 + \frac{\hat{z}_0 + z_{\alpha/2}}{1-\hat{a}\left(\hat{z}_0 + z_{\alpha/2}\right)}\right\} \text{ and}$$

$$\alpha_2 = \Phi\left\{\hat{z}_0 + \frac{\hat{z}_0 + z_{1-\alpha/2}}{1-\hat{a}\left(\hat{z}_0 + z_{1-\alpha/2}\right)}\right\},$$

where $z_{\alpha/2}$ is the $\alpha/2$ quantile of the standard normal distribution (e.g. $z_{0.05/2} \approx -1.96$). Then, the $(1-\alpha)100\%$ BCa bootstrap confidence interval for κ is as follows

$$CI_{BCa} = \left[\hat{\kappa}^*_{(\alpha_1)}, \hat{\kappa}^*_{(\alpha_2)}\right],$$

where $\hat{\kappa}^*_{(\alpha)}$ denotes the α^{th} percentile of the distribution of $\hat{\kappa}^*$.

4. Simulation Study

The confidence interval for the index of dispersion of a ZTPA distribution estimated via various bootstrap methods was considered in this study. Because a theoretical comparison is not possible, a Monte Carlo simulation study was designed using R version 4.2.2 [24] to cover cases with different sample sizes (n = 10, 30, 50, 100 and 500). To observe the effect of small and large variances, the true parameter (θ) was set as 0.25, 0.5, 1, 1.5, 2, and 2.5, then the index of dispersion (κ) were 5.083, 3.004, 1.780, 1.245, 0.923, and 0.709, respectively. The number of bootstrap replications (B) was set as 2,000 because Ukoumunne and Davison [25] claimed that 2,000 bootstrap samples are sufficient to estimate the coverage probability for the 95% confidence intervals with a standard error of just under 0.5%. Bootstrap samples of size n were generated from the original sample and each simulation was repeated 1,000 times. Without loss of generality, the nominal confidence level $(1-\alpha)$ was set at 0.95. The performances of the bootstrap methods were compared in terms of their coverage probabilities and average lengths. The one with a coverage probability greater than or close to the nominal confidence level means that it contains the true value and can be used to precisely estimate the confidence interval for the index of dispersion.

The results of the study are reported in Table 1. For $n = 10$, the coverage probabilities of the three methods tended to be less than 0.95 and so did not reach the nominal confidence level. For $n = 30$, all of the methods once again provided coverage probabilities that were less than the nominal confidence level of 0.95. All bootstrap methods had coverage probabilities close to the nominal confidence levels for large sample sizes ($n \geq 50$). Additionally, the coverage probabilities of all bootstrap methods were not significantly different for these situations. Thus, as the sample size was increased, the coverage probabilities of the methods tended to increase and approach 0.95.

Moreover, the average length of the methods decreased when the value of κ was decreased because of the relationship between the variance and κ. Unsurprisingly, as the sample size was increased, the average lengths decreased. For small sample sizes ($n \leq 30$), the average lengths of the PB and SB methods were shorter than those of BCa method. For large sample sizes ($n \geq 50$), the average lengths of all bootstrap methods were not significantly different.

Table 1. Coverage probability and average length of the 95% bootstrap confidence intervals for the index of dispersion of the ZTPA distribution

n	θ	κ	Coverage probability			Average length		
			PB	SB	BCa	PB	SB	BCa
10	0.25	5.083	0.916	0.912	0.908	2.5321	2.5340	2.6197
	0.5	3.004	0.910	0.918	0.909	1.5674	1.5654	1.6075
	1	1.780	0.891	0.926	0.900	1.1912	1.1934	1.2079

n	θ	κ	Coverage probability			Average length		
			PB	SB	BCa	PB	SB	BCa
	1.5	1.245	0.886	0.882	0.913	1.0738	1.0727	1.0853
	2	0.923	0.870	0.856	0.910	0.9787	0.9763	0.9980
	2.5	0.709	0.874	0.830	0.923	0.8916	0.8946	0.9338
30	0.25	5.083	0.937	0.930	0.936	1.5667	1.5663	1.5893
	0.5	3.004	0.950	0.953	0.941	0.9352	0.9360	0.9450
	1	1.780	0.941	0.946	0.952	0.7144	0.7146	0.7190
	1.5	1.245	0.937	0.942	0.942	0.6582	0.6585	0.6617
	2	0.923	0.916	0.924	0.938	0.6208	0.6206	0.6260
	2.5	0.709	0.924	0.911	0.943	0.5792	0.5798	0.5890
50	0.25	5.083	0.942	0.938	0.947	1.2280	1.2297	1.2385
	0.5	3.004	0.931	0.933	0.934	0.7336	0.7328	0.7375
	1	1.780	0.946	0.955	0.950	0.5567	0.5564	0.5586
	1.5	1.245	0.944	0.949	0.948	0.5166	0.5172	0.5183
	2	0.923	0.940	0.940	0.947	0.4893	0.4892	0.4913
	2.5	0.709	0.943	0.936	0.946	0.4568	0.4569	0.4619
100	0.25	5.083	0.943	0.945	0.942	0.8728	0.8728	0.8767
	0.5	3.004	0.947	0.947	0.940	0.5220	0.5223	0.5234
	1	1.780	0.948	0.952	0.953	0.3950	0.3952	0.3963
	1.5	1.245	0.942	0.942	0.944	0.3697	0.3695	0.3701
	2	0.923	0.949	0.952	0.952	0.3523	0.3517	0.3530
	2.5	0.709	0.942	0.937	0.947	0.3283	0.3287	0.3306
500	0.25	5.083	0.938	0.940	0.939	0.3945	0.3949	0.3948
	0.5	3.004	0.967	0.966	0.965	0.2352	0.2352	0.2352
	1	1.780	0.944	0.948	0.944	0.1779	0.1777	0.1780
	1.5	1.245	0.947	0.946	0.949	0.1658	0.1658	0.1657
	2	0.923	0.937	0.930	0.938	0.1584	0.1587	0.1586

n	θ	κ	Coverage probability			Average length		
			PB	SB	BCa	PB	SB	BCa
	2.5	0.709	0.943	0.942	0.943	0.1485	0.1487	0.1488

5. Numerical Example

We used two real-world examples to demonstrate the applicability of the bootstrap methods for estimating confidence interval for the index of dispersion of the ZTPA distribution.

5.1 The Number of Unrest Events

The number of unrest events occurring in the southern border area of Thailand from July 2020 to October 2022 collected by the Southern Border Area News Summary was used for this example (the sample size was 28). The number of unrest events per month during this time period in the five southern provinces of Pattani, Yala, Narathiwat, Songkhla, and Satun is reported in Table 2. This study used the chi-square goodness-of-fit test for checking whether the sample data is likely to be from a specific theoretical distribution [26]. The chi-square statistic was 3.9112 and the p-value was 0.6887. Thus, a ZTPA distribution with $\hat{\theta}$=0.5707 is suitable for this dataset. The point estimator of the index of dispersion is 2.7261. Table 3 reported the 95% confidence intervals for the index of dispersion of the ZTPA distribution. The estimated parameter $\hat{\theta}$ is approximately 0.5. The results correspond with the simulation results for $n = 30$ because the average lengths of the PB and SB methods were shorter than those of the BCa method.

Table 2. The number of unrest events in the southern border area of Thailand

Number of unrest events	1	2	3	4	5	6	7	≥ 8
Observed frequency	3	1	3	2	4	3	4	8
Expected frequency	1.7775	2.4149	2.8174	2.9684	2.9084	2.6987	2.4008	10.0140

Table 3. The 95% confidence intervals and corresponding widths using all intervals for the index of dispersion in the unrest events example

Methods	Confidence intervals	Widths
PB	(2.2753, 3.1634)	0.8881
SB	(2.2754, 3.1770)	0.9016
BCa	(2.2862, 3.1999)	0.9137

5.2 Demographic Example

Table 4 shows the demographic data on the number of fertile mothers who have experienced at least one child death [27]. The total sample size is 135. For chi-square goodness-of-fit test, the chi-square statistic was 3.5737 and the p-value was 0.1675. Thus, a ZTPA distribution with $\hat{\theta}$ = 2.9563 is suitable for this dataset. The point estimator of the index of dispersion is 0.5720. The 95% confidence intervals for the index of dispersion of the ZTPA distribution are reported in Table 5. The results correspond with the simulation results for κ = 1.245 and n = 100 because the average lengths of the PB and SB methods were shorter than those of the BCa method.

Table 4. The number of fertile mothers who have experienced at least one child death

Number of child deaths	1	2	3	≥ 4
Observed frequency	89	25	11	10
Expected frequency	83.4756	32.3839	12.2451	6.8953

Table 5. The 95% confidence intervals and corresponding widths using all intervals for the index of dispersion in the demographic example

Methods	Confidence intervals	Widths
PB	(0.4279, 0.7125)	0.2846
SB	(0.4323, 0.7121)	0.2798
BCa	(0.4377, 0.7300)	0.2923

6. Conclusions and Discussion

Herein, we propose three bootstrap methods, namely PB, SB, and BCa, to estimate the confidence interval of the index of dispersion of the ZTPA distribution. When the sample sizes were 10 and 30, the coverage probabilities of all three were substantially lower than 0.95. When the sample size was large enough (i.e., $n \geq 50$), the coverage probabilities and average lengths using three bootstrap methods were not markedly different. According to our findings, the PB and SB methods provided the shortest average length for small sample sizes and parameter settings tested in both the simulation study and using real data sets. Our findings provided the simulation results which are correspondent with the study of Jung et al. [28]. They compared three bootstrap confidence intervals for generalized structured component analysis (GSCA) using a Monte Carlo Simulation. They found that the PB method produced confidence intervals closer to the desired level of coverage than the other methods. Future research could focus on the other approaches to compare with the bootstrap methods.

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What is Environmental Corporate Social Responsibility (ECSR) and why is it important?

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Abstract

Nowadays there is a growing concern about climate change and global warming. As a response to solving this challenging issue in the industrial sector, the concept of Environmental corporate social responsibility (ECSR) has increasingly gained significance in the corporate world. Implementation of ECSR activities aims to address the threat of climate change by reducing the negative impact on the environment from business operation processes. ECSR is one dimension of corporate social responsibility (CSR), related to corporate governance, sustainability, and performance having aims to reduce the hazardous impact on the environment in an organization's production process to achieve long-term environmental well-being. This article has the objective to answer these two questions: 1. What is environmental corporate social responsibility (ECSR); and 2. Why ECSR is important? The article used state-of-the-art literature review methods, relevant to the stated objective, and searched by typing keywords such as, "Environmental Corporate Social Responsibility" and "Importance of Environmental Corporate Social Responsibility" from relevant search engines available online. The result found ECSR to be a multi-dimensional concept as it is related to corporate governance, and sustainability, and helps to increase the substantial capacity of a company's competitiveness and performance. ECSR has gained importance increasingly among scholars, policymakers, and practitioners as the implementation of ECSR activities successfully leads to sustainable development. The article concluded that the adoption of ECSR in corporate management is very essential as a strategy to solve environmental problems while strengthening a green ecology for the overall well-being of the economy and society.

Keywords: environmental corporate social responsibility (ECSR); corporate social responsibility (CSR); corporate management; environmental well-being; sustainable development

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1. Introduction

In the last few decades corporate social responsibility (CSR) has been gaining popularity and is widespread among industrial experts and researchers because CSR improves a company's image and performance[1]. This is because most industrial companies caused an environmental impact in the form of climate change, global warming, changes in seasons, air pollution, unpredictable weather, and rainfall, which affects the well-being of people, animals, as well as all living beings. To minimize this environmental impact, business management experts create and promote the program CSR, which will help to transform into a green manufacturing company [2]. So CSR can be defined as a concept used for business management in which a company is responsible for the impact of the manufacturing process on the people living in the community, both socially and environmentally [3]. CSR has been defined in many ways in the literature [4]. Corporate social responsibility (CSR) refers to a company's ethical and sustainable operation toward societal members [5]. This implies that companies should consider ethical and environmental concerns of the community in its industrial operation even though it is not a legal requirement [6]. It is commonly seen that businesses create new jobs and increase wealth. However, daily industrial operation emits lots of carbon dioxide into the atmosphere if the company operates recklessly and does not take responsibility, resulting in a threat to society and the environment [7]. So, it is important for a business company to follow business ethics and adopts strategies of CSR for socio-economic development with environmental sustainability [8]. Adoption of CSR a is important specifically since it helps to increase sale volume as customers have preference to buy products from the company that are socially and environmentally friendly. In brief, CSR consists of corporate activities with welfare consideration of stakeholders, community, and environment. There are many reasons for a company to engage in CSR activities as given below [9]:

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- CSR activities are requirements of responsible citizen.

- CSR activities aid employee's motivation, job security, and interest to continue working.

- CSR activities motivate customers to purchase goods and products from environmentally friendly companies.

- CSR activities are available to the company that have environmental concerns, result in lesser costs in logistics and resource usage.

- CSR activities are important feature of a company's risk management. In addition, the adoption of CSR brings lots of benefits to a company as follows [6]:

- Competitive advantage due to consideration of social and environmental factors.

- Lesser cost in production due to ethical considerations for sustainability, such as saving resources, using recycled products in packaging, etc.

- Enhance a better corporate image or brand to the public.

- Attract more customers.

- Provide education to employees regarding CSR activities, strategies, and responsibilities.

- Increased positive attitude to employees regarding personal and career development.

ECSR is one dimension of CSR for environmental protection to achieve long-term environmental well-being. It is the strategy adopted by a company to solve the deterioration of the environment caused by business organizations [10]. Adoption of ECSR is important in the corporate world because ECSR performs multi-dimensional activities, related to corporate governance, sustainability, and an increase in the substantial capacity of a company's competitiveness and performance due to its ability to add green business initiatives to CSR [11]. ECSR particularly focuses on the awareness of climate change and the organizational responsibilities to mitigate adverse environmental effects [12]. In other words, ECSR is a multi-dimensional concept, related to a company's corporate governance, sustainability, and performance, having aimed at reducing the hazardous impact on the environment in the process of an organization's production process. This article is prepared by using the state-of-the-art literature review method, relevant to the stated objectives. Literature for reviewing is searched by typing keywords, such as environmental corporate social responsibility and importance of environmental corporate social responsibility in relevant search engines available online.

This article aims to answer the following questions:

1. What is environmental corporate social responsibility (ECSR)?

2. Why ECSR is important?

2. What is environmental corporate social responsibility (ECSR)?

This article focuses on the environmental realm of corporate social responsibility abbreviated as "ECSR" or environmental CSR because there is a growing importance to lessen the impact of greenhouse gas emissions, global warming, climate change, and other environmental problems heightened by the industrial production process, and other reckless human behavior [13]. The concept of environmental CSR (ECSR) is a constituent of CSR, developed for effective sustainable business management with social and environmental concerns. So, ECSR can be termed as an important characteristic of CSR, which is developed by the integration of two paradigms of management, business, and environment, having care at the selection of sustainable equipment, raw materials, and products to minimize environmental deterioration [11]. ECSR has been defined by various scholars from various theories including stakeholder and organizational [14-15], local community CSR management [16], and social welfare[17].

There have been studies that show the positive relationship between ECSR and corporate brand competition of an organization that has the responsibility of environmental protection following CSR guidelines for achieving the target of a sustainable development framework [12]. Industrial operating companies that follow strategies of ECSR management can crucially reduce the hazardous effect on the environment due to industrial activities [18]. ECSR is an organization's activities that address sustainable development issues for environmental preservation, which include the reduction of CO2 emissions, conservation of natural resources, and promotion of using environmentally friendly products and services [1]. In other words, ECSR aims to enhance business performance while minimizing the side- effects of organizational activities on the environment. ECSR is defined as activities, which need collaboration with stakeholders for systematic implementation and it is aimed at environmental protection for community well-being [19]. ECSR is a company's awareness of its responsibility to operate ethically without negatively affecting society and the environment in which we live. It is the integration of environmental concern in business activities with aims to bring sustainable development and environmental protection, and has been defined based on a literature review from three views [20]:

1. Action-based ECSR: Environmental activities adopted by a company

2. Process-based ECSR: Protection of the natural environment from the impact of business process activities

3. Product-based ECSR: Ways that a company provides environmentally friendly goods and services.

For creating a sustainable world and environment, ECSR includes the following activities [21]:

• Activities to recycle waste products following the guidelines for general waste management, e.g., separating types of generated office waste into different types of bins with different labels as general waste, recyclable waste, or hazardous waste.

• Activities to lessen the amount of generated waste from daily business operations that are harmful to the environment. This includes imparting knowledge about the environmental benefits of saving resources to the employees [22].

• Activities to reduce the amount of energy and water consumed in daily industrial operations, e.g., creating awareness through education about the ways and benefits of less energy and water consumption in business operations. For example, limiting the time of energy and water usage, and selecting innovative devices that save energy and water consumption [23].

• Replace fossil fuel energy with renewable energy in business activities with the promotion and introduction of advantages of switching fossil fuel energy to renewable energy.

• Activities to reduce the amount of plastic consumption. Plastic waste takes long time to decompose. Single-use plastic, even though, is preferred on the ground of safety and health consideration generates massive volumes of plastic waste and increases loads for managing waste, particularly in countries that lack adequate and sophisticated facilities for waste management. These plastic wastes cause more problems to the environment if they are dumped and burned in the open space, which emits hazardous gases and chemicals into the environment. So, efficient plastic waste management activities are essential for solving the environmental problem [24]. The 3Rs strategies, that is, reduction, recycling, and recovery need to be adopted in order to use plastic beneficially for human needs without polluting the environment. This can be implemented by imparting environmental lessons or awareness to consumers regarding the usage and disposal of plastic waste along with innovation to preserve a sustainable environment [25].

• Green innovation activities to reduce GHG emissions in business operations. This includes switching to a sustainable mode of travel and transportation, e.g., walking or cycling for short distance travel, using public transportation for long distance travel, and replacing conventional logistics with green logistics for business cargo transportation [26], changing the form of business meetings, seminars, workshops, and conferences to virtual or online mode, along with a selection of a certified eco-friendly, green hotel or avenue for conference or seminar. As GHG emissions cause environmental air pollution with the presence of Particulate Matter (PM) in the atmosphere, which shortens the life span of the global population, it is therefore important to implement ECSR activities to minimize such impact from industrial operation process, use of fossil fuel energy, and use of vehicles for travel and transportations.

Implementation of ECSR is important for sustainable development as it aims to offset climate change problems by adopting measures to lessen the impact on the environment. So, ECSR is defined as an action program, adopted by a company to minimize the impact of industrial activities

3. Environmental CSR and its importance

Nowadays there is a growing concern about climate change and global warming and as a response to solving this challenging issue in the industrial sector. the concept of ECSR and implementation of ECSR activities has increasingly gained significance in the corporate world. ECSR aims to address the threat of climate change by reducing the negative impact on the environment from the business operation process. Consequently, there has been growing attention to the concept of ECSR among academicians, practitioners, and policymakers as the implementation of ECSR management strategy, a driver of environmentally friendly behavior, can lead to sustainable development [14]. Wu et al. [27] pointed out two dimensions of ECSR, viz., strength (less energy and resource usage, reduction of waste, increasing green products and strategies to control pollution by a firm) and concern (strategies of industrial waste disposal and reduction of environmental polluting source). Many organizations follow ECSR processes and practices to promote pro-environmental behavior among office staff [28] and are increasingly implementing environmentally responsible behavior as it is associated with corporate performance, financial performance, and environmental well-being [29]. ECSR has gained importance recently among academicians and policymakers as it is a factor for sustainable development. Implementation of ECSR can significantly guide an organization in encouraging employees' environmentally friendly behavior [30] by following green philosophy with the objective of a collaborative improvement of society, the economy, and the environment [14]. The following gives the discussion of the growing importance of ECSR gathered from the review of the literature:

Makhdoom et al. [1] investigated the role of various kinds of collaboration between a business supplier, customers, and government offices in studying the role of ECSR and company performance. The result of the study contributed insights into understanding the impact of ECSR on company's performance, which is considered relevant to policymakers and practitioners for the development of sustainable industries in terms of cost reduction, revenue achievement, and reputation improvement for creating a better business brand image. This finding has been supported by another study that reported the positive relationship between ECSR and company performance as adoption of ECSR can

save production cost, through efficient resource usage, and revenue accumulation by developing products and services to increase brand image and reputation. Also, since both consumers and producers have a high interest in being socially responsible, they are likely to favor environmentally responsible firms [31].

CSR has been classified into 4 types of responsibilities: environmental, ethical, philanthropic, and economic. ECSR refers to an organization's commitment to sustainability and environmentally friendly practices at every stage of business operations. Its growing importance can be seen as companies of all sizes and industries are prioritizing sustainable practices to lessen the impact on the environment [32].

Yin et al. [20] studied the linkage between ECSR and the pro-environmental behavior of an employee. The specific aim of the study was to minimize the outcome of industrial operation activities on the environment. The study refers to ECSR as environmentally friendly activities adopted by a company, e.g., reusing, recycling, selecting eco-friendly products for packaging, waste reduction, energy saving, and water conservation to lessen the environmental impact of business activities. The research result confirmed the positivity of ECSR implementation as the promotion of employees' environmental citizenship is the factor for the success of ECSR employees' environmental citizenship behavior.

Alam and Islam [33] attempted to study the combined role of ECSR, GCA (Green Competitive Advantage), and GCI (Green Corporate Image) in business corporations for achieving organizational sustainable competition. This study contributed to a better understanding of the strategic benefits for sustainable competitive advantages, resulting from an integrated green concept in a company's's CSR activities, such as resource efficiency, market-sales enhancement, and corporate image branding.

Implementation of ECSR is important as a management tool for environmental management due to the following reasons [34]:

- Increase a company's reputation for using ecological criteria in the production process;

- Create eco-innovation for the long-term sustainable development of a company;

- Promote new energy sources, including renewable energy, that emits low or zero-carbon;

- Encourage the adoption of environmental measures to reduce greenhouse gas emissions; and

- Increase awareness among staff, associated market partners, and the general public of environmental protection through knowledge transfer to increase environmental performance.

Rela et al. [19] emphasized ECSR's influence on the perception of environmental well-being, in terms of food production, water use, sanitation, climate change, etc. ECSR activities have an influence on improving environmental well-being since business organizations adopt countermeasures to solve negative environmental impact. The environmentally friendly measures includes the usage of renewable energy, reduction of CO2 emissions, and recycling of waste products to increase the performance of a firm as being sustainable and improve the well-being of the community.

Zelazna et al. [35] showed that many companies increasingly realized the environmental impact of business activities and considered adopting responsible behavior to preserve the resource of the environment. As a result, many companies search for solutions to reduce the environmental impact of business activity at all stages of the manufacturing process. So ECSR is a concept for conducting business activities in strict compliance with the law, without lessening the profit, by voluntarily taking into consideration approaches to reduce the environmental impacts of business operations while aspiring to achieve the target of sustainable development for a better world. Table 1 below provides a summary results from the review of literature according to the article's objectives.

4. Case study analysis of implementing ECSR

Wolniak et al. [47] analyzed the benefits of implementing ECSR activities through a case study in a Poland–based company in Koszalin City from 2017-2020. The result demonstrated that the company has been deeply committed to ECSR issues, including its performance in environmental management, that is, based on sustainable development policy so as to achieve perpetual organizational growth while having concern and care for the natural environment. The implementation of ISO 140001 and ECSR strategy in the company resulted in many benefits for creating a sustainable environment. Due to this contribution, many firms are implementing proactive environmental social responsibility approach, that is, ECSR strategy, which leads to ecological innovation with aims to lessen the negative impact of business activities on the environment and to support continuous environmental sustainability.

Some benefits include providing ECSR steps to achieve sustainable development with environmental protection as given below:

- Save energy and water resource consumption;

- Reduce and manage waste to be safe to the environment through waste sorting, storing, dumping, recycling, etc.;

- Reduce air pollution by implementing innovative and environmentally friendly solutions;

- Establish a company board to maintain and review the environmental policy, goals, and implementation;

- Improve personal commitment of staff to implement and achieve the defined environmental development goals;

- Minimize CO2 emissions;

Table 2. Environmental Corporate Social Responsibility (ECSR) and its importance

Definition/Importance	Objectives/Results
- ECSR is an organization's actions relating to environmental issues for sustainable development [1]. - ECSR is a company's attempt aimed at integrating environmental care into the business process and with stakeholders' interactions [10]. - ECSR is important as it promotes sustained SMEs in both innovative and non-innovative firms [37]. - ECSR is a multi-dimensional concept, that has a close relationship to corporate sustainable business performance management [33]. - ECSR fosters corporate business sustainability, social, economic, and well-being of the community environmentally [19]. - ECSR is a firm's obligation for environmental protection, with strength and concern as working dimensions of corporate environmental responsibility (CER) [27]. - ECSR is an extension of the CSR concept, where the main reference is environmental protection [34]. - ECSR refers to a company's contribution to result to the development of the economy, society, and community by being environmentally responsible [38]. - ECSR is having consideration of social and environmental in the distribution and working process of a business organization along with facilitation of stakeholders' participation [39]. - Incorporating ECSR strategies in organization management is considered an effective tool for achieving sustainable performance [40]. - ECSR deals with a company's eco-activities, and the reduction of negative impacts environmentally by being responsible in governance, credibility, and care of the environment [12]. - Implementation of ECSR is important as it increases a company's prestige and lucrativity [43]. - ECSR is the integration of environmental concerns in the working process of business organizations without affecting the economic output [44]. - Defined as the environmental care responsibility the corporations take to minimize the hazard of industrial activities, for example, the creation of a green work environment and valuing sustainable development [5]. - ECSR is a company's working system having the objective of reducing negative environmental impact from business operations by adopting green activities that have abilities to save energy, water, raw materials, and air while increasing productivity [45].	- Confirm a positive relationship between business performance and ECSR [1]. - Adoption of ECSR practices saves production costs, develops innovative products and services, and increases a firm's brand image [36]. - Identify the positive impact of ECSR on consumers' allegiance to a firm [10]. - Use techonlogical resources and investigate the contribution of ECSR to increase SMEs' (small and medium-sized enterprises) systems and product innovativeness [37]. - Investigate relationships of 3 concepts' (ECSR, GCI, and GCA) of a firm. The result showed the important function of ECSR in bridging the other two in the green business world [33]. - Explore the impact of ECSR strategies on employees' behavior toward the environment. The result confirmed the positive relationship [20]. - ECSR practices had resulted in an increase of community's EWB and sustainability [19]. - Reveal CER's impact on company's performance and innovation [27]. - Firms that implemented ECSR have a significant impact on the role and attitude of citizens toward environmental issues that resulted in stable development, business success, reputation, ethical behavior, and quality of life [34]. - Study the relationship between CSR, green innovation, environmental strategy, and performance. The results showed that CSR contributed to the adoption of an innovative green strategy for improving environmental performance [41]. - Study the relationship between CSR practices and sustainable development and also environmentally sustainable development with green innovation [42]. - Investigate the role of an airline's ECSR in bridging customer's allegiance supported by factors such as brand prestige, affection and appreciation, and environmental preservation [38]. - Investigate the linkage of ECSR and pro-environmental behaviors through the moderating act of empathy. The result confirmed positive [39]. - Examine the framework for the adoption of CSR activities, green practices, and the effect on employees' pro-environmental behavior [40]. - Propose to study ECSR with the corporate philosophy, output, and equipment used on the environment to minimize resource usage and generated waste [12]. - Examine the impact of ECSR on customers' enduring allegiance towards a company [44]. - Investigate ECSR's influence on corporate prestige and in increasing profit. The result confirmed positive [43]. - Investigate the positive impact of ECSR on corporate financial performance [45]. - Examine role, relevance, motives, and pressures to adopt ECSR practices in business companies [46].

- Improve technical parameters of atmospheric emissions such as time and temperature of combustion, height of emission source, travel of combustion gases; reduce consumption of energy; and lower emissions of air pollutants and volume of waste; and

- Improve all the processes connected with environmental management.

Similarly, Hidayati [48] analyzed the pattern of CSR management in four Indonesian companies by focusing on three main areas: 1. relation of a company's CSR programs and core businesses; 2. programs on the economic, social, and environmental dimensions; and 3. the implementation of CSR programs for the company's competitive advantage and sustainable development. The result indicated high commitment from the four companies in the implementation of CSR programs and business ethics. The result of the study also revealed a comprehensive account of CSR practices of companies in Indonesia, based on the companies' characteristics, CSR programs' relations to the core business; CSR programs covering the economic, social, and environmental dimensions; and the sustainability of the CSR programs. The study contributed to CSR concepts, theories, business ethics, and sustainable development. In this study, sustainable development includes three domains, that is, economy, society, and the environment. The environmental aspect of CSR in this study, such as of Astra Cooperative Company, included the adoption of green strategy, green process, green product, and green employee.

5. Conclusions

From the above analysis of literature, it can be stated that ECSR has been defined in many ways by many scholars. It is a management concept whereby a company integrates environmental concerns in daily business activities, by operating in a sustainable to bring sustainable development. ECSR practices increase corporate prestige, customer's enduring allegiance, profitability, competitiveness, financial performance, green innovation, and sustainable development with environmental preservation. Any organization that has the responsibility for environmental protection is considered to be following environmental CSR, which provides a strategic guideline for an organization to achieve sustainable development goals. So, it is a multi-dimensional concept because it is related to corporate governance and sustainability, and helps to increase the substantial capacity of a company's competitiveness and performance. ECSR has gained importance increasingly among scholars, academicians, policymakers, and practitioners in recent decades as the implementation of ECSR activities successfully will lead to sustainable development. Also implementation of ECSR can significantly aid employees' green vision and pro-environmental behavior. A company needs to implement ECSR as it can help to minimize cost in production, while improving corporate brand image and prestige, thus helping to achieve a better performance in all corporate variables such as management, competitiveness, reputation, innovation, profitability, consumer loyalty, sustainable development, and environmental sustainability. Finally, it can be concluded that the adoption of ECSR in corporate management is very essential as a strategy to solve the environmental problem while strengthening a green ecology for the overall well-being of the economy and society. However, it is important to note that the ECSR activities of a firm require systematic commitments and periodic assessment with stakeholders' collaboration for the successful implementation of sustainable business strategies.

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Abbreviations

CER	Corporate environmental responsibility
CSR	Corporate social responsibility
ECSR	Environmental corporate social responsibility
EWB	Environmental well-being
GCA	Green competitive advantage
GCI	Green corporate image
GHGs	Greenhouse gases
SMEs	Small and medium enterprises
3Rs	Reduction, recycling, and recovery

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Interdisciplinary Research Review
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"Beyond Four Walls": Qualities of Criminal Justice Professors from the Students' Perspective

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Abstract

This study aims to explore the qualities that make a good criminal justice educator and what contributes to their likability of students, with seven participants responding to a rigorously validated set of open-ended questions to address the predetermined research questions. Regarding the perspectives on the qualities of good criminal justice educators, the participants identified that beyond transmitting information, essential qualities of criminal justice professors include an ability to value students' emotional and learning needs, portray professionalism, competence, and responsibility for their welfare, as well as advocate for their personal and professional development. Additionally, a professor likability of students is significantly influenced by their ability to relate on a personal level, present material in an interesting manner, communicate effectively, and manage students. Moreover, factors such as using humor, providing real-world examples, being receptive to students, understanding their problems, and inspiring personal growth are all contributing to increasing a professor's likability.

Keywords: quality educators, students' perspective, valuable professors

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1. Introduction

Teachers, educators and professors are integral to education and learning experiences, with teachers and educators encompassing a wide range of professionals involved in teaching and facilitating learning across different educational settings, while professors specifically denote experts in higher education who engage in teaching, research, and scholarly pursuits within academic institutions.

The provision of quality education is one of the primary ways through which teachers, educators and professors can help students succeed academically. Research has found consensus among researchers exists regarding the significant role they played in shaping students' academic success and future life outcomes within the school setting [1][2][3]. However, there was a major issue in deciding the exact teaching traits that characterize an effective educators and professors [4]. This problem presents a significant barrier for academics attempting to identify the components that contribute to teacher effectiveness and their impact on student performance [5]. Yet, research suggests that there were qualities that educators or professors must have as, such as being role models [6], excellent character [7], mentoring and coaching effectiveness, inspiring leadership, and being expert professor [8][9]. Meanwhile, educators' unique blend of character [10], professionalism [11], pedagogy [12][1], and technical and innovative qualities [13] can contribute to the success of graduates [14][4]. Moreover, the pedagogical approach of professors involves extending the teaching and learning experience beyond the conventional classroom environment by integrating real-world scenarios and a variety of resources to establish genuine and captivating educational prospects. The approach promotes engagement, hands-on education, and engagement with the global community to cultivate comprehensive growth and significant utilization of knowledge and competencies.

The professors' dedication to creating such an educational environment can be instrumental in enabling students to succeed in their academic pursuits in higher education [15][16][17]. The primary responsibility of a professor is to establish a conducive classroom atmosphere that fosters the reciprocal process of teaching and learning, thereby motivating students to acquire knowledge accurately and authentically [18]. As a result, the ability of professors to engage in effective teaching and learning exchanges is required [7]. However, it was not always the case that these qualities positively impacted the professors' perceived qualities by the students. For example, it was found that professors who make harder courses tend to get lower ratings than those who make more accessible classes. However, ratings are subjective regarding the school's qual-

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ity and the student's intellectual ability [19].

Furthermore, professors' likability has been subjected to researchers in the past. It has to do with how much of an impact of students' opinions on their professors have on their performance in class. Factors such as a professor's personality, rapport, enthusiasm, fairness, helpfulness, and knowledge can affect how well they are liked in the classroom [20][21][22][1]. Moreover, the students took into account various factors such as gender, physical appearance, and academic discipline when assessing the level of likability of their professors [20]. With the evolution of teaching, professors who are adept at using technology have garnered positive student feedback, while those who are digital immigrants may experience a disconnect with students. [23][24][25][26][27].

With the evolution of teaching, there has been a notable distinction in student feedback between technology-savvy professors who effectively utilize digital tools and those who are digital immigrants, as the latter may experience a disconnect with students due to their limited familiarity and proficiency in technology. [28][29]. However, the professors involved in criminal justice education programs have frequently faced disapproval for exhibiting an excessive focus on their own perspectives, leading to surface-level comprehension and constrained aptitude for critical thinking among their students [23][24][32]. Moreover, an onsite visit, such as students merely observing inmates or other individuals involved in the criminal justice system, is deemed a negative learning experience [33]. Addressing these challenges in delivering optimal learning experiences can be addressed using learners-centered practices [29]. The findings of a research conducted among criminal justice students in Massachusetts have indicated that the combination of conventional pedagogical methods with adult-learning settings can result in the most favorable outcomes with respect to the students' competency levels [34]. The current trend in education is to prioritize learner-centeredness with the objective of enabling students in the criminal justice discipline to engage in more profound and significant learning experiences [35][36][37]. The integration of new technology in the instruction of criminal justice students also has a profound effect on their educational experience and academic achievement [38][39], specifically those that can invoke the emotional state of students during the learning process[40][41] and to date, there has been a dearth of further inquiry regarding the composition of these orientations concerning professors-centered approaches [37].

Although limited in number, some studies have explored the instructional approaches or perspectives employed by professors in criminal justice education institutions[37][42][43][44][45]. Previous studies on this subject have predominantly utilized techniques such as questionnaires and standardized assessments, which are insufficient in comprehensively capturing the range of attributes that constitute an effective educator. The extant research and scholarly works pertaining to the characteristics and prevalence of criminal justice professors may face certain possible constraints. The multifaceted nature of the gaps in the literature regarding effective teaching in higher education is evident. These gaps include the absence of a consensus among scholars regarding the precise attributes that constitute an effective professor, the inadequacy of conventional assessment techniques to capture a comprehensive range of qualities, the susceptibility of student evaluations to subjective influences, the dynamic nature of the teaching landscape with the incorporation of technology, and the limited exploration of qualitative research methods in this particular domain. The act of bridging these gaps holds significant importance in fostering an in-depth understanding of the attributes and likeability of professors, thereby facilitating advancements in educational methodologies and achievements within the realm of criminal justice education.

This study sought to address the gaps by utilizing a qualitative research approach to explore the qualities of professors in the field of criminal justice education, which had not yet been thoroughly explored. This study is novel because it focuses on an area of criminal justice education that has not been extensively investigated using qualitative methods. This research can provide valuable insights on how to improve the quality of educators in the field of criminal justice by examining the unique characteristics of a successful professor of criminal justice. Specifically, the objectives of the study are to investigate the characteristics of an effective criminal justice professors and the determine the factors that contribute to their likability among their students.

2. Methods

This qualitative case study utilized Yin's methodology [46] and in-depth interviews to explore the perceptions of criminal justice education students regarding their professors at J.H. Cerilles State College, a government-funded college in the Philippines. The main focus of the study was to investigate the qualities that professors possess and examine how these qualities impact students' learning outcomes in criminal justice education. By adopting this approach, the study aimed to gain a comprehensive and insightful understanding of students' perspectives on their professors and identify critical factors contributing to effective teaching and learning in this discipline. Furthermore, we hypothesize based on the presented gaps and research question for the study and utilized this qualitative hypothesis to develop the themes. First, criminal justice professors who demonstrate a genuine concern for their students' emotional well-being and

academic success are more likely to be perceived as good educators by students. Secondly, criminal justice professors who effectively incorporate humor and engaging communication techniques in their teaching approach are more potential to be liked by students.

Conducting research during the Covid-19 pandemic posed challenges for us regarding participant recruitment. To overcome this obstacle, we employed a convenience sampling methodology in selecting participants who were easily accessible and willing to participate in the study. However, the criteria for selecting the participants was set based on the two years stayed in criminal justice programs, and at least 3rd year college students at the time of the interview. Before data collection, we established a set of protocols that included validating interview guide questions by a panel of jurors, obtaining necessary approvals from school authorities, and ensuring adherence to rigorous qualitative research standards [47][48]. By following these protocols, we aimed to confirm the validity and reliability of the study's findings [49].

Implementing applicable ethical principles to safeguard human subjects is crucial to all research endeavors. Ethical considerations were given due importance throughout the study, following the guidelines suggested by Mohd Arifin [50]. Ethical considerations ensure that participants' rights, welfare, and dignity are upheld and respected throughout the research process. The ethical principles of informed consent, confidentiality, minimizing risks, and promoting beneficence and honesty were ensured by adhering to these principles. These further ensure the integrity and credibility of the research process applied in this study.

The period of data collection extended from January through February of 2022. Although the study involved face-to-face interviews, we adhered to safety protocols during the COVID-19 pandemic to ensure the well-being of both the participants and the researchers. During the data collection phase, participants in the study underwent in-depth interviews. These interviews were conducted in a way that allowed for detailed exploration of their perspectives and experiences related to the qualities of good educators in the field of criminal justice. To ensure accuracy and precision in capturing the data, voice recording technology was utilized to record the interviews. This approach allowed for reliable and verbatim documentation of the participants' responses and insights. By recording the interviews, the researchers aimed to maintain the integrity of the data and ensure that no valuable information or nuances were missed during the analysis phase. The interviews were transcribed verbatim to preserve the authenticity of the participants' responses. We opted to terminate the interviews upon reaching data saturation [51][52] at the seventh participant, signifying that adequate data had been collected to tackle the research inquiries.

The collected data underwent a rigorous analysis process to derive meaningful insights. The analysis followed a procedure outlined by Rashid and colleagues [49] which involved several key steps. Initially, the data was subjected to initial coding, wherein sub-concepts and themes were identified and labeled, looking for patterns and relationships within the data that address the research questions. After, we interpreted the analyzed data to draw meaningful conclusions and insights. We related the findings back to the research questions and objectives and discussed their implications and contributions to the existing knowledge in the field of criminal justice education. To proficiently convey the results of this particular investigation, we have devised a thorough and organized document encompassing the study's discoveries, approach, evaluation, and elucidation. Our process involved utilizing precise and succinct terminology while presenting corroborating proof obtained from the gathered information. Moreover, the accuracy and credibility of the research findings were improved by validation through member checking and review by the participants and members of the researcher committee. Lastly, to enhance the veracity and dependability of our analysis, we utilized the triangulation method. The process entailed meticulously comparing the interview data with field notes and pertinent documents to authenticate and corroborate the ascertained categories and themes. The utilization of diverse data sources was implemented to establish a firm evidence foundation and enhance the conclusions' overall credibility. We also tried to explore the generalization of our findings for the practice of teaching and the academic profession.

sectionResults and Discussion

The majority of the students were quite aware of the good qualities of criminal justice professors, which qualities make a good criminal justice professor, and what factors contributed to criminal justice professor likability among the students. The emerging themes that were derived from the informants' statements during the interview were classified into seven attributes, as reflected in Table 1. The professors demonstrated these attributes in their dealings with their students.

Theme 1: Qualities of a good criminal justice professor

This emergent emphasize the significance of criminal justice professors valuing students' emotional and academic needs, as well as exhibiting qualities such as compassion and empathy. Criminal justice professors who prioritize students' emotional and academic needs, demonstrate compassion and empathy, and actively advocate for their personal and professional development are perceived as good educators by students in the field of criminal justice.

Valuing students' emotional and learning needs beyond the four walls

Criminal justice professors who demonstrate an understanding and consideration of their students' emo-

Table 2. Effectiveness of the online lessons on English sound system and pronunciation of the sample group

Emergent themes	Cluster themes/Sub-themes
Qualities of a good criminal justice professor	-Valuing students' emotional and academic needs beyond four walls -Professionalism, competence, and responsible for the welfare of their students students -An image of respect, compassion, motivation, and empathy -Advocating personal and professional development of their students
Likable qualities among the students	-Personal concerns toward students -Knowledge of how to deliver the subject matter in humorous ways -The ability to communicate well and handle clients

tional and learning needs beyond the classroom setting will contribute to a positive and conducive learning environment. Developing students' emotional and psychological well-being is crucial to their academic success, indicating that education is about more than just imparting knowledge. Criminal justice educators who take into account their students' social and emotional needs outside of the classroom are more likely to foster an atmosphere that is conducive to student growth and development. That's because when students feel like they belong, they relax and focus on their studies. The qualities of a good professor that students admired are their way of valuing students beyond the classroom setting. Professors who prioritize student growth know that academic success depends on more than just acquiring knowledge and skills. Students perceive professor's capacity to address their students' emotional needs in addition to their intellectual ones as a desirable quality. Professors have the intrinsic ability to advise and direct students through the challenges of life. Many of the participants considered one of the most important qualities of a professor is having the ability to connect with their students on a personal level. The participants stated that;

"They are very approachable, and they are not only an instructor, but they can be your guardian, you can approach them personally even your problem they can help you that." (Participant 1)

"Our professors were concerned about us not only when we performed low in the class and with the absences of other students but also with our wellbeing outside the class." (Participant 4)

"As I rate their qualities in handling students' concern, I rate them A+ because all instructor I encounter is very approachable and they know how to help the student with their concern." (Participant 3)

"The criminology instructors are all experts and their all knowledgeable. The criminology instructors interact with their students and is very approachable, in time during you need help they are there to help and they help you with your problem, any kind of your problem they will help." (Participant 5)

"Being knowledgeable and respect itself so that they can respect all and good in socializing. The qualities of instructor in handling students' concerns are approachable, willing to listen to student problems and best of in giving of advises." (Participant 7)

Having an image that portrays professionalism, competence, and responsibility for the welfare of their students

A professional, competent, and responsible educator image is crucial to developing a successful learning environment. A teacher who is well-groomed, calm, and collected projects an image of professionalism to their students. In every educational institution, cultivating an atmosphere that exudes professionalism, expertise, and responsibility on the part of the educator is crucial to the development of a productive learning environment. Professors are the students' models in life, and they play a significant part in guiding their students' intellectual, social, and emotional growth. Students look up to their teachers as role models. For this reason, professors must present their students with an image that is positive and professional.

A well-groomed appearance is an essential component in a professional light. Criminal justice professors were seen to have always worn the proper attire and were always keep a clean and nice appearance. It is easier to leave a favorable impression on the minds of one's students when one professionally presents themselves, maintains good personal hygiene, and dresses in clothes that are nice and tidy. Students are given the impression that their teacher takes their job seriously and is committed to their line of work when the teacher dresses in a manner that is appropriate for their career. A competent instructor should not only be well groomed in the eyes of their students but also calm and cool throughout the entire class. Criminal justice professors who can maintain their composure in the face of difficult circumstances contribute to the creation of a pleasant and supportive learning environment. A teacher who maintains composure and demonstrates healthy behavior is one whose students are more likely to want to emulate.

Responsibility is another essential component of presenting a professional image to the outside world.

Criminal justice professors have to take responsibility for their students' health and academic development, as well as the acts and choices they take on their behalf. A responsible teacher who can communicate clearly with their pupils and the parents of those students, is well-organized and arrives on time, and keeps the commitments they make, is seen having valuable attributes. Additionally, a responsible educator exhibits a dedication to continued professional development and is continually looking for new methods to improve their teaching abilities. The participants contended that;

"In my opinion, I can view the criminology instructors that they are very competent and they build the student in their way." (Participant 2)

"The opinion as a criminology student I view the criminology instructor as a very active instructor, especially in academic performance. They teach us very well; Criminology instructors interact with students by giving reports, and oral recitations. They show us reaches and students interaction." (Participant 6)

"The qualities that are beneficial in classroom instruction possessed by criminology instructor are nothing late, use a proper haircut and proper uniform or complete uniform then wear an ID." (Participant 3)

"Through giving us the appropriate knowledge about the discussion, sharing their experiences." (Participant 4)

"Criminology instructor presents him/herself to students have a standard like when you are in class they show that they are high to student and respect them." (Participant 6)

An image of respect, compassion, motivation, and empathy

These themes showed how the participants responded to the questions about the views of students about the criminal justice professors through how they showed their image to the student as a mentor. A criminal justice professor who is respectful, inspiring, and likable may be pictured as someone who is warm and welcoming but also professional and well-versed in their field. They could be someone who takes an interest in what you have to say, invites you to ask questions, and offers insightful criticism. Professors who value the student's opinions, experiences, and ideas can demonstrate respect for their students. Furthermore, the welcoming and secure setting in which the student would feel at ease expressing themselves, making requests for assistance, and taking chances to further their academic endeavors. Professors who are easy to talk to and get along with, have a good sense of humor, and show real concern for their students are considered possess good attributes. Someone who cultivates a pleasant and supportive relationship with their students, assisting them in achieving their goals and becoming the greatest version of themselves, is a respectable, inspiring, and likable educator. Lastly, criminal justice professors are approachable, allowing them to quickly build strong, trusting relationships with their students. The participant shared that;

"Being a good instructor should be knowledgeable and approachable, so it helped them to improve their learning." (Participant 1)

"For me, the criminology instructors are knowledgeable enough, competent, and responsible. They interact with students like that they should show to students that they are respectable and presentable enough." (Participant 2)

"They are people who are giving the students a bright future. They interact using showing the personality of being approachable. A respectable, a friendly one, and a person who is kind." (Participant 3)

"Criminology instructors present him/herself to students through teaching us the students with all their passion of teaching. The criminology Instructors are very patient to their students and hardworking in terms of teaching. They are giving feedback on their students' performance." (Participant 4)

"They are knowledgeable enough to their field of teaching, very approachable, very sensitive to their student." (Participant 5)

"Knowledgeable, approachable, knows how to understand every student struggle. They are willing to understand every student struggle. Through giving us the appropriate knowledge about the discussion, sharing their experiences." (Participant 6)

"Being knowledgeable and respect itself so that they can respect all and good in socializing. The qualities of an instructor in handling students' concerns are approachable, willing to listen to student problem and best of in giving of advised." (Participant 7)

Advocating personal and professional development of the students

In the criminal justice education practice, professors who provided opportunities to their respective students to learn and explore in a supportive environment were positively viewed as advocates for students' development. This shows that participants place a high value on professors who can create a learning environment that is both helpful and inter-

esting, and in which students may grow and be successful. Students have the potential to develop both personally and academically with the help of professors who are dedicated to their roles as educators and who are experts in the disciplines in which they teach. These professors performed their duties by offering advice that would help them achieve their goals. In addition, criminal justice educators who are skilled in interpersonal communication are better able to connect with their students, contributing to the development of a constructive and encouraging educational setting that is conducive to both student advancement and achievement. This theme emerged from the responses of participants.

"The qualities of the instructor should be good to understand and work well with people the decides of teach between the subject the motivation, creativity, empathy, and meditation skills." (Participants 1)

"I can say that they have good qualities since they help us to grow personally and academically." (Participant 2)

"For me the qualities that need to be good instructors are responsible, and full knowledge about the criminology courses." (Participant 3)

"Our instructors help us to meet compliance of the subject by providing guidance and help develop our academic standing through their advice." (Participant 5)

"Hard working instructors and very passionate in terms of teaching and aiming for our improvement." (Participants 6)

Theme 2: Likability of Mentors This theme highlighted the significance of having the ability of criminal justice professors to establish strong personal connections with students and provide guidance and support were the reasons why students like their professors. Further, if criminal justice professors prioritize the holistic well-being of their students and embody these qualities, they are likely to be perceived as effective educators and advocates by their students. Moreover, fostering a positive learning environment can lead to students feeling valued, supported, and motivated to excel both academically and personally.

Personal concerns toward students

The idea of taking care of personal concerns for students draws attention to the significance of criminal justice professors being aware of and attentive to the unique challenges and needs of their students. According to the opinions made by the participants, having professors who take the time to listen and provide them with assistance and direction can have a beneficial effect on how well students get along with those professors. Students value and like professors who are approachable and eager to listen when they have questions or concerns about a topic being covered in class. It is possible to foster a sense of trust and respect among students when professors demonstrate a real interest in the personal lives and well-being of their students, thus, making this characteristic contribute to the likability of professors among their students. As shared during the interview;

"I like professors who are easy to approach and get along with especially if we have concerns related to his subject." (Participant 1)

"One thing that I appreciate and like about our professors is their way of entertaining our concerns about the subject they taught." (Participant 2)

"Being good, they know to help the students when they need them." (Participant 3)

"They influence me most is when you have any concern they are willing to listen and to help." (Participant 4)

"They are good at socializing, they are willing to listen if need them, they did not ignore you, cause they are helpful in terms of your needs, grades or any other, etc." (Participant 5)

Knowledge of how to deliver the subject matter in humorous ways

The theme of knowledge on how to convey the subject matter in humorous ways emphasizes the significance of professors possessing not only the knowledge to teach their subject but also the ability to make the subject engaging and relevant to students. Through the use of humor and real-world examples, criminal justice professors can increase their likeability and create a more relaxed and pleasurable learning environment by simplifying difficult concepts into engaging lessons. This can result in an increased more favorable attitude toward the instructor and the course. The professors' likeability is further influenced by their ability to employ a variety of teaching methods, which contributes to the development of a learning atmosphere that is encouraging and welcoming to all students. The participants shared during the interview that;

"Being good, you can ask them for assessment, especially for the lesson which is difficult, you can approach them." (Participant 1)

"We like our professors because of how he delivers the subject matter. He can answer complex questions and make students understand difficult topics in simple ways. Sometimes they use jokes for us to understand." (Participant 2)

"Professors in the criminal justice were good at making the subject understandable by using attention-catching scenarios such as jokes and questions. This is why we like the way they handle classes." (Participant 3)

"Being knowledgeable, they are good at teaching, and if you have any question they find a way to answer you." (Participant 5)

"Our professors are using different styles of delivering the lesson some used life scenarios that make us laugh and get interested, we like instructors who are like that." (Participant 6)

"The reason that I like criminology instructors is they have enough knowledge to teach their learners related to their courses which is criminology." (Participant 7)

The ability to communicate well and handle clients

The criminal justice professors' ability to interact with clients or students significantly influences the participants' perceptions of their likability. They noted that instructors who demonstrate this trait are more likable because they are not only concerned with enhancing their students' knowledge but also with helping them become better people. The participants valued instructors who were receptive and understanding of their problems, as well as those who displayed a parental-like demeanor. Additionally, they mentioned that instructors who spoke well, displayed friendly expressions, and treated them honestly were more likable. The ability to effectively manage students and inspire them to become better people is a significant factor in determining the likeability of criminal justice professors.

"First reason that I like criminology instructors, is they are not only building us to have a better future but also they help the student to be better person." (Participant 1)

"I like criminology instructors because of their way of teaching and their open-minded about every student about their problem, they know how to understand the student's problem, etc." (Participant 2)

"I like our professors because they are like parents to us. They speak well and show us how to tackle difficult things." (Participant 3)

"One thing I like about our professor is when we approach him, he shows his smile and talks well to us." (Participant 4)

"I like our professors because of their truthfulness and handle us very well, especially when we approach them." (Participant 5)

"It is the attitude towards us how they deal with us which I think is why they are likable." (Participant 6)

3. Discussion

An effective and engaging learning experience for students in the field of criminal justice is contingent upon a confluence of key qualities that a professor must possess. First, having knowledge is essential. Professors who have a good grasp of the subject can explain difficult ideas in an easy-to-understand way. They keep up with the latest research and trends to make sure their teaching is current and applicable [53]. It is imperative to continually update the responsibilities of university professors in their capacities as counselors, facilitators, and researchers. This update should not only stem from their disciplinary expertise, but also from their pedagogical knowledge. By assuming a more educational role that transcends the subject matter, professors can contribute to enhancing the overall quality of education during academic practice[54]. The professor's knowledge helps them communicate well with students and teach them about the details of the criminal justice field. Just having knowledge is not sufficient to motivate students. Professors must be enthusiastic about their job, and this reflects in their teaching [55]. They are very enthusiastic and excited, which makes the learning environment lively and interesting. Criminal justice professors inspire students to explore and learn more about criminal justice by making the subject matter interesting. Having a passion for something makes students curious, interested in the subject, and encourages them to participate and learn more[56].

In addition, criminal justice professors accept the challenging aspect of their role to enhance students' growth and learning. Professors promote critical thinking by asking questions that make you think and showing real-life situations [57]. By challenging students to step out of their comfort zones, they encourage intellectual growth and aid in the development of analytical skills needed in the criminal justice field. This approach is challenging and helps students to use their knowledge in real-life situations, which will prepare them for the difficulties they may face in their future jobs. An excellent professors also values fairness and equality in their teaching practices [58][59]. They set clear expectations and grading standards to ensure fairness and consistency. Additionally, professors who welcome feedback from students understand the significance of continuous communication[60][61][62]. Being open enables them to deal with concerns and

make changes to enhance the learning experience. The professor creates a classroom environment that is fair, which helps students feel respected and trusted. This promotes a positive and inclusive atmosphere[63]. A good criminal justice professor should be knowledgeable, passionate, challenging, and fair. They should also support their students' academic and personal growth. Professors are always ready to assist students in achieving success by providing guidance and help whenever required. They are understanding and patient, which allows students to feel safe when seeking help, asking questions, or expressing their concerns. The professor helps students overcome challenges and achieve their full potential by offering support, mentorship, and resources. Being supportive helps to create good relationships and makes learning more enjoyable [64][65][66][67].

In addition, the warmth of criminal justice educators arises from their aptitude to forge connections with students and furnish assistance and direction. This is apparent through their conscientiousness towards the individualized needs of students and their readiness to lend an ear and provide support. Professors foster likability by exhibiting a sincere concern for the welfare and personal lives of their students, thereby establishing a foundation of trust and respect. In addition, the adeptness of instructors in imparting the course content through captivating and amusing means heightens their likeability to their student [68]. Professors establish a comfortable and pleasant learning atmosphere by utilizing teaching techniques that simplify intricate concepts, incorporate real-world illustrations, and integrate humor. This methodology cultivates a more positive disposition towards the educator and the curriculum, rendering them more likeable to the students[69]. The capacity of professors to communicate proficiently and manage students in a professional manner is an additional aspect that affects their likability. The significance of professors who exhibit a responsive, empathetic, and nurturing disposition is emphasized by the students. Professors' likability is enhanced by their capacity to effectively engage with students, attentively attend to their concerns, and demonstrate respectful conduct towards them. Furthermore, the students place a high degree of importance on professors who possessed effective communication skills, utilized friendly language, and exhibited integrity [70][71][72]. The capacity to proficiently administer students and motivate them towards personal growth is an additional factor that enhances the likeability of criminal justice professors. Lastly, in the realm of criminal justice education, the likability of professors is significantly influenced by the interrelated concepts of personal investment in students, the use of humor in knowledge dissemination, and the ability to communicate effectively.

4. Conclusion

The findings of the research analysis allow the study to determine the characteristics that are indicative of an effective educator in the field of criminal justice. These qualities include valuing students' emotional and learning needs beyond the four walls of the classroom, having an image that portrays professionalism, competence, and responsibility for the welfare of their students, having an image that portrays respect, compassion, motivation, and empathy, and advocating for the personal and professional development of the students. The attributes that students respect in a professor of criminal justice are varied and extend beyond the act of merely transmitting information to students. Professors who project a professional image that emanates competence and accountability, and demonstrate respect, compassion, motivation, and empathy toward their needs as students are seen as good attributes. In addition, the qualities of being able to cultivate a supportive learning environment the criminal justice professors encourage and promote students' development and achievement in their courses. Similarly, it has been shown that professors need to understand and embody the qualities stated above to effectively connect with students and guide them toward becoming the best versions of themselves.

Furthermore, a professor's likability among their students depends on several factors, including his or her ability to relate to his or her students on a personal level, to present the material interestingly, to communicate effectively, and to manage students. When a student has questions or concerns regarding a subject being covered in class, they appreciate and like professors who are approachable and willing to listen. Professors can make the class more enjoyable for their students and turn complex ideas into interesting lessons by using humor and real-world examples. This helps fostering an environment conducive to learning, where all students feel supported and included. Professors who are receptive and understanding of their students' problems, have a friendly demeanor and treat them honestly are perceived as more likable. The ability to effectively manage students and inspire them to become better people is a major factor in determining criminal justice professors' likeability.

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Training Curriculum to Enhance Customer Service Skills for Alien Workers in Thailand 's Hotel and Resort Industry

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Abstract

This research aimed to develop a training curriculum to enhance customer service skills for alien workers in hotel and resort businesses in Thailand using the Delphi technique and curriculum experimentation. Data were analyzed statistically using median, absolute value of the difference between median and base values, interquartile range, mean, standard deviation, and t-test (one sample group). The results showed that the training curriculum consisted of 6 components: principles, objectives, content structure, duration, methods and activities, and evaluation. The training curriculum and documentation suitability was ranked at the highest level ($\bar{x}$ = 4.83, S.D. = .095). All components of the training curriculum were appropriate at the highest level and the index of correspondence between various components of the training curriculum and elements of the activity plan in each learning unit according to expert opinions. The index of congruence was equal to 1.00 for all items. Overall, the alien workers in the experimental group had a statistically significant difference in customer service skills between pre- and post-training at a .01 level. Additionally, they had the highest satisfaction with the training curriculum ($\bar{x}$ = 4.62, S.D. = 0.209).

Keywords: Training Curriculum, Customer Service Skills, Alien Workers, Hotel and Resort Businesses

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1. Introduction

Nowadays, human resources are a highly valuable resource. In Thailand, there has been economic growth and change in the production structure according to the country's economic situation. There has been both domestic investment promotion and encouragement, prompting foreign investors to invest in Thailand. There has also been improvement in the production system of goods and services, causing an employment imbalance. Particularly in the tourism and service industries, there is a growing demand for workers, which has been met with a shortage of labor in some occupations. In some areas, the available labor skills do not match the demands of the labor market, causing a labor shortage problem. Entrepreneurs, therefore, need to find workers from other places to fill the positions they need. In terms of economic problems and the lack of production factors, the labor and wage rates of alien workers in neighboring countries such as the Union of Myanmar and Lao People's Democratic Republic are lower than in Thailand [1].

Hotels and resorts are businesses that focus on providing accommodation services for those who have to travel long distances for different purposes. Today, hotels are not just places to stay, but can also be used as venues for various events. Therefore, the hotel business plays an increasingly important role in the economy, meaning there is a lot of competition in the service industry. At the same time, many countries, including Thailand, are focusing on promoting the tourism industry, which is considered the country's main income. To be successful in today's era, hotel and resort businesses are unpredictable without good service. Service is essential to the survival and growth of any type of business, as can be seen from the various business organizations that have adopted service as one of the strategies to differentiate them from others. Both product businesses and service businesses must make their businesses stand out from the competition to increase their market competitiveness. This is possible by aiming to meet the needs of the service recipients (customers) by providing the service recipients with the highest satisfaction. When the service recipients are satisfied with the service they receive, they often come back to use the service from that business again. Becoming a loyal customer and often recommending that service or product to others (word of mouth) makes the business grow even more. Chomnat Nittayo, Sophon Thanyavejkit, Bowonwit Jindarak, and Nanthanit Thongsri [2] found that the employment of highly-skilled foreign workers in the targeted industries, both in the former industry (first S-Curve) and the new industry (new S-Curve), is still a small proportion overall in terms of the proportion of high-skilled migrant workers in the targeted industries. As the group with the most employment, the tourism industry is well-compensated (Affluent, Medical, and Wellness

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Tourism). In addition, when comparing highly-skilled migrant workers to the total workforce, it is still considered a small proportion. Initially, the proportion of high-skilled and low-skilled migrants was similar. In recent times, however, the proportions of the labor force in both groups are quite different. The share of low-skilled migrant workers rose sharply to 9 percent in 2019 as a result of key policy outcomes; the minimum wage increased in 2011 and a waiver of foreign worker registration was assessed in 2018.

Despite the availability of training courses, there can be limitations that contribute to problems in the tourism industry. Here are a few reasons why these courses may not be sufficient: language barriers, lack of hands-on experience, limited customization, and inadequate ongoing training and support. These limitations can contribute to problems in the tourism industry, including decreased guest satisfaction, negative reviews, and potential loss of business. To address these issues, it is important to consider comprehensive training programs that incorporate language training, practical experience, customization based on specific hotel or resort needs, and ongoing support to enhance and maintain customer service skills. Therefore, the researcher recognizes the importance of developing a training course to enhance customer service skills for migrant workers in hotels and resorts in Thailand to enable service operators to demonstrate desired behaviors and ultimately enhance satisfaction to service recipients. The research results will also be useful to the tourism and service sectors when making decisions about opening courses, teaching, and training to enhance knowledge and other skills for the quality of foreign workers to the right to continue working. The results can address the sustainability of training programs and their long-term impact on customer service. This can involve investigating methods for ongoing training, coaching, and support to ensure continuous improvement of customer service skills among alien workers as well.

2. Literature Review

The literature and related research were analyzed to create a conceptual framework, as shown in Figure 1. From the literature review, the relationship between variables is seen as follows:

2.1 The primary variables in this research are the components of a training course for enhancing customer service skills for alien workers in the hotel and resort business in Thailand based on the concept of Taba [3], Smith [4], and Pornsima [5]. It is indicated that training is the process of structuring events to equip trainees with knowledge, skills, and experiences that they can use in the future to develop and improve their own behavior. There are four important management processes in training: investigating training requirements, developing training courses, conducting training activities, and evaluating and following up. The facilitator is responsible for planning and designing activities that are appropriate for the group of trainees, using the training time wisely with respect to the material, and choosing an appropriate place and equipment. Most essential, the activities must be tightly knit and linked to connections and continuity. Another critical factor influencing training management success is the selection of training techniques and procedures that are suited to the objectives' content and target population. The researcher analyzed and synthesized the topic and content structure that was set according to the training criteria for the assessment of tourism accommodation standards [6], including uniforms and name tags, personality, and manners, communication in Thai and foreign languages, and providing effective information and assistance.

2.2 The dependent variable is the training curriculum to enhance customer service skills for alien workers in the hotel and resort business in Thailand. As a result of recent advances in science and technology that have given rise to new management or working practices, the training in this study is referred to as training to increase operational skills (skill training), which focuses on upskilling and requires employees to develop skills to meet the needs of the organization [7].

2.3 In terms of the outcome, the benefits obtained from the training curriculum can enhance customer service skills for alien workers in the hotel and resort business in Thailand. This is a key component in evaluating training effectiveness and the satisfaction of alien workers with the training curriculum.

3. Methodology

This research study was conducted in the form of research and development with the following research steps:

3.1 Phase 1 Study of the Elements of the Training Curriculum

Phase 1 was a study of the elements of the training curriculum to enhance customer service skills for alien workers in the hotel and resort business in Thailand using the 3-round Delphi Research Technique. By conducting multiple rounds of surveys, data can be systematically gathered and synthesized from the opinions, expertise, and insights of a diverse group of experts in the field of customer service, training, or the hotel and resort industry. This can help establish a collective agreement or convergence of opinions on the training curriculum to enhance customer service skills for alien workers. Utilizing the Delphi technique increases the reliability and validity of the findings through data triangulation. Triangulation involves comparing the responses across rounds, identifying patterns, areas of agreement, and divergence,

Figure 1: Theoretical framework of the study

and gaining a more comprehensive understanding of the topic.

The sample consisted of 17 experts chosen from the sample size determination according to the McMillan study [8], which found that for a sample of 17 or more, the degree of discrepancy was reduced steadily. There is also a very low error of 0.02 starting with the sample number of 17-21 experts or more. The selection of experts was a specific selection with purposive sampling that involved government officials and private sector representatives with at least 5 years of experience related to operations in the tourism industry, and the hotel and resort business in Thailand. In this research study, the details of the sample group are as follows:

1. 12 hotel and resort business executives,

2. 1 government sector employee in skill development, and

3. 4 private sector representatives who are involved in training alien workers in hotels and resorts.

The first phase of the study involved an examination of the background data. The Delphi Technique was used to study the components of a training curriculum to enhance customer service skills for alien workers in hotels and resorts in Thailand. Therefore, the interview form and opinion questionnaire of experts were used in a total of 3 rounds from 5 January 2022 to 11 February 2022.

The median of the data, the range between the quartile, and the absolute value of the difference between the median and base values were analyzed in the third round of the Delphi research method. Theoretically, the criteria for determining the consensus statement are: the median must not be less than 3.50, the absolute difference between the median and baseline is not more than 1.00, and the interquartile range is not more than 1.50 [9][10]. There must be no more than a 15%change in answers from the previous round to be considered an acceptable criterion [11]. The results were then summarized as components of a training curriculum to enhance customer service skills for alien workers in the hotel and resort business in Thailand.

3.2 Phase 2 Development of a Trial Training Curriculum

The trial training curriculum to enhance customer service skills for alien workers in the hotel and resort business in Thailand was designed based on the results of data obtained from Phase 1. The researcher contacted all 5 selected experts by phone to explain the details of the research and ask for their consent to provide information about this research. All experts informed consent to participate in this study. After that, the researcher submitted a request for approval to review the trial training curriculum along with the documentation, trial training conformity assessment, and the satisfaction questionnaire for alien workers who participated in the curriculum experimentation. The period of data collection was from 28 February 2022 to 9 March 2022.

The data obtained from the trial training curriculum suitability assessment were analyzed statistically in terms of mean and standard deviation. The eligibility criteria for the acceptable trial curriculum were determined at a higher level ($\bar{x}$ = 3.51 or higher) (Best Kahn, 1993). The scores were analyzed for the Index of item objective congruence (IOC) which is considered to be in conformity and usable criteria at 0.60 or higher. These values are considered sufficient and statistically acceptable [12]. If more than 3 experts have additional suggestions on the corresponding issues, they consider adding to the training curriculum by considering the data from Phase 1.

3.3 Phase 3 Curriculum Experimentation

This is where the training curriculum was tested with a targeted sample to verify its effectiveness. The sample group included alien workers in the hotel and resort business in Thailand who entered under Section 59 of immigration law. The type of aliens who come to work in the country according to the Memorandum of Understanding (MOUs) made by the Thai government with foreign governments includes those who come from Myanmar, Laos, and Cambodia. They can communicate well in Thai, are aged 20 years or older, and voluntarily participated in 30 trials of a training curriculum to enhance customer service skills without coercion. It was the smallest sample size to perform statistical analysis that was able to generate a normal curve. The normal curve can give the mean and standard deviation with the least acceptable deviation [13] by using the voluntary selection technique.

The researcher set the time for the activities to be carried out on 23-24 March 2022 from 8.30 AM –

16.30 PM at the Malibu Garden Resort, located in Rayong Province. The experiment included organized activities with the speakers and adjusted the flexible time to suit the content media and learning resources specified in the activity plan. The researcher conducted an assessment according to the actual conditions by observing participants in activities and performance results together with an individual interview to observe changes in the behavior of alien workers' customer service skills. After experimentation on the last day of training, the customer service skills of migrant workers and the satisfaction of alien workers were measured using tests and questionnaires.

For data analysis, data collected from the quantitative measuring tools were analyzed using statistics, i.e., mean and standard deviation. For the Customer Service Skills Assessment Form for Foreign Workers, a dependent t-test was used to compare the mean difference in customer service skills of migrant workers between the pre- and post-training according to the single-group pretest-posttest design [14], as shown in Figure 2.

Pretest	Experiment	Posttest
O_1 ⟶	X	⟶ O_2

Figure 2: Single-group pretest – posttest design

4. Results

4.1 Components of a training curriculum to enhance customer service skills for alien workers in Thailand's hotel and resort industry

The findings from the third round of Delphi research found that experts' opinions were at the highest level (Md = 4.88, Mo = 4.89, Md-Mo = 0.01, IR = 0.04), as shown in Table 1.

4.2 Development of a training curriculum to enhance customer service skills for alien workers in Thailand's hotel and resort industry

The researcher used the results of Phase 1 to design and develop a trial training curriculum. The details are as follows:

1. Principles and rationale consist of 2 issues:

1.1 This is a curriculum that focuses on training alien workers to satisfy and impress customers.

1.2 This is a curriculum that focuses on communication skills and the coordination of alien workers.

2. Objectives consist of 2 issues:

2.1 To enhance knowledge and skills for customer service to alien workers.

2.2 To enhance communication skills and good coordination for alien workers.

3. Content structure consists of 4 learning units:

Unit 1 General knowledge about products and services

Unit 2 Service Fundamentals

Unit 3 Basic English for Services 1

Unit 4 Basic English for Services 2

4. Training duration

The total training duration is 12 hours, defined as 2 consecutive working days from Tuesday to Thursday only.

5. Training methods and activities

The training curriculum is designed for every unit to perform the same 4 types of activities, namely learning from a role model, learning from real, active, and taking lessons. For better learning, learning media will be used to organize the activities in the trial training curriculum. A variety of learning media included worksheets, knowledge sheets, picture sheets, articles, simulated problem situations, board games, and recreational games.

6. Training evaluation measurements

The trial training curriculum is based on two types of authentic assessment principles, comprising the assessment of knowledge and ideas, and the assessment of performance and processes. There are two stages of learning: before and after the training. In addition, the overall scoring criteria (holistic rubrics) are set.

The trial training curriculum and documentation were reviewed by 5 experts. The results showed that the suitability of the trial training curriculum and documentation was ranked at the highest level ($\bar{x}$ = 4.83, SD = .095). When considering each component, it was found that the trial training curriculum components were at the highest level. The conformity index between the components of the trial training curriculum and the elements of the activity plan in each unit had a concordance index of 1.00 for all items. Consequently, the trial training curriculum has appropriate elements that meet the specified criteria and is consistent among the internal components. Further, the activity plan can be used for training to enhance the customer service skills of alien workers in the hotel and resort business in Thailand.

4.3 Evaluation of the effectiveness of a training curriculum to enhance customer service skills for alien workers in Thailand's hotel and resort industry

The researcher used the trial training curriculum, which was revised according to the advice of experts, to experiment with a sample of 30 alien workers. The alien workers in the trial group were assessed for customer service skills during and after the training. Overall, there was a statistically significant difference at the .01 level. When considering the customer service skills component, it was found that the alien workers in the experimental group had customer service skills before and after training. There was a statistically significant difference at the .01 level for all

Table 1. Source of emission and absorption of greenhouse gases and greenhouse gas emissions for the carbon footprint assessment of Rajabhat Universities in Southern Thailand.

Components of a training curriculum	Md	Mo	Md-Mo	IR
1. Principles	**5.00**	**5.00**	**0.00**	**0.80**
1.1 Alien workers are necessary for hotels and resorts in Thailand.	5.00	5.00	0.00	0.00
1.2 Important factors for sustainable business success are providing customers with satisfaction and impression.	5.00	5.00	0.00	0.00
1.3 Service is an important indicator in the hotel and resort business.	5.00	5.00	0.00	0.00
1.4 Increasing the work skills of alien workers who have good quality service and meet their needs will be able to create satisfaction for customers.	5.00	5.00	0.00	0.00
1.5 Cultivating alien workers with a service mind is a focus of service work.	5.00	5.00	0.00	0.00
1.6 Alien employees who provide services must develop themselves to always have service consciousness.	5.00	5.00	0.00	0.00
1.7 The development of effective communication and coordination skills by alien workers is a priority for the organization.	5.00	5.00	0.00	0.00
Components of a Training Curriculum	Md	Mo	Md-Mo	IR
1.8 Understanding of the roles and duties of alien workers to have the skills to work with others and the ability to communicate effectively to strive for excellent service as well as meet the various needs and expectations of customers is necessary.	5.00	5.00	0.00	0.00
2. Objectives	**4.60**	**4.60**	**0.00**	**0.20**
2.1 To encourage migrant employees to realize the importance of service excellence.	5.00	5.00	0.00	0.00
2.2 To improve work processes and skilled service for efficiency.	5.00	5.00	0.00	1.00
2.3 To enable alien workers to have good service behaviors, communication skills, and good coordination.	5.00	5.00	0.00	0.00
2.4 To enable alien workers to develop basic knowledge in service.	5.00	5.00	0.00	0.00
2.5 To enable migrant workers to realize the importance of goals and create a sense of ownership of the organization.*	4.00	4.00	0.00	0.00
3. Content Structure	**4.90**	**4.89**	**0.01**	**0.06**
3.1 Uniform and Name Tag that are neat, clean, and suitable for the type of work.	5.00	5.00	0.00	0.00
3.1.2 Employees should be trained on make-up appropriate for the job.	5.00	5.00	0.00	0.00
3.1.3 Dress and name tags should follow the rules and regulations of the organization.	5.00	5.00	0.00	0.00
3.1.4 The topic of clothing maintenance techniques should be trained.	5.00	5.00	0.00	0.00
3.2 Personality and Manners	**4.75**	**4.75**	**0.00**	**0.25**
3.2.1 Employees should be trained to smile.	5.00	5.00	0.00	0.00
3.2.2 Employees should be trained on correct salutations.	5.00	5.00	0.00	0.00
3.2.3 Employees should be trained to greet customers.	5.00	5.00	0.00	0.00
3.2.4 There should be content about service and different cultures.*	4.00	4.00	0.00	1.00
3.2.5 There should be content to practice polite gestures in service, such as standing, walking, and sitting.	5.00	5.00	0.00	0.00
3.2.6 Critical positive attitudes towards service should be established to influence personality expression and manners.	5.00	5.00	0.00	1.00
3.3 Communication in Thai and foreign languages	**5.00**	**5.00**	**0.00**	**0.00**
3.3.1 Employees should be able to communicate well in the Thai language suitable for duties and types of work.	5.00	5.00	0.00	0.00
3.3.2 Employees should be able to use basic English.	5.00	5.00	0.00	0.00
3.3.3 Employees should be able to introduce themselves and welcome guests in English.	5.00	5.00	0.00	0.00
3.3.4 Employees should be able to tell customers the correct time in Thai and English.	5.00	5.00	0.00	0.00
3.3.5 Employees should be able to give correct directions to customers in Thai and English.	5.00	5.00	0.00	0.00
3.3.6 Employees should be able to communicate the weather properly.	5.00	5.00	0.00	0.00
3.3.7 Employees should know the terms that refer to products in the organization in English.	5.00	5.00	0.00	0.00

Table 1. Source of emission and absorption of greenhouse gases and greenhouse gas emissions for the carbon footprint assessment of Rajabhat Universities in Southern Thailand. (Continue)

Components of a training curriculum	Md	Mo	Md-Mo	IR
3.4 Giving effective information and assistance	**4.80**	**4.80**	**0.00**	**0.20**
3.4.1 The organizational structure should be introduced in the training curriculum.	5.00	5.00	0.00	0.00
3.4.2 The organization's products should be known.	5.00	5.00	0.00	0.00
3.4.3 Basic medical terminology should be understood to provide accurate and timely assistance to customers.	5.00	5.00	0.00	1.00
3.4.4 Employees should learn how to communicate information by telephone to customers.	5.00	5.00	0.00	0.00
3.4.5 Foreign workers can provide accurate information about the organization.	5.00	5.00	0.00	1.00
4. Training Duration	**5.00**	**4.80**	**0.20**	**0.40**
4.1 The optimal duration is 3 days or 18 hours.*	4.00	5.00	1.00	2.00
4.2 The optimal duration is 2 days or 12 hours.	5.00	5.00	0.00	0.00
4.3 The training should be continuous, and should not be delayed for a long time.	5.00	5.00	0.00	0.00
Components of a Training Curriculum	Md	Mo	Md-Mo	IR
4.4 Training should be done on weekdays without overlapping weekends or public holidays.	5.00	5.00	0.00	0.00
4.5 The optimal times are Tuesday, Wednesday, and Thursday.	5.00	5.00	0.00	0.00
5. Training Methods and Activities	**5.00**	**5.00**	**0.00**	**0.10**
5.1 Training activities should be practice-based.	5.00	5.00	0.00	0.00
5.2 Training activities should include video tutorials or case studies to attract attention.	5.00	5.00	0.00	0.00
5.3 Training activities should include periodic Q&A sessions to stimulate interest and repeat understanding.	5.00	5.00	0.00	0.00
5.4 Training activities should include recreational activities or games to enhance learning.	5.00	5.00	0.00	0.00
5.5 Training activities on the topic of foreign language communication should use native speakers.	5.00	5.00	0.00	0.00
5.6 Foreign language training activities should include Thai language lectures to enhance understanding.	5.00	5.00	0.00	0.00
5.7 Training activities should complement the use of basic technology in training.	5.00	5.00	0.00	0.00
5.8 Training activities should include group or interpersonal activities to build good relationships between participants.	5.00	5.00	0.00	0.00
6. Training Evaluation Measurements	**5.00**	**5.00**	**0.00**	**0.00**
6.1 Individual testing should be performed after training.	5.00	5.00	0.00	0.00
6.2 There should be a variety of assessments.	5.00	5.00	0.00	0.00
6.3 Assessment criteria and results should be communicated to the participants.	5.00	5.00	0.00	0.00
6.4 Post-test improvement recommendations should be made.	5.00	5.00	0.00	0.00

*Unqualified

components. Moreover, they also had the highest satisfaction with the trial training curriculum ($\bar{x}$ = 4.62, SD = 0.209) at the highest level for all components.

5. Discussion

Alien workers are important to the hotel and resort industry in Thailand. Entrepreneurs should cultivate good service-mindedness and develop customer service skills for foreign workers to ensure maximum customer satisfaction because service-mindedness can create significant value for hotels and resorts as well as the overall industry. If alien workers have good customer service skills, customers will be impressed and potentially be willing to pay more. What is more, they are more likely to come back to use the service again as they feel satisfied with their previous experience. The value that customers are willing to pay for is consistent with research titled "The Study of the Effectiveness of Training in Hospitality – Kerala Tourism Development Experience" [15]. This research found that trained employees applied their knowledge and skills to their jobs. This has led to improvements in the efficiency of the relevant functions of employees and responsible departments, which have reported that better performance improvements are closely aligned with standard operating procedures. The results of "The Study on the Impact of Employee Training on Customer Service [16] summarized that customer complaints are handled professionally after training. It also found that employees of private companies are motivated to attend training. Employees participating in training can improve services for the benefit of customers in achieving clear organizational objectives.

Training course objectives should focus on developing good customer service skills as well as on improving communication skills in both Thai and English as good customer service skills are critical to the success of any hotel and resort business. The duties of alien workers involved in service work are a reflection of the value of service work. Alien workers need to develop skills, behavioral knowledge, and understanding of their role in service through regular training with the goal of impressing customers. Thus, they need to have knowledge of service etiquette and personality development. The use of speech to communicate services in both Thai and English is essential, as is building service performance to increase the competitiveness of hotels and resorts in accordance with research on staff training and service quality in the hotel industry [17]. The study revealed a significant correlation between employee perceptions of the benefits of training, training support, and service quality, consistent with previous research on service skills and service quality [18]. The results of a corroborative component analysis demonstrated the suitability of the acceptable model and found that the efficiency of technical skills had a greater impact on the quality of service.

The content of the course structure should focus on dress training, labeling, and make-up suitable for the service industry, as well as basic character etiquette such as smiling, bowing, standing, etc., and knowing the rules, regulations, and products of the agency. In addition, emphasis should be placed on workshops for Basic English communication such as greeting customers, telling the time, giving directions, etc., as such structures form the basis of good hospitality standards for tourism accommodation. If alien workers are trained according to the developed framework of tourism accommodation standards, this will result in customer service quality equivalent to international standards. It will also be possible to apply knowledge to effectively develop operations in the hotel and resort business [19], which studied developing the potential of service personnel in small-hotel businesses in "A case study of a hotel in Loei Province". The study found that the establishment needed personnel development in 5 skills, namely hospitality management, use of information technology, communication and coordination with customers, leadership, and entrepreneurship in team development, and foreign languages [20]. That study described that there are five essential elements of the diversity management of hotel staff in Ubon Ratchathani Province, including respect and appreciation, good interaction, knowledge exchange and understanding, attitude, and behavior modification and revelation.

The duration of the training should be short, should not exceed 12 hours. It should be carried out on weekdays and not overlap with holidays, since hotels and resorts need to accommodate their clients during weekends and public holidays. If the training overlaps such time or is arranged for too long, it will affect the operation of the hotel and resort business in terms of overall customer care. It is due to most customers decide to book and purchase a hotel accommodation because they have plans to relax during the holidays, followed by hotel reservations because they have plans to do errands in other provinces. Some people book hotel stays because of a promotion [21]. The training duration of the workshop should be 2 days [22].

Training methods and activities shall emphasize participant-involved training rather than lectures alone, although the use of basic technology may be supplemented in the training. For training on communication in foreign languages, there should be training from foreign speakers to promote accuracy. Training on various topics through various media such as recreational games, video clips, practical activities, etc. is in line with an article titled "The Proactive Learning in Hospitality Studies [23], concerning the study of hospitality and services, proactive learning involves a variety of fun and dynamic activities to introduce the real-world situations that students might experience in their service careers. The use of proactive learning tends to be associated with two key areas of student

engagement: acquiring knowledge and optimizing service skills. Also, the training course should include creative activities [4].

A good measurement and evaluation should be a multifaceted assessment. Successful training curriculum development should include all curriculum elements and emphasize on-the-job training. This is considered a practical training exercise, with the trainer closely monitoring the participants [3]. Mentors should inform trainees of the assessment criteria before the commencement of training. The results of the assessment after individual training are reflected so that the training participants can use them for improvement later. This is because measuring and evaluating the learning outcomes of the trainees is an important element in the development of training course quality. This provides the information necessary to determine whether trainees achieve the expected learning quality of learning outcomes. What are the problems and shortcomings in the training? How much can the trainers guide and assist trainees to solve problems? There must be a proper adjustment to the point consistent with the concept of measuring and evaluation of 21st century learning skills [24], which states that the measurement and evaluation of 21st-century learning skills must be a qualitative assessment emphasizing practicality, integrating assessment methods, and using a variety of measurement tools, as well as creating and developing a student portfolio system, applying technology for measurement and evaluation, and applying the benefits of feedback from learners to improve work.

To summarize, for training to be truly effective, executives must recognize the importance of training and believe in their approach to people development through training, which will result in benefits to the organization's efficiency. The most important factor in training effectiveness is course content selection, which consists of three critical steps: 1) development of the course outline, 2) making a study schedule, and 3) placement of course content. The content must meet the training objectives, be consistent with actual working conditions, and be accurate and up-to-date. When planning training, consider the type of learning you want to achieve and then select an appropriate training method. Training evaluation must also choose an appropriate evaluation method. The method of data collection itself is crucial. The scientific method is the most used approach. There is a test before and after training.

6. Conclusion and Recommendations

The training curriculum to enhance customer service skills for migrant workers at hotels and resorts in Thailand is a training course focusing on training dress and personality labeling, etiquette, good communication in Thai and foreign languages, and providing effective information and assistance using basic information in conjunction with agency procedures. The person in charge of providing training or the facilitator of the customer service skills training program for alien workers must have basic knowledge of the training protocol in order to properly conduct the training. In addition, there must be coordination within the team, coordination with trainees, and even coordination with speakers. A good coordination strategy is needed so that the coordinator is impressed and wants to be a part of the training.

In terms of suggestions for further research, the next step of the study should include additional training courses on the skills of alien workers, such as maid service, food, and beverage (room) service, guest service agent, etc. Further research should also focus on special services through foreign language communication training courses.

7. Implications

The main finding regarding practical implications is that the relevant agencies can use the research results to support the development of human resources and run hotels and resorts in Thailand's tourism business as a consequence of the knowledge gathered from the analysis. The curriculum created as a result of the research can be focused on helping the organization's foreign employees develop their customer service skills so they can meet the demands of the business community, cater to tourists' needs, instill confidence in those working in the industry, and serve as a selling point to draw in more visitors.

8. Limitations

The situations caused by the new coronavirus outbreak spread rapidly and expansively throughout Thailand from March 2021 to January 2022 affected the conduction of research. This caused the researcher to postpone the research several times.

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Extending Sustainable Social Protection for the Informal Sector in Thailand

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Abstract

The research on "Expanding Sustainable Social Protection for Informal Workers in Thailand" has four objectives: to study the current situation and the impact of the COVID-19 epidemic on informal workers; to study the existing social welfare system and social protection for informal workers; to assess measures to provide immediate government assistance to informal workers and their barriers to access; and to propose policies and measures to expand sustainable social protection. The research employed a qualitative method to collect data by organizing a focus group discussion and in-depth interviews with informal sector workers.

The findings reveal the spread of the COVID-19 pandemic in Thailand has affected informal workers, both Thais and foreigners, in terms of mental health and quality of life. The government assistance program is unsustainable, and the existing social welfare system cannot provide security for informal workers.

The researcher suggests the government improve the Social Security Act by: expanding the benefits of Section 40 insured informal workers to have benefits that are close to those insured under Section 39, issuing ministerial regulations or ministry announcements to enforce the law in detail, improving the management of the Informal Sector Occupation Promotion Fund by including representatives of the Informal Sector Federation to be part of the administrative committee, and clearly linking the network of government aid protection systems at both local and national levels.

Keywords: Sustainable Social Protection, Informal Sector in Thailand

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1. Introduction

COVID-19 is an emerging disease which started in Wuhan Province. in the People's Republic of China on December 30, 2019, and has spread to many countries around the world. As a result, the World Health Organization (WHO) declared it a pandemic on March 11, 2020.

The first patient with COVID-19 in Thailand was of Chinese nationality [1]. The government ordered public places and businesses in Bangkok to close and declared a state of emergency, prohibiting people from leaving their residences at night from the night of April 3, 2020. They also ordered to temporarily suspend the sale of liquor and prevent people from travelling across the provinces and closed the schools in August 2020.

The spread of COVID-19 continues to expand. Data from the Department of Disease Control as of July 31, 2021, found 597,287 cumulative cases, 18,912 new cases, and 4,857 deaths [2].

Economically, many people experienced a sudden drop in income. As a result, debt repayment ability has decreased, and overall debt has increased. During the past year, Thai households' debt increased by about 500,000 million Baht, from 13,489,333 million Baht (79.8% per GDP) in the 4th quarter of 2019 to 14,020,730 million Baht (89.3% per GDP) in the 4th quarter of 2020. According to the Bank of Thailand, in early 2021, about 4,700,000 people were unemployed.

Informal workers are a large group of workers in Thailand. The National Statistical Office conducted a data collection on informal workers in the third quarter (July-September) of 2019. It found that 37.5 million of the employed population were unprotected workers. The lack of social security is predominant among workers is the informal sector, which accounts for about 20.4 million people, or 54.3 percent [3]. The National Statistical Office indicates that in Bangkok, there are 26.3 percent of informal workers. Occupational service workers in shops and markets, of which 7.75 million were severely affected by COVID-19[4].

In the first wave of the COVID-19 epidemic, the government issued remedial measures for both domestic and informal workers, consisting of eight main measures: 1. For labor groups, temporary workers and self-employed that are not covered by the social security system will receive 5,000 Baht per person per month for a period of 6 This group has 3 million people. 2. Special loan of 50,000 Baht per person at an interest rate of 35% per month with collateral. 3.

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An emergency loan of 10,000 baht per person at an interest rate of 1% per month without collateral. 4. The Thananukroh Office gets a low interest pledge by charging interest from the public at a rate of not more than 125 percent per month. 5. Extension of the personal tax payment period to August 2020 6. Increase the amount of deduction for health insurance premiums from 15,000 baht to 25,000 baht. 7. Exemption from income for medical personnel risks 8. Training to increase professional skills or organize social activities, including students who are still unable to find work in addition, on October 1, 2020, at 6:00 am, the government will open registration through the website half-person.com for "The 50-50 co-payment scheme (Kon La Krueng) the 'half-per-person' project to restore the economy at the foundation level. The government will pay 50 percent, but not more than 150 baht per person per day.

Subsequently, under the third wave of the COVID-19 epidemic situation, on May 5, 2021, the Cabinet approved the projects such as We Win scheme (Rao Chana), We Love Each Other scheme (Section 33 Rao Rak Kan), The more you pay the more you gain to increase purchasing power for those who need special assistance.

Research objectives: 1. To study the effects of the COVID-19 epidemic on informal workers.

2. To study the social welfare system and social protection for existing informal workers.

3. To evaluate measures to provide immediate government assistance to informal workers and barriers to access.

4. To propose policies and measures to increase long-term social protection for informal workers.

Research questions

1. Can the current state's social welfare system, which provides the opportunity for informal workers to enter social security under Section 40 of the Social Security Act 1990, help informal workers to have security?

2. Will short-term government measures that come out by paying 5,000 baht per month for 3 months help solve the problem of informal workers?

3. Does the government need to amend the Social Security Act No. 4, 2015, the Home Workers Protection Act, 2010 and 2018, and the Labor Protection Act, 2019 or other laws? resulting in truly sustainable social protection of informal workers.

2. Literature review on social protection

Social protection is a concept that dates to the Roman Empire between the 3rd and 5th centuries AD, during the era of Emperor Triyanus. Trajan was also known as Emperor Trajan. He organized a free grain distribution program to unite the poor citizens. A public fund was established to help the poor children of that era [5].

In the late 19th and early 20th centuries, Germany and the United Kingdom established a welfare system for the working class. During the Great Depression of 1930, the United States implemented an emergency relief policy for those severely affected by the Depression. Social protection is used in the welfare states of Europe and the rest of the developed world to maintain a standard of living and deal with poverty. Social protection in the modern era has broadened the scope of issues and objectives. It is now used as a policy guide in developing countries to address persistent structural poverty. Moreover, it is a measure designed to lift the poor out of poverty. Instead of providing coverage only during emergency situations, social protection is also used to reduce poverty in developing countries. To promote economic and social growth, the rationale behind social protection is to promote a dynamic, cohesive, and stable society for greater equality and security. Over the past few decades, social protection has become an important tool for improving the lives of people, including the poorest and most marginalized people in the world.

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International organizations have defined social protections as a right under Article 22 of the Universal Declaration of Human Rights (UDHR). It is a measure to protect the lack of income caused by illness, childbirth, work-related injuries, unemployment, old age, or the deaths of family members [6]. It is a program that helps individuals and society manage risk and volatility while protecting them from poverty [7], and to prevent, manage, and overcome situations affecting people's livelihoods [8].

Social protection consists of policies and programs designed to reduce poverty by promoting effective labor markets [9]. It is also one of the United Nations Sustainable Development Goals [10], which aim to

eliminate poverty and promote greater social equality.

The three most common forms of social protection are: Labor market interventions which are policies and programs designed to promote employment; efficient operation of the labor market; and labor protection through social insurance. It reduces the risks associated with unemployment, poor health, disability, work-related injuries, and old age by providing health or unemployment insurance, and social assistance, which is the provision of cash or material assistance to vulnerable individuals or households. Single parents, homeless people, people with physical or mental disabilities, poor children, women, the elderly, and people with disabilities, including the displaced, the unemployed [11].

Social protection can contribute to economic growth, long-term development and help people permanently out of poverty [12].

3. Research Methodology

This research uses a qualitative research methodology, focusing on collecting insights of Thai and foreign informal workers in the manufacturing sector. and the service sector. In-depth interviews and focus group discussions were used as data collection tools.

The sample selection for this research was purposive sampling. The researcher discussed with an NGO working with informal workers, "The Network of Informal Worher in Thailand" on who should be the sample according to the objectives of this research. The following are selected samples: 1. Three groups of home-employed workers, namely, Rom Klao garment subcontractors, Ladkrabang District, and Garment Group in Bang Khun Thian District, and the Goldware Production group, Chatuchak District. Total = 15 people.

2. Three taxi drivers who do not have their own cars, 3 motorcycle taxis, 3 street vendors, and 3 domestic workers.

3. Five leaders of the Informal Workers' Union

4. Three academics with expertise in informal labor

5. One lawyer who specializes in labor law and the informal sector.

4. Research Tools

The researcher has prepared questionnaires for homework recipients' discussion and three sets of in-depth interviews to be used as a tool for collecting data. Three experts were assigned to assess the consistency between the question and the research objective (the Index of Item-Objective Congruence (IOC). The assessment result was an IOC value higher than 0.5, meaning the question was consistent with the objectives of the research at an acceptable level.

5. Research ethics

The Huachiew Chalermprakiet University Research Ethics Committee issued certification 965/2563 on the 20^{th} of July 2020 approving this research. The researcher explained the purpose of the research, the methodology, the outcomes, including safety, consequences, and the right to terminate participation in this research project at any time before collecting data.

6. Research findings

Home-employed workers, taxi drivers, motorcycle taxis, street vendors, and domestic workers were seriously affected by COVID-19. They lost about 50% of their income, which affected their mental health and quality of life. (in-depth interview 3 groups of home-employed workers 3 taxi drivers, 3 motorcycle taxis, and 3 street vendors)

The current Thai Government's social welfare system and social protection for informal workers is to provide informal workers to access social security under Section 40 of the Social Security Act of 1990. Informal workers do not enter the Social Security system under Section 40 due to unstable income. Entering the social security system under Section 40 does not answer the job requirements of informal workers. At present, informal workers are already exercising their rights under The Universal Coverage Scheme (UCS) or health insurance card (gold card) for medical treatment. (in-depth interview 5 leaders of the Informal Workers' Union)

In relation to the Home Workers Protection Act of 2010, the study found that this Act can enable homemakers to receive fair wages, but on the other hand, it causes employers to have concerns in this respect as well. It makes getting the job harder because there must be documentary evidence of employment. Some employers find it difficult and therefore hire a worker who does not need documents to get the job done at home instead. including government agencies that do not see its importance. In addition, government officials were unable to answer legal inquiries or questions. When officials do not understand the law, they give the wrong advice. including those who accept work to do at home without knowledge or understanding of the law. It became apparent that this law was not effectively used despite its existence. (in-depth interview 3 groups of home-employed workers and 5 leaders of the Informal Workers' Union)

The measures to provide immediate assistance to informal workers did not help the informal workers. The government's remedies of 5,000 baht per month for 3 months did not help them to use it to build social stability in the long run. It does not help informal workers to use it to build social stability in the long term.

7. Discussion

The results of this study leading to expanding sustainable social protection for informal workers in Thailand are as follows:

1. Thailand's social protection system is still fragmented and weak.

The approach to social protection of several international organizations, including the ILO, World Bank, ADB, UNICEF, UNAIDS, describes social protection as a basic human right. It is a measure that benefits the poor, to cover loss of income caused by sickness, disability, childbirth, work-related injuries, unemployment, old age, or the death of family members. It is a collection of public and private policies and programs designed to reduce poverty and vulnerability by promoting an efficient labor market, reducing people's risk, and increasing our ability to protect ourselves from harm and disruption/loss of income. Its purpose is to reduce structural socio-economic vulnerabilities.

The COVID-19 crisis that occurred in Thailand as a test that Thailand's social protection system is not strong enough to withstand, in line with the research of Kusol Soonthornthada (2016) on *"Diversity of health and security for informal workers in Bangkok"* found that most of the injured informal workers did not go for medical treatment, accounting for 72.5 percent. Furthermore, informal workers receive 71.94 percent of their medical care through the universal health insurance card (86.59 percent). The social protection rights of informal workers are still very few compared to formal workers because of the limitations and inequality of access to services due to the lack of protection under the current labor law.

The lack of interest in the social security system from the informal sector may be due to uncertainty in wages and working conditions. As a result, informal workers are unable to pay contributions according to the conditions of membership in the social security system. The remaining 28.06 percent of injured informal workers did not use welfare to cover medical expenses. Most pay for their own medical expenses.

Social security is a welfare system to protect the benefits of insurers or individuals in the private sector. It is like the government's medical welfare system. However, the three amendments to the Social Security Act still focus on protecting workers in the government sector. There is only Section 40 of the Social Insurance Act, B.E. 2533, as amended by the Social Insurance Act (No. 4). B.E. 2558 stipulates that any person may apply to be an insured person under this Act to show their intention to the Social Insurance Office. At the Cabinet meeting on April 25, 2017, there was a resolution to extend the benefits for insurers under Section 40, who are informal workers, to have more benefits like those insured under Section 33, who are formal workers, by increasing the benefits as well as increasing membership options for informal workers. However, only a few informal workers enter social insurance under Section 40. The sickness protection benefits are not attractive enough because they can use the rights to medical treatment in the 30 Baht health insurance system to treat all diseases [13].

Research findings on the impact of COVID-19 on taxi driver is like the previous research findings of Pakapon Salathong (2012) titled "Mechanisms to support the quality of working life of informal sector workers: a case study of taxi drivers in Bangkok," which found that most taxi drivers are renting cars. There is no security or safety in this occupation. Most of them take care of their health by taking a rest and buying medicines to take when they are sick. The researcher proposes expanding social protection for taxi drivers; for equality and fairness; support and development of income stability; establishment of a provident fund for taxi drivers; promoting and developing the potential of taxi drivers to achieve stability in occupation; budget grouping support for the welfare and professional welfare of taxi drivers. Measures should also be taken for the preparation of risk measures and the integration of laws and regulations to facilitate the career management of taxi drivers [14]

Research findings on the impact of COVID-19 on migrant informal workers who are domestic workers are like the research of Banyat Salee (2011) titled *"Informal Migrant Workers"*. This study found that the problem of informal migrant workers was that most of them have to work long hours. In many cases, the employer cheated on their wages and failed to pay the agreed amount. Informal migrants are unable to make a claim and dare not confront government officials for the crime of illegally working or working without a permit [15].

2. The Home Workers Protection Act 2010 lacks details of enforcement.

A review of the Home Workers Protection Act found many gaps, as follows:

1) Although there is a provision that empowers the Minister of Labor and the Director-General of the Department of Labor Protection and Welfare to issue ministerial regulations and direct the Department of Labor Protection and Welfare for effective law enforcement; it does not appear that the Ministry of Labor has issued a ministerial regulation specifying the type of work. In practice, the ministerial regulations on the protection of labor in work to be done at home, B.E. 2547, issued under the Labor Protection Act, B.E. 2541, Section 22, came into force instead, which have different intentions in promulgating.

2) Section 14 prohibits the employer from requiring or accepting a guarantee of work or a guarantee for damage while performing work unless the type, quantity, or value of the work performed may cause the employer harm. However, the request for or receipt of such security must be in accordance with the rulees, procedures, and conditions prescribed by the Director-General. Until now, the Department of Labor Pro-

tection and Welfare has not announced the rules, procedures, and conditions for calling or receiving work guarantees or collateral for damage from work.

3) Section 21 categorizes hazardous work into 4 categories: (1) work relating to hazardous substances according to the law on hazardous substances (2) work to be done with tools or machines where the worker has been exposed to potentially dangerous vibration; (3) work related to extreme heat or cold which may be dangerous; and (4) other work that may affect health, safety, or environmental quality by the hazardous work under (2) to (4) prescribed by law to be in accordance with the Ministerial Regulation. There is no ministerial regulation issued under the Protection of Homeworkers Act, 2010, section 21. Therefore, it lacks clarity.

4) According to Section 24, *"the employer shall be liable for the cost of medical care, rehabilitation, and funeral expenses in the event that the worker experiences danger, illness, disability, or death as a result of the use of raw materials, equipment, or other things used in the work that the employer has prepared or delivered; or because the employer does not provide protective equipment for work safety; or in the event of an accident at the workplace."* At present, there is no ministerial regulation prescribing such rules, procedures, and rates of payment.

Therefore, it can be concluded that the Home Workers Protection Act, 2010 cannot provide guarantees that domestic workers will receive social protection in accordance with the intent of this Act.

3. The Informal Workforce Management Strategic Plan has not been implemented.

The Ministry of Labor has prepared the first strategic plan to manage informal workers, 2012–2016, with the vision that informal workers are protected and have social security leading to a better quality of life. The goal is for informal workers in all occupations to be protected by the social security system equally and fairly and with benefits close to those that formal workers receive. Moreover, the Informal Workforce Management Strategic Plan (Second Edition) 2017-2021 had been developed to ensure continuity from the previous plan. and to serve as a framework for the work of agencies under the Ministry of Labor, including agencies related to informal workers. However, an assessment by the Office of the Health Promotion Foundation (ThaiHealth) found that informal workers still lack social security. The Informal Workforce Management Strategic Plan was not put into practice. Informal workers therefore do not have a better quality of life according to the goals of the two plans.

Recommendations

The state should implement policies for "Universal Social Protection" in Thailand. The state should develop a high-quality and sustainable social protection system by clearly defining minimum standards for welfare and social protection services; integrating agencies related to social protection for informal workers; amend the Social Insurance Act, No. 4, 2015 by expanding the benefits for insured workers under Section 40 to be comparable to those insured under Section 33; revise the Home Workers Protection Act, 2010, Section 14, which prohibits employers from demanding or accepting work guarantees or guarantees for damage in work; Section 21 on dividing dangerous work into 4 types: (1) work related to hazardous substances according to the law on hazardous substances; (2) work to be done with tools or machines where the maker has been exposed to potentially dangerous vibration; (3) work related to extreme heat or cold; and (4) other work that may affect health, safety, or environmental quality by the hazardous work; ratify ILO Convention No. 98 to support the gathering of informal workers to play a role in building social protection for sustainable informal workers.

The Informal Workers' Union which is an informal worker organization should be empowered itself by strengthening its committee, its members, play leading role in pushing its demand on sustainable social protection for the informal sector, and mornitor the government to implement the policies as above mentioned.

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Compulsory education quality development model with a focus on the desired outcomes of learning based on equal and inclusive growth

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Abstract

The purposes of this study were to 1) investigate the concept of compulsory educational quality with a focus on desired outcomes of learning based on equal and inclusive growth; 2) examine the needs, problems, and guidelines for the development of compulsory educational quality; 3) develop a model for the development of compulsory educational quality; and 4) to verify the model and a manual. The key informants consisted of 37 experts and 364 administrators. The instruments used were 1) a conceptual synthesis table, 2) a focus group discussion, 3) a developed model, and 4) a verifying form. The data were statistically analyzed by percentage, frequency, mean, and standard deviation. The results were summarized as follows: 1. The concepts of compulsory educational quality were divided into two levels. 1.1) The primary level consisted of 5 major concepts with 17 minor concepts and 70 indicators. 1.2) The lower secondary level consisted of 5 major concepts with 23 minor concepts and 100 indicators. The confirmation results were overall at the highest level and passed the set criteria at 3.51 or higher. 2. The needs, problems, and guidelines for the overall development of compulsory educational quality were at a high level in every aspect. 3. A model for developing compulsory educational quality with a focus on desired outcomes of learning based on equal and inclusive growth, named the "LIASM" Model, consisted of seven components. 4. The verifying results of correctness, appropriateness, feasibility, and utility of the model and a manual for developing compulsory educational quality were overall at the highest level and passed the set criteria of 3.51 or higher.

Keywords: compulsory education quality development model, desired outcomes of learning, equality, inclusive growth

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1. Introduction

According to the World Bank Group, quality education for all in Thailand has been achieved over the past 25 years as Thailand has achieved significant development in the expansion of basic education and bridging the gap among socio-economic groups through sustained attempts to increase the number of schools and compulsory education. [1]

Compulsory education in Thailand refers to an educational period that is mandated by the government and expected of everyone. In Thailand, students must complete a basic education comprised of nine years: six years of primary school and three years of lower secondary school, consistent with Chapter 2 of the National Education Act B.E. 2542 (1999) and the Amendments (the Second National Education Act B.E. 2545 (2002) [2] regarding educational rights and duties. Section 10 stipulates that in the educational provision, everyone must have the same rights and chances to receive free, public basic education for at least 12 years. On a worldwide basis, such education is provided at both high quality and cost-free.

Since 2008, the Bureau of International Cooperation, Ministry of Education, Thailand [3], referred to the Office of the Basic Education Commission (OBEC), accept a commission to minister and support basic education for all educational age groupings, stipulate everyone access equal basic education, and provide them education based on moral principles, integrated with the sufficiency economy philosophy, and develop the quality and standards of basic education. Thai education reform must place a focus on learners to ensure equal and inclusive growth among learners from outreach villages who faced limitations in accessing quality education in comparison to their urban, ethnically diverse places, the majority of whom were rural. In accordance with the United Nations [4], it would be guaranteed that everyone finished nine years of compulsory education without paying fees by 2030. Moreover, it should be an equitable and quality basic education leading to relevant and desired learning outcomes.

As a matter of fact, the main issue that Thais face is educational inequality throughout the country. The gap in the economic level among Thais is causing widespread inequality. The needs and problems are still not actively addressed to ensure quality education for all. For example, the isolated small schools remaining to be supported the budgets, re-organized the school network for the remote schools, and offered

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training and greater incentives to attract quality teachers since students desired outcomes can be enhanced by improving teacher and school evaluations, etc.

In compulsory educational quality management, it was required to have the same educational administration with a fully integrated system as other institutions. There should be independent management based on the context of the educational institutions and learners' aptitude. The Ministerial Regulation on Educational Quality Assurance B.E. 2561 (2018) [5] stipulates that educational institutions shall provide internal quality assurance systems by setting educational standards. Likewise, National Educational Standards B.E. 2561 (2018) [6] mentioned that the desired outcomes were required by the National Education Administration, which was the attributes of the learners at all levels of educational administration from early childhood education, basic education, vocational education, to higher education. Nevertheless, educational institutions are free to adhere to the philosophies, principles, and visions of educational management, and to correspond to education which consisted of a learner as an innovative co-creator and an active citizen.

As a faculty member in charge of educating educational administrators, therefore, the researcher has recognized the need to conduct research on a quality development model for compulsory education focused on desired outcomes of learning. This refers to measurable achievements concerning what students should know, be able to do, and value as a result of integrating knowledge, skills, and attitudes into learning throughout the curriculum based on equal and inclusive growth. Moreover, it will create opportunities for all relevant parties to develop educational quality in educational institutions that provide compulsory education and other levels.

2. 2. Research Questions

2.1 What is the concept of compulsory educational quality with a focus on the desired outcomes of learning based on equal and inclusive growth?

2.2 What are the needs and problems in the development of compulsory educational quality with a focus on desired outcomes of learning based on equal and inclusive growth?

2.3 What is the quality development model of compulsory education with a focus on desired outcomes of learning based on equal and inclusive growth?

2.4 What are the verified results of the model and a user manual for developing compulsory educational quality with a focus on desired outcomes of learning based on equal and inclusive growth?

3. 3. Research Objectives

3.1 To investigate the concept of compulsory educational quality with a focus on desired outcomes of learning based on equal and inclusive growth.

3.2 To examine the needs, problems, and guidelines for the development of compulsory educational quality with a focus on desired outcomes of learning based on equal and inclusive growth.

3.3 To develop a quality development model of compulsory education with a focus on desired outcomes of learning based on equal and inclusive growth.

3.4 To verify the model and a user manual for developing compulsory educational quality with a focus on desired outcomes of learning based on equal and inclusive growth.

4. Materials and Methods

The research process was divided into four phases as follows:

Phase 1: The investigation of the concept of compulsory educational quality with a focus on desired outcomes of learning based on equal and inclusive growth was divided into two steps: 1) the study of concepts, theories, compulsory educational quality development, and internal quality assurance both domestically and internationally, and 2) the model verification by seven experts selected by purposive sampling. Instruments used to collect the data were conceptual synthesis, discussion issues, and conceptual verification form. The data was statistically analyzed by percentage, frequency, mean, and standard deviation.

Phase 2: Regarding the examination of needs and problems for the development of compulsory educational quality, the respondents were educational institution administrators, acting administrators, or teachers from 364 schools selected by multi-stage random sampling. A questionnaire was used as an instrument. The data were statistically analyzed by percentage, frequency, mean, and standard deviation.

Phase 3: In the investigation, guideline identification, and development of a model and a user manual for compulsory education quality, data sources were from the results of Phase 1 and Phase 2. The key informants, selected by purposive sampling, consisted of 21 school administrators, acting administrators, or deputy directors responsible for academic administration, and teachers from 21 schools with best practice awards, as well as 15 experts participating in an educational workshop. The data were analyzed using content analysis and inductive summarizing.

Phase 4: Regarding the verification of the model and a user manual, key informants were 15 experts in educational quality development and educational administration at various levels, selected by purposive sampling. They attended connoisseurship. The tool used was a form for verifying the model appropriateness and possibility. Content analysis and inductive summarizing were used to analyze the data.

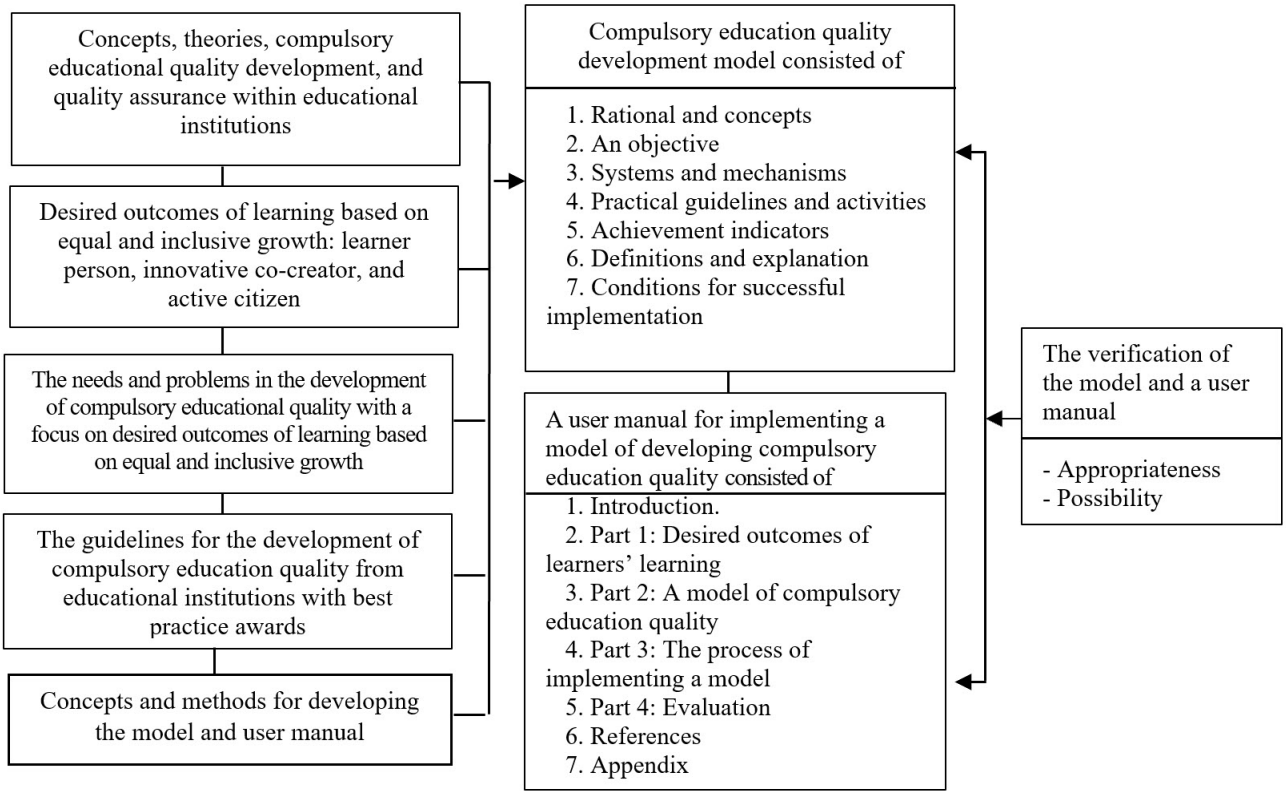

Figure 1: Research framework

5. Results and Discussion

1. The concept of developing compulsory educational quality with a focus on desired outcomes of learning based on equal and thorough growth were divided into 2 levels: both primary and lower secondary levels. There are 5 major concepts, namely, 1) learner persons, 2) innovative co-creators, 3) active citizens, 4) shared values, and 5) virtues, which comprise 17 minor concepts from primary level and 23 minor concepts from the lower secondary level, with the highest level of confirmation results passing the set criteria of 3.51 or higher. Likewise, the National Educational Standards B.E. 2561 (2018) [6] mentioned the required outcomes, which were the desired attributes of the learners from early childhood education, basic education, vocational education, and higher education. Nevertheless, educational institutions were free to adhere to the philosophies, principles, and visions of educational management and to correspond to education standards, which consisted of a learner person, an innovative co-creator, and an active citizen.

Moreover, UNESCO's framework on the factors of education quality comprises five dimensions: 1) learner attributes, e.g., student capacity, diligence, school preparedness, background knowledge, learning obstacles, and demographic factors; 2) contextual influences, including educational resources from the government, family support, national standards, labor market pressures, socio-cultural and religious considerations, and the amount of time available for school and homework; 3) enabling contributions, e.g., teaching and learning resources, infrastructure and facilities, and human resources; 4) instruction, including learning duration, instructional strategies, evaluation, and class size; and 5) outcomes comprised of morals, life skills, literacy, and coding skills. [7]

2. The needs and problems in developing compulsory educational quality were as follows:

2.1 The needs for the development of compulsory educational quality with a focus on desired outcomes of learning based on equal and inclusive growth were overall at a high level. The plan implementation was at the highest level, and the plan preparation was at the lowest, focusing on quality development according to the standards.

2.2 Problems in the development of compulsory educational quality with a focus on desired outcomes of learning based on equal and inclusive growth consisted of six aspects as follows: 1) There was quite small number of study and analysis of laws, national strategies, master plans, subordinate plans, the national education development plan, policy, focus, and goals of their affiliate agencies from the education service area level or higher. 2) There were unclear strategies, policies, and operations, especially on the equal and inclusive growth so it was not able to implement. 3) The school administrators, teachers, and educational personnel had a few operations for creating a quality culture in educational institutes. 4)

The internal educational quality assessment plan was unclear. 5) The supervision and follow-up were discontinuous. 6) Those responsible teams for preparing SAR were inconsistent or incoordinate with those responsible teams for the development of educational quality standards with a focus on learning outcomes.

2.3 The guidelines for the development of compulsory educational quality with a focus on desired outcomes of learning based on equal and inclusive growth consisted of 1) participatory strategic educational management emphasizing career skills, work skills, and life skills; 2) the learning management process which integrates the philosophy of sufficiency economy and active learning through a 4-step Q-P-A-R process; and 3) quality education management according to educational standards based on PLC and PDCA processes.

Similarly, Organization for Economic Co-operation and Development (OECD) [8] analyzed each component of the interaction and the framework to perceive a number of policy dimensions. The results consisted of educational quality outcomes, educational opportunities, educational equal outcomes, educational equal opportunities, sufficiency, including effective and efficient educational resources for investment in education, and the relevance of education policy factors to develop educational outcomes.

Liu, Yao, Zhou [9] revealed that regarding China's education practice, studies on outcome-oriented evaluation are still insufficient; therefore, compulsory education school standardization was taken to construct a model. The remaining studies majorly emphasize the description of standards, principles of construction, methods, and issues, as well as necessity and possibility.

3. A model for developing compulsory educational quality with a focus on desired outcomes of learning based on equal and inclusive growth was named DOLEIG-EQD Model. It consisted of seven components. 1) in terms of the needs for the development of compulsory educational quality focused on desired outcomes of learning based on equal and inclusive growth in terms of plan implementation. 2) in terms of problems consisting of studying and analyzing laws, national strategies, master plans, and subordinate plans, the national education development plan, policy, focus, and goals of their affiliate agencies from the level of the education service area or higher; unclear strategy, policy, and operations, especially on the equal and inclusive growth so it was not able to implement; and the school administrators, teachers, and educational personnel had a few operations for creating a quality culture in educational institutes; the internal educational quality assessment plan was unclear; the supervision and follow-up were discontinuous, and those appointed responsible teams for preparing SAR were inconsistent or incoordinate with those responsible teams for the quality development of educational standards focused on learners' learning outcomes, and 3) in terms of the guidelines for the development of compulsory educational quality focused on desired outcomes of learning based on equal and inclusive growth consisting of 3.1) participatory strategic educational institution management emphasizing career skills, work skills, and life skills; 3.2) earning management process integrates the philosophy of sufficiency economy and active learning through a 4-step Q-P-A-R process; and 3.3) quality education management according to educational standards based on PLC and PDCA processes. All aspects were synthesized to construct a model. The model was named "LIASM-Model" consisted of 7 components as shown in Figure 2:

According to the model, it can be explained as follows:

3.1 Principles and concepts consisted of 1) systematic administrative mechanism (I-P-O-F), 2) internal educational quality assurance, a new concept with integrated cross-disciplinary quality management cycle (PDCAA), 3) transdisciplinary, 4) flexibility and diversity, 5) participation, strong teams, 6) use of data-based and information communication technology (ICT), 7) continuously improvement, before and after reflection (BAR-AAR), innovation development based on cutting differential of students based on the student support system in all dimensions according to the genius and potential of each learner and the area-based context of school and community context.

3.2 An objective was to apply as a guideline for compulsory educational quality with a focus on desired outcomes of learning based on equal and inclusive growth for primary and lower secondary education.

3.3 Systems and mechanisms consisted of the relationship among various parts of the compulsory educational quality development as follows:

1) Input refers to the resources supporting the process, i.e., a quality curriculum focused on outcomes, quality school administrators, quality teachers, learning media, and equal budget for local learners, as well as parents' participation in the development network.

2) Process refers to the procedures of studying the major and minor conceptual frameworks, descriptions, and indicators in all five areas, as well as studying the development guidelines; and constructing instruments to develop and assess learner quality by integrating the five dimensions.

3) Desired outcomes refer to three learners' characteristics according to the National Education Standard Act 2018 as follows: 3.1) learner persons, 3.2) innovative co-creators; and 3.3) active citizens based on morals and sharing values. 3.4) Feedback refers to the information systems and self-assessment reports that meet the determined educational standards according to actual and reliable conditions.

3.4 Practical guidelines and activities consisted of

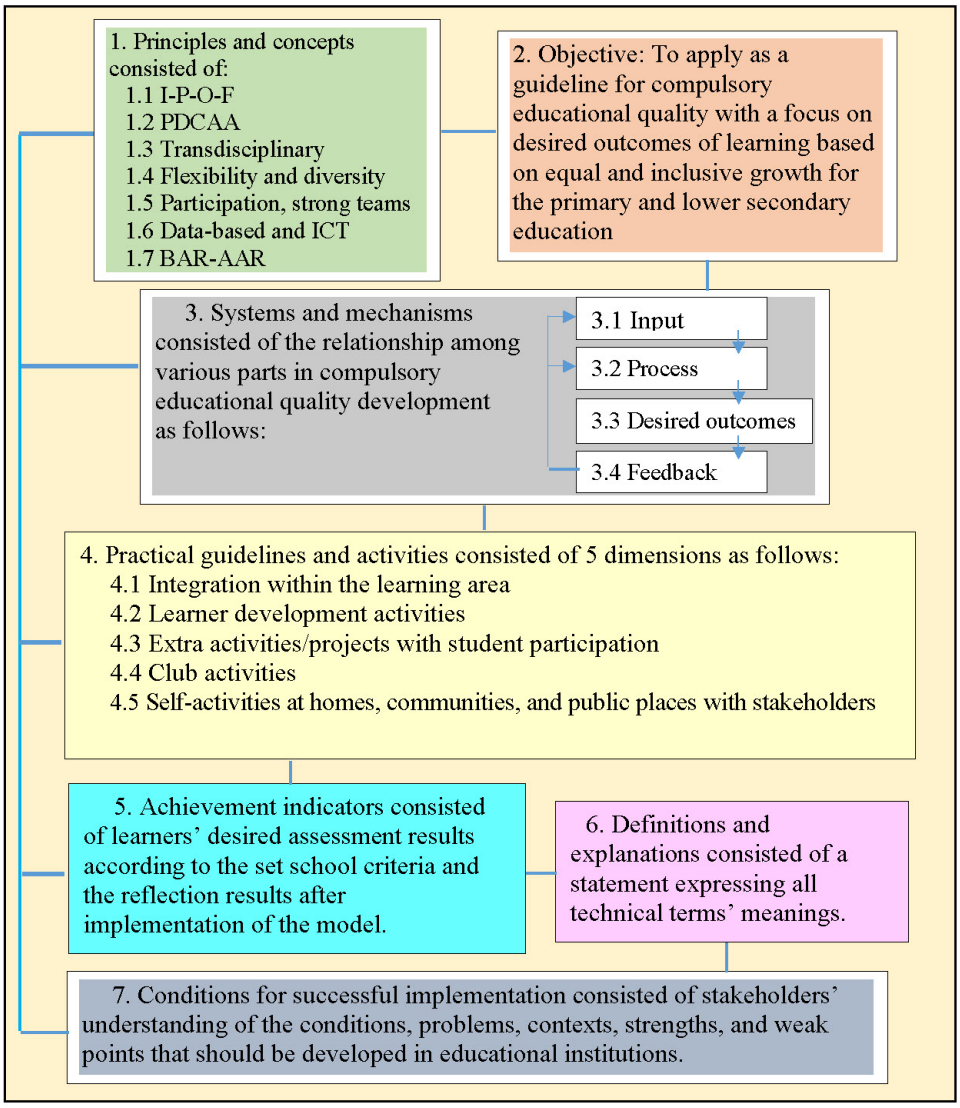

Figure 2: LIASM-Model, a complete model of compulsory education quality development with a focus on the desired outcomes of learning based on equal and inclusive growth.

five dimensions at each level as follows: 1) integration within the learning area; 2) learner development activities; 3) extra activities/projects with student participation; 4) club activities; 5) self-activities at homes, communities, and public places with stakeholders.

3.5 Achievement indicators consisted of 1) learners' desired assessment results according to the school criteria set and 2) reflection results after implementation of the model.

3.6 Definitions and explanations consisted of a statement expressing all technical terms' meanings.

3.7 Conditions for successful implementation consisted of stakeholders' understanding of conditions, problems, contexts, strengths, and weak points that should be developed in educational institutions.

A user manual for implementing a model of compulsory education quality consisted of 1) An introduction to implementing a model, 2) Part 1: Desired outcomes of learners' learning, 3) Part 2: A model of compulsory education quality, 4) Part 3: The process of implementing a model consisted of four steps: preparation, implementation, reporting, and improving, 5) Part 4: Evaluation of implementing a model by the indicators of success, 6) References, and 7) Appendix.

Similar to the findings of Phumphongkhochasorn, Chotientip, Wirat Maneephruek, Nampaponangkul [10], the development of educational quality model and standards according to a new quality assurance framework was established to develop the educational quality and standards by focusing on desired outcomes through research, innovation, academic services, administration, and quality management.

Correspondingly, Poungkaew Puthaprasert [11] revealed that the developing results of the model of work-integrated learning to prepare educational administrators were named "POSO (rca) CDEM" model. It consisted of 8 elements as follows: 1. principles, 2. objectives, 3. a system, 4. operational methods with requirement analysis, combination, and assessment, 5. conditions for achievements, 6. definitions, 7. evaluation, and 8. manual.

In addition, Mitchell [12] indicated that five key components of the development model, appreciation, and usage were as follows: 1) the definition and requirements of the model, 2) the design of the model, 3) the mode of data management, 4) the results from analysis, and 5) continuous feedback and improvement.

4. The verifying results of correctness, appropriateness, feasibility, and utility of the model and manual for developing compulsory educational quality with a focus on desired outcomes of learning based on equal and inclusive growth were overall at the highest level and passed the set criteria of 3.51 or higher.

In line with Phonprasert, Phruitthikul, Teacha [13], it was found that the results of the assessment of the educational quality development of small-sized model schools in the lower northern region showed that the overall feasibility and the utility were at a high level. The results of using the educational quality development system and the manuals demonstrated that the overall utility was at a high level and the preparation of the manuals was correct and suitable at the highest level.

6. Conclusions

From the results of the study, it was found that the quality development model for compulsory education with a focus on desired outcomes of learning based on equal and inclusive growth can be practically applied to the quality development of compulsory education and internal quality assurance in educational institutions. However, this depends on the context and potential of learners, as well as school administrators, teachers, and related personnel.

7. Recommendations

Recommendations for applying the research results are as follows:

1. The educational institutions should designate responsible persons, workloads, activities, tasks, and projects according to the management structure; prepare a calendar of operations; plan, follow-up, monitor, and evaluate the performance, including providing clear documents, evidence, and informing all parties to participate in the process at the start of the annual action plan.

2. The educational institutions should set up a working group to conduct an analytical study related to education and educational institutions, especially the sub-plans of the national strategy and the national education development plan and related issues to be used in determining the standards and target values of educational institutions.

8. Recommendations for further research

1. There should be research on the quality development model with a focus on desired outcomes of learning based on equal and inclusive growth at other educational levels, e.g., early childhood, upper secondary, higher education, vocational education, or non-formal and informal education.

2. There should be research on the quality development model with a focus on desired outcomes of learners in each level of education to support their uniqueness, for example, vocational students or students with unique characteristics. Acknowledgment

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Causal Factors Influencing the Moral and Ethical Development of Early Childhood in the 21st Century

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Abstract

The objectives of this research were to 1) study the causal factors influencing the moral and ethical development of early childhood in the 21st century; 2) develop a linear structural relationship model of the causal factors influencing the moral and ethical development of early childhood in the 21st century; and 3) examine the coherence of the linear structural model of causal factors influencing the moral and ethical development of early childhood in the 21st century. Mixed methodology was used in this research, which was divided into 2 steps. The first step was qualitative research. The sample was 13 experts who were selected by purposive random sampling. The focus group was employed. Qualitative data were analyzed by content analysis. The second step was quantitative research. The population was administrators, teachers, and parents of the kindergarten 3 pupils under the Nakhon Nayok Primary Educational Service Area Office, Nakhon Nayok Province. Simple random sampling was employed to select the sample. The research tool was the questionnaire which used collecting data from 571 persons. Quantitative data was analyzed by the LISREL program. The result showed that:

1. The causal factors influencing the moral and ethical development of early childhood in the 21st century consisted of 3 components: 1) internal factors (IF), including ego and superego to comply with mutual agreement; 2) environmental factors (EF), including care development and raising, learning activities outside the classroom, interaction with others, providing suitable environment, and being a role model; and 3) physical literacy factors (PLF), including motivation and confidence in doing physical activities, physical competence to perform physical activities, knowledge and understanding of movement, and encountering physical activities for life. 2. The results of linear structural relationship model of the causal factors influencing the moral and ethical development of early childhood in the 21st century were similar to the empirical data which examined by the chi-square test at the significant revel level of 0.01 (p=.000). All index consisted of the CFI=1.00, GFI=0.97, AGFI=0.93 met the criteria respectively. On the other hand, the aspects lower than the significance of .05 consisted of the RMSEA=0.042 and SRMR=0.02. 3. The examination of the coherence of the linear structural model of causal factors influencing the moral and ethical development of early childhood in the 21st century revealed that the variables directly influenced the moral and ethical development of early childhood in the 21st century at the significance level of .01. The direct effect variables which developed the moral and ethical development of early childhood in the 21st century were PLF, INF, and EXF with the values equal to 0.50, 0.34, and 0.16, respectively. The indirect effects variables were EXF and INF with the values equal to 0.22 and 0.16, respectively.

Keywords: causal factors, moral and ethical, physical literacy, early childhood.

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1. Introduction

Education management according to the Early Childhood Education Curriculum is an essential part to develop children including physical, emotional, mental, social, and intellectual abilities holistically and balancedly through playing with meaning. This is consistent with functioning of brain, enhancing life skills, parenting children through positive discipline, taking care of children with love, warmth, and generosity, and providing health care, nutrition, and safety with the aim for children to be strong, healthy, having good mood, well behaved, disciplined, self-controlled, and in good relationship with others [1]. Moral and ethical cultivation should begin at the age of 2-6 years old when children begin to have a more rational learning process leading to the development of memory and problem-solving with reasons [2]. Family is the basis for transferring values and preparing children to enter society. For the early childhood development centers, they are responsible to develop social values, attitudes, and expected behaviors [3]. Piaget and Kohlberg, as well as Pulpat [4] believe that teachers play an important role in educating and being a good role model, and they have the ability to create an environment to promote learning and take care of children in order to enhance discipline for children, especially early childhood as the foundation to be a well-disciplined per-

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son living in society. Moral and ethical characteristics should be first cultivated as "self-disciplinary" because it leads to success, achievement, and better goals [5]. According to Mowrer's theory of discipline and Peck and Havighurst's theory of Ethical Motivation or Discipline, it can be concluded that the development of self-disciplinary must be instilled in children from birth. Children will gradually accumulate learning experiences both directly and indirectly from family and society until becoming self-controlled or self-disciplined to act out proper behavior.

Experience management for children must be consistent with their development, maturity, and learning by emphasizing early childhood to authentically practice and learning through the five senses. Especially, learning activities involve movement, exploration, play, observation, discovery, experiment, and solving problems on their own [1]. Learning activities at the early childhood level, therefore, normally organize experiences through a variety of plays by emphasizing learning by doing. Playing helps develop creativity and stimulates the stimuli in the brain to make the brain alert and learn things in the surrounding. If there is inappropriate sensory stimulation, children's brain development will be slower. This affects mood and socialization later on. Consequently, physical movement is an important stimulus for brain development [6]. The sequences of development may be faster or slower depending on the environment, training, and parenting [7]. Children must be stimulated by physical movements or physical activities. There is movement of large muscles and small muscles, therefore, for children to be successful in learning by playing, children must have physical literacy or have knowledge and understanding, be able to move, memorize movement and quality of movement which is appropriate for their ages. This is consistent with Whitehead [8] and Penny Chandler [9] that children are physically literate, have the ability to move, and still have motivation, self-confidence, and ability to adapt to the environment, as well as, creativity, ethics, enthusiast, and responsibility to society.

With the mentioned reason, this research aimed to study "the causal factors influencing moral and ethical development of early childhood in the 21^{st} Century" for the early childhood to learn happily, achieve real learning achievement leading to development according to the potential of being a good citizen, and live happily.

2. Research Objectives

1. To study the causal factors influencing the moral and ethical development of early childhood in the 21^{st} century.

2. To develop a linear structural relationship model of the causal factors influencing the moral and ethical development of early childhood in the 21^{st} century.

3. To examine the coherence of the linear structural model of causal factors influencing the moral and ethical development of early childhood in the 21^{st} century.

3. Material Methods

The research method was divided into 2 steps as follows;

The first step was to study the causal factors influencing the moral and ethical development of early childhood in the 21^{st}century. The research tool was the focus group discussion form and then collecting data from the expert who had experiences more than 5 years in the area of early childhood education, educational research and development, child health care, physical literacy, morality and ethics, and community leaders, totaling 13 persons. Content analysis was employed.

The final step was to create, investigate, and study the effect of the casual factors which affected the development of morality and ethics of early childhood in the 21^{st} century as follows:

2.1 The development of a linear structural relationship model of the causal factors influencing the moral and ethical development of early childhood in the 21^{st} century was based on theory, ideas, and focus group discussion. After that, the model and hypothesis of the development of the linear structural relationship model of the causal factors influencing the moral and ethical development of early childhood in the 21^{st} century were created.

2.2 Examination of the coherence of the linear structural model of causal factors influencing the moral and ethical development of early childhood in the 21^{st} century was based on the results of the survey which used the questionnaire to collect data from 571 administrators, teachers, and parents of kindergarten 3 pupils under the Nakhon Nayok Primary Educational Service Area Office, Nakhon Nayok Province. LISREL program was employed to analyze the data, including 1) investigating the construct validity of the variables which analyzed the correlation coefficient, and 2) analyzing the confirmatory factor analysis of each factor.

Participants

Participants were divided into 2 steps as follows:

The first step was gathering data from the experts who had more than 5 years of experience in early childhood education, educational research and development, child health care, physical literacy, morality and ethics, and community leaders, totaling 13 persons. The purposive random sampling was employed.

The final step was to collect data from the sample which consisted of 129 administrators, 221 teachers, and 221 parents of kindergarten 3 students under the Nakhon Nayok Primary Educational Service Area Office, Nakhon Nayok Province, totaling 571 people, selected by purposive sampling.

Procedure

The causal factors influencing the moral and ethical development of early childhood in the 21st century were examined by studying the concept of related theories regarding early childhood learning through playing. Then, the causal factors were studied by using a structural equation model from documents, textbooks, books, research articles, journals, and the Internet before analyzing and synthesizing to be conceptual framework. In addition, a focus group conversation was conducted by having 13 experts consider causal factors influencing the moral and ethical development of early childhood in the 21st century to formulate a research conceptual framework.

A linear structural relationship model of causal factors influencing the moral and ethical development of early childhood in the 21st century was constructed using the data from concept theory and focus group conversation. The four main components and 14 subcomponents were used to create a questionnaire with 103 questions. The Likert approach was applied to create the 5-rating scale questionnaire. The experts were asked to approve the questionnaire through content validity and the index of item objective congruence that all items were equal to 1.00. Some items were edited from suggestions to be more complete. After that, the questionnaire was tried out with 30 sample who had similarly traits close to the sample and then conducted the reliability test based on Cronbach's alpha. The result was at the value of 0.989. As a result, the certified questionnaire was used to collect the data from the sample for data analysis.

The consistency of the linear structural model of causal factors influencing the moral and ethical development of early childhood in the 21st century was examined. The main components and sub-components of the causal factors was analyzed by affirmative component analysis.

Data analysis

The data obtained from document, concepts, theories, and related research papers both national and international works was analyzed and the conceptual framework of the research was formulated by content analysis.

The general status of the questionnaire respondents including gender, status, age, work experience, educational background, income, and accommodation were analyzed using frequency distribution and percentage.

The appropriateness of the causal factor variables influencing the moral and ethical development of early childhood in the 21st century was analyzed by comparing with a mean criterion. The mean and the standard deviation of the educational institution administrators' questionnaire concerning the opinions toward the main components and sub-components, and the variables of causal factors influencing the moral ethical development of early childhood in the 21st century was equal to or greater than 3.00. Then, the data was interpreted.

The analysis of causal relationship between variables by statistical package program was conducted by analyzing the correlation of the variables. The causal model from the conceptual framework and theory was used to determine whether the data matched the theoretical correlation by analyzing it with the LISREL Model. Data analysis by the researcher was as following processes.

1) The correlation coefficient for each variable was calculated using Pearson's product moment correlation coefficient as a correlation matrix using the KMO (Kaiser-Meyer-Olkin measure of sampling adequacy), and Bartlett's test of Sphericity was implemented to decide whether the data is suitable for the composition analysis method or not.

2) The model identification was decided to specify that the model components approximated to a single parameter. There should be at least 3 observable variables per latent variable, known as the rule of three indicators [11].

3) Evaluation of the data-model fit was conducted to confirm the component model. The chi-square statistic was used to test the statistical hypothesis that the fitting function is zero or the research hypothesis theoretical component model is consistent with the empirical data. The statistically insignificant chi-square (p¿ .05) indicates that the component model corresponds to the empirical data; relative chi-square is the ratio between the chi-square value and the number of degrees of freedom (/ df). In general, if the relative chi-square value is less than 3.00, the model is considered consistent with the empirical data. The statistical value used to measure the degree of fitting value was Adjusted goodness of fit index (AGFI) and Comparative fit index (CFI). AGFI greater than 0.90 indicates that the model is consistent with the empirical data. If the CFI index is greater than 0.95, the model is consistent with the empirical data. There is also a model error indicating the root of Standardized root mean square residual standardized (RMR). If values are less than 0.08, the model is consistent with the empirical data, and if root mean square error of approximation (RMSEA) value is less than 0.06, the model is consistent with the empirical data. To verify the validity of a research hypothesis element model or evaluating the validity of a component model or check the concordance between the elemental model and the empirical data, the researcher considered the following statistical values. If the chi-squared statistic is not statistically significant (p ¿ .05), the GFI index and the AGFI index are greater than 0.90, the CFI index is greater than 0.95, the standardized RMR is lower than 0.08, and the RMSEA is lower than 0.06, it indicates that the model is consistent with the empirical data. To verify the validity of a research hypothesis element model or evaluate the validity of a component model or check the concordance between the elemental model and the

empirical data, the researcher considered the following statistical values. If the chi-squared statistic is not statistically significant (p ¿ .05), the GFI index and the AGFI index are greater than 0.90, the CFI index is greater than 0.95, the standardized RMR is lower than 0.08, and the RMSEA is lower than 0.06, it indicates that the model is consistent with the empirical data. If the statistical chi-square is statistically significant (p ¿ .05), but the relative chi-square is less than 3.00, the GFI index and the AGFI index are greater than 0.90, the CFI index is greater than 0.95, the standardized RMR is lower than 0.08, and RMSEA is lower than 0.06, it indicates that the model is consistent with the empirical data.

4) Regarding the model modification, in case the model is found not to be inconsistent with the empirical data, the model must be adjusted and analyzed. The modification indices (MI) index will suggest which parameters should be added or removed from the model in order to make the model consistent with a large standardized root mean square residual (above 2.00). This large standardized root mean square residual may indicate a problem with the relationship between the observable variable and the latent variable. The researchers need to analyze the revised model with the original data set. The researcher used a group of samples to confirm the developed model, totaling 514 participants.

4. Results

The results of the research framework synthesis to find out the sub-components of the causal factors influencing the moral and ethical development of early childhood in the 21^{st} century were divided into 3 parts as follows:

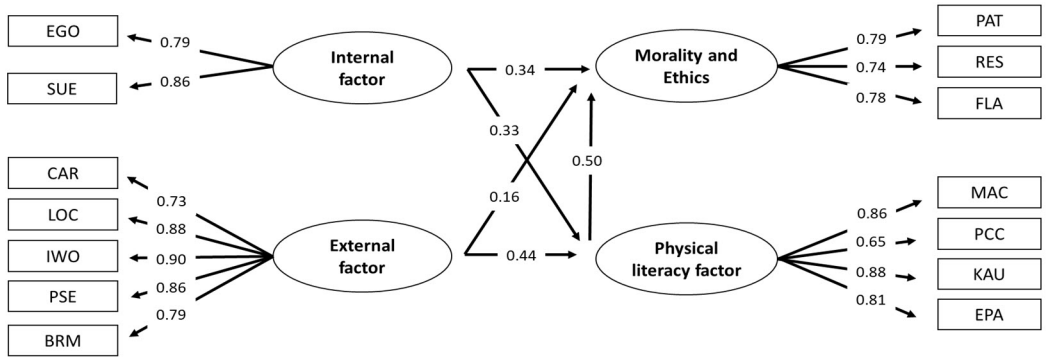
1. The results of the study of causal factors influencing the moral and ethical development of the early childhood in the 21^{st} century revealed that the causal factors are as follows: 1) For intrapersonal factors, the observable variables consisted of ego and superego to comply with mutual agreements. 2) For environmental factors, the observed variables were cares development and raising, learning activities outside the classroom, interaction with others, providing suitable environment, and being a role model. 3) For physical literacy factors, the observable variables include motivation and confidence, physical competence, knowledge and understanding of movement, and encountering physical activities for life.

2. The results of the consistency examination of the linear structural correlation model of causal factors influencing the moral and ethical development of early childhood in the 21^{st} century is showed in the figure below.

According to the Figure, it was found 3 components of causal factors influencing the moral and ethical development of early childhood in the 21^{st} century: 1) Internal Factors (INF) consisted of 2 variables: ego (EGO) and superego to comply with mutual agreements (SUE) with component weight (λ) equal to 0.46 and 0.4. 2) Environmental Factors (EXF) consisted of 5 variables: cares development and raising (CAR), learning activities outside the classroom (LOC), interaction with others (IWO), providing suitable environment (PSE), being a role model (BRM) with component weights (λ) of 0.40, 0.50, 0.52, 0.54 and 0.47. 3) Physical Literacy Factors (PLF) consisted of 4 variables: motivation and confidence (MAC), physical competency (PCC), knowledge and understanding of movement (KAU), and encountering physical activities for life (EPA) with a component weight (λ) of 0.41, 0.34, 0.46, and 0.40. In the moral and ethical components of the early childhood in the 21^{st} century, the model is consistent with empirical data ((χ^2 = 103.76, df= 40 p= 0.00 CN= 425.53, CFI= 1.00 GFI= 0.97, AGFI= 0.93, RMSEA= 0.042, SRMR=0.02). The examination result of the causal factor model consistency influencing the moral and ethical development of early childhood in the 21^{st} century is consistent with the empirical data by considering the absolute index, which the chi-square statistic (χ^2) was 108.33, degrees of freedom (df) was 40, the level of significance was 0.00, the relative chi-square statistic ((χ^2)/df) was 2.71, Goodness of Fit Index (GFI) was 0.97, and Adjusted Goodness of Fit Index (AGFI) was 0.93. The root mean square error of approximation (RMSEA) was 0.042. The Standardized Root Mean Squared Residual (SRMR) was 0.023 and the sample size index (CN) was 425.53, with all statistical values passing, excluding statistical significance level values. This shows that the causal factor model influencing the moral and ethical development of early childhood in the 21^{st} century is consistent with the empirical data.

3. The study results of direct influence, indirect influence, and the combined influence of variables of causal factors influencing the moral and ethical development of early childhood in the 21^{st} century are in Table 1.

According to the table 1, it was found that all variables were positively correlated with the moral and ethical development of early childhood in the 21^{st} century with a statistical significance at the .01 level. In the 21^{st} century, physical literacy factor (PLF), internal factor (INF) and external factor (EXF) were 0.50, 0.34, and 0.16, respectively. The factors influencing the moral and ethical development of the early childhood in 21^{st} century were the external factor (EXF) and the internal factor (INF) with influence of 0.22 and 0.16, respectively. The causal variables on physical literacy factors (PLF), internal factors (INF) and external factors (EXF) had a combined influence of 0.50, 0.50 and 0.38, respectively. The variance rate of the 21^{st} century early childhood moral and ethical (MAE) variable was explained with approximately 81 percent of exogenous causal variables. When consid-



χ^2 = 103.76, df= 40 p= 0.00 CN= 425.53, CFI= 1.00 GFI= 0.97, AGFI= 0.93, RMSEA= 0.042, SRMR=0.02

Figure 1: Results of the consistency analysis of causal factor model influencing moral and ethical development of the early in the 21st century

Table 1. Synthesis of components of causal factors influencing moral and ethical development

Variables	R2	Influence	Casual factors		
			INF	EXF	PLF
PLF	0.51	Direct effects	0.33	0.44	-
		Indirect effects	-	-	-
		Total effects	0.33	0.44	-
MAE	0.81	Direct effects	0.34	0.16	0.50
		Indirect effects	0.16	0.22	-
		Total effects	0.50	0.38	0.50

ering direct influences and indirect influence, it was found that when the latent variable in physical literacy factor (PLF) was the dependent variable in the structural equation. It was directly influenced by the latent variable, which was internal factor (INF), at 0.33. Additionally, it was directly influenced by the external latent variable, which was environmental factor (EXF), at 0.44. About 51 percent of the physical literacy factor variables (PLFs) were explained by external causal variables.

5. Discussion

The results of the study of causal factors influencing the moral and ethical development of the early childhood in the 21st century revealed that the casual factors included internal factors, external factors, and physical literacy factors. Since moral and ethical development has to be cultured from birth until maturity, it is important that the relationship between the infants and the parents or caregiver begins from the raising with love, warmth and parenting, or teaching from caretakers until the characteristics are bonded with satisfaction to follow instruction or develop to become a person with morality and ethics. This is consistent with Mowrer's theory and Bandura's theory that most human learning is learning by observation or imitation through interaction with the surrounding environment and social groups that influence on instilling moral and ethical values that are expected by society to instill and foster imitation from the example in society in children. It is consistent with Rath, Harmin and Simon's theory of values clarification, which stated that the process by which a person clarifies his own ethics, self-awareness, knowledge of others, society, and environment is a way for a person to accept their feelings and self-thinking under given circumstances. This theory believes that the results of this process facilitate thought and action and believe that if a person has the ability to think or express their own feelings and can answer questions or be able to analyze the results of their own behaviors in well expressed manner, it will help a person clarify their beliefs, attitudes, and values fairly and accurately. For the factor of physical literacy, this is one of the factors of children's moral and ethical development of children because the physical development of children changes rapidly according to the rate of physical growth through movement activities, either indoor or outdoor activities to help develop large muscles and small muscles to be strong as well as skills and ability to control the use of muscles fluently and balancedly. Therefore, children should be cared for, nurtured and taught in the right way appropriately according to age and maturity. As a result, children have a good quality of life with physical, emotional, social and intellectual development. Especially, physical development is a development that will enhance confidence in children. A child who reaches full maturity is considered based on the fact that the child has a physical shape, physical ability, and physical performance compared to others as saying, "A good mind resides in a healthy body." This will help the child move

and use the correct posture when growing up. It can be concluded that physical activities are important for the development of learning and skills that are essential for the future survival of children because it is related to development in other areas. It also affects health and overall physical fitness. Physical literacy is a lifelong holistic learning process applied to movement and physical activity comprising body, mind, intellect, and society, and it is essential to help us stay healthy and fulfilled. Physically literacy people are able to integrate their physical, emotional, cognitive, and social abilities to support health and mobility related to the situation and the environment as well. It is consistent with the case study of Whitehead [8] and the Penny Chandler [9] that children who are physically literacy are not only having physically and mentally competent, but they also have motivation and confident without relying on others, and they are able to adapt to the environment, including having knowledge and understanding. This resulted in a variety of development, including creativity, ethics, enthusiasm, and responsibility to society.

The results of the development and consistency examination of the causal factor model influencing the moral and ethical development of the early childhood in the 21^{st} century revealed that the model was consistent with the empirical data. This is because the study of causal factors is conducted by structural equation modeling and related concepts and theories, and researches to be the basis for modeling as conceptual framework for research. The analysis and synthesis of concepts and theory were conducted by analyzing content and generating inductive conclusions through a group discussion process based on concepts, theories and related research. The research tools were created and validated and proved with high quality in terms of content validity. Construct validity and reliability is at high level in each aspect. The LISREL model was then analyzed by examining the empirical data consistent with the developed model. The rapid changes in the world resulted in rapid changes in social sciences and behavioral sciences along with the study of relationships between variables, and it becomes more complicated than ever. Relationship analysis requires a number of mathematical equations. This set of mathematical equations is called "Structural Equation Modeling (SEM), which aims to study the causal relationship model between theoretical latent variables or constructs that are correlated with many variables or used for causal relationship model analysis between latent variables and observed variables thus resulting in the development and coherence of the influencing causal-factor model. Moral and ethical development of the early childhood in the 21^{st} century is consistent with empirical data. This is consistent with the study of Tikul [12] who studied the development of a causal model of self-disciplinary among undergraduate students at Suranaree University of Technology. Multigroup analysis found that the causal model of self-disciplinary was consistent with the empirical data. The variable in the model accounted for 79% of the variance in self-disciplinary and consistent with the study of Nonkaew [13] that the development of a causal model of morality and ethics among high school students showed that a multigroup analysis was directly influenced by environmental variables with statistical significance.

The results of the study on direct, indirect, and combined influence of variables of causal factors influencing the moral and ethical development of the early childhood in the 21^{st} century were that the variables with the highest direct influence were physical literacy factors, followed by the internal factors and external factors. In addition, the moral and ethical development of the early childhood in the 21^{st} century was also indirectly influenced by external factors and internal factors. The findings concluded that the most direct influencing variables on the moral and ethical development of the early childhood in the 21^{st} century were physical literacy, followed by internal factor, and external factor. It was based on the assumption that "Internal factors, external factor, and physical literacy factor affect the moral and ethical development of the early childhood in the 21^{st} century." This is because children who are physically literacy were not only physically and mentally able to move, but they also have motivation and self-confidence without relying on others. Moreover, they are able to adapt to the environment, including the knowledge and understanding resulting in the development of various aspects. In addition, a person who is physically literacy will not only be able to move more effectively, he is also creative, ethical, enthusiastic, and responsible to society. Therefore, the causal factor influencing the moral and ethical development of the early childhood children in the 21^{st} century has the most direct influence, physical literacy factors. The conclusion of this research on this issue is consistent with Sum et al. [14] who studied the effects of continuing professional physical education development on physical literacy knowledge, self-efficacy, and students' learning outcomes. Moreover, teachers' physical literacy and self-efficacy were important factors in effective physical education teaching and to the physical intelligence and participation in physical activities of students. It is also consistent with a study by Brown et al. [15] who considered the state of physical literacy and differences in children's participation in activities. The findings suggested that physical literacy played an important role in shaping the exercise regimen at an early age, and environmental factors influenced the moral development of early childhood in the 21^{st} century. This is consistent with the study of Sribuanam [16] who studied on the development of a causal model of factors influencing student morality and found that the moral variables of the lower secondary students were most directly influenced by the

positive environmental variables in their families.

The research shows that the promotion of childhood development should include physical activities in the form of plays. They will be able to interact with the world around them, overcome fear and obstacles. It helps them to develop new abilities that lead to the confidence and adaptability to handle the new challenges of the 21^{st} century. This is consistent with Penny Chandler [9] that apart from moving efficiency, children with physical literacy are also creative, ethical, enthusiastic, and responsible to society.

6. Conclusions

The causal factors influencing the moral and ethical development of early childhood in the 21^{st} century consisted of 3 components: 1) internal factors (IF) including ego and superego to comply with mutual agreement; 2) environmental factors (EF) including care development and raising, learning activities outside the classroom, interaction with others, providing suitable environment, and being a role model; and 3) physical literacy factors (PLF), including motivation and confidence in doing physical activities, physical competence to perform physical activities, knowledge and understanding of movement, and encountering physical activities for life.

The results of the linear structural relationship model of the causal factors influencing the moral and ethical development of early childhood in the 21^{st} century were similar to the empirical data using the chi-square test which examined by the chi-square test at the significant level of 0.01 (p=.000). All index consisted of the CFI=1.00, GFI=0.97, AGFI=0.93 met criteria respectively. On the other hand, some index was lower than the significance of 0.05, consisting of the RMSEA=0.042 and SRMR=0.02.

Regarding the examination of the coherence of the linear structural model of causal factors influencing the moral and ethical development of early childhood in the 21^{st} century, it was found that the variables that directly influenced the moral and ethical development of early childhood in the 21^{st} century at the significant level of .01 were PLF, INF, and EXF with the values equal to 0.50, 0.34, and 0.16 respectively. While the indirect effects variables were EXF and INF with the values equal to 0.22 and 0.16 respectively.

Conflicts of interest: The authors declare that there is no conflict of interest.

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Influence of Longan Wood Biochar on the Growth of Pure White Hokkaido Sweet Corn and Siamese Ruby Queen Corn

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Abstract

Sweet corn is a cash crop that can be grown all year round, which is considered as one of the causes of soil fertility degradation. Biochar is a highly porous material, able to absorb water and nutrients well. It has the potential to be used as an ingredient in soil improvement. The objective of this study was to investigate the effect of Longan wood biochar on the growth of Hokkaido Pure White sweet corn and Queen Ruby Siam corn. Method: A completely randomized design was conducted by dividing into experimental kits according to the strain of sweet corn. Each strain has a ratio of Longan wood biochar mixed in 0% (control), 5% and 10% of planting material. The results showed that the ratio of longan wood biochar was 10% of planting material which had the higher stem, and higher reproductive growth, and found to have significant differences statistically. Studies revealed that using biochar as an ingredient in planting material can help increase the growth and yield of Hokkaido Pure White Sweet Corn and the Siamese Ruby Queen, as well as reduce agricultural waste. Keywords: biochar, sweet corn, planting material

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1. Introduction

Thailand's northern region is the main source of sweet corn production. There is a variety of sweet corn. Among them are popularly grown sweet corn that can be eaten fresh, which is Pure White Hokkaido originated from Japan, and Queen Ruby Siamese sweet corn originated in Thailand. With its outstanding sweet properties, it is two to three times more sweet than regular sweet corn. However, Thailand's agricultural production is on a downward trend. In particular, the production of sweet corn in Thailand has been the number one export champion in the world for decades. In 2020, Thailand's total production of sweet corn was 498,699 tons, while in 2021, the total production of sweet corn in the country was 494,108 tons (decreased by 4,591 tons). The trend is steadily decreasing [1], mainly due to natural disasters and improper farming behavior of farmers. In addition, it is due to soil degradation. As a result of low soil adhesion, there is leaching of plant nutrients in the soil, leading to soil infertility and unsuitable for agriculture [2]. Compared to other plants, the macronutrient requirements are as follows: organic matter content of more than 3%, phosphorus (available P, Bray II) of more than 20 ppm, and exchangeable potassium (Exchangeable K) of more than 60 ppm.[3]

Therefore, many researchers are trying to devise a method that can help restore the quality of degraded soil suitable for growing crops, namely Biochar [4]. It is a material produced from agricultural waste from annual longan pruning in the northern region [5], which is an important source of sweet corn cultivation in Thailand through the process of thermal decomposition at 350-500 degrees Celsius. Without oxygen, it is called slow pyrolysis [6] until the material is obtained with a very high surface area and porosity (93.36 m3/g), which is a property that can increase water absorption and plant nutrients in the soil [7]. This helps to reduce the leaching of nitrogen in the soil from water by absorbing ammonium ions, so it has the potential to be used as a soil modifier, especially the pH of the soil [8], which is better than using lime in the same ratio[9]. Biochar also helps to store carbon in the soil [10]. With the current biochar efficacy limitations, it also depends on the usage ratio and strain of

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cultivated plants [11].

The objective of this research was to compare the effects of biochar as an ingredient in planting material on the growth of Pure White Hokkaido sweet corn and the Siamese Ruby Queen corn to increase the quality of planting material for sweet corn planting. This experiment provided the optimal biochar ratio for sweet corn. Moreover, the acquisition of biochar is the utilization of agricultural waste and decrease in production costs.

2. How to conduct research

2.1 Experimental planning

The first step of the research was to plan a completely randomized design trial experiment. The Completely Randomized Design (CRD) experiment consisted of 5 iterations with 2 factors: the ratio of biochar and the growth of sweet corn. According to Suksawat et al. [5], the 5% and 10% biochar blends responded to pH changes 10% faster than the 10% biochar blends. Therefore, the ratio of biochar is 0% (control), 5% and 10% of 10 liters of planting material.

2.2 Biochar production

The longan branches were chopped to length 50 centimeters. They left to air dry for a month before being burned in a 200-liter metal fuel tank with a maximum temperature of 550 degrees Celsius for 3.5 hours to make biochar. After that, it was sifted in a sieve with a resolution of 2 mm. The properties of the resulting biochar were pH 7.7-8.0, Phosphorus 124 ppm and Potassium 1100 ppm.

2.3 Planting and care

The experiment was conducted in greenhouse conditions. The plant house was 2.7 x 4 x 3 meters, divided into 3 rows with 1 m spacing between rows and 30 cm spacing between plants. Pure White Hokkaido and Siamese Ruby queen sweet corn was sowed in randomly arranged planting bags. Each planting pack contains three seeds. The seeds were placed in a hole about 3 mm deep and then sprayed water moderately. After that, the plants were watered once a day (approximately 500 ml/plant in the morning).

2.4 Recording of experimental results

The growth of Pure White Hokkaido sweet corn and the Siamese Ruby Queen corn in each batch were then measured. It is based on the principle of morphological change according to the method of Ritchie et al. [12] divided in 2 stage:

2.4.1 Vegetative stage: Next, the plant height, stem diameter, number of leaves, weight above the ground, and root parts of the cultivated corn after 55 days were collected.

2.4.2 Reproductive stage: The length, diameter and weight of corn pods in the shell were collected. Corn pods were harvested after 35 days of full pollination.

2.5 Statistical data analysis

The growth and yield data of Pure White Hokkaido Sweet Corn and Queen Ruby Siamese varieties grown in each experimental batch were calculated such as mean, variance (ANOVA), and statistical differences for comparison using the Duncan's new multiple range test at 95.0% confidence with SPSS Statistics 26.0.

3. Results

3.1 Vegetative stage

The stem and leaf growth of Hokkaido Pure White sweet corn grown in biochar-material in different ratios is shown in Table 1. Height, trunk diameter, fresh and dry weight of 10% biochar ratio has an average of 74.51 cm, 15.39 mm, 155.44 g, and 32.11 g, which are higher 0% and 5% biochar ratios with a significant difference ($p > 0.01$). 0% biochar ratios having an average of 63.84 cm,12.17 mm, 114.07 g, and 19.35 g, respectively, while 5% biochar ratio has an average of 64.86 cm, 12.43 mm, 117.68 g, and 20.58 g, respectively. However, no significant difference was found between leaf number and biochar ratios.

The stem, branches, and leaf growth of the Queen Ruby Siamese sweet corn species grown in biochar-containing planting material in different ratios is shown in Table 2. Height, trunk diameter, fresh and dry weight of 10% biochar ratio has an average of 101.23 cm, 16.50 mm, 216.27 g, and 70.01 g, which is the higher than 0% and 5% biochar ratios with a significant difference ($p > 0.01$). 0% biochar ratios have an average of 75.43 cm, 12.45 mm, 142.70 g, and 44.03 g, respectively, while 5% biochar ratio has an average of 67.93 cm, 12.77 mm, 145.01 g, and 45.42 g, respectively. However, no significant difference was observed between leaf number biochar ratios.

3.2 Reproductive Stage

The reproductive growth of Pure White Hokkaido sweet corn grown in biochar-containing planting material in different ratios is shown in Table 4. There is a significant difference (p¡0.01) with biochar ratios of 0% and 5% with average pod lengths of 13.83 and 14.07 cm, respectively. Corn pod diameter and weight tend to be in the same direction as corn pod length. Sweet corn grown with a biochar ratio of 10% has an average diameter and weight of 39.98 mm and 106.25 g, respectively. There is a significant difference ($p > 0.01$) in biochar ratios of 0% and 5%, with pod diameters of 36.54 and 37.19 mm and pod weight of 61.96 and 62.83 g, respectively. While the length, diameter and weight of corn pods grown with 0% and 5% biochar ratios did not make significant differences.

Table 1. Growth of Pure White Hokkaido Sweet Corn

Biochar Content (%)	Height (cm)	Number of leaves (leaves)	Trunk diameter (mm)	Weight (g)	
				fresh	dry
0	63.84±3.31 b	7.07 ± 7.70 a	12.17 ± 1.25 c	114.07 ± 5.48 b	19.35 ± 1.14 b
5	64.86±2.48 b	7.20 ± 0.68 a	12.43 ± 0.80 bc	117.68 ± 4.46 b	20.58 ± 1.45 b
10	74.51±3.37 a	7.33 ± 0.49 a	15.39 ± 0.58 a	155.44 ± 5.26 a	32.11 ± 2.12 a
F-test	**	ns	**	**	**
C.V. (%)	8.35	8.59	12.80	14.99	24.80

** = significantly different at the 99 % (p<0.01) respectively
ns = Not Statistically Significant
Means with the different letter are significant different test with Duncan's multiple range test

Table 2. Growth of sweet corn varieties of Queen Ruby Siam

Biochar Content (%)	Height (cm)	Number of leaves (leaves)	Trunk diameter (mm)	Weight (g)	
				fresh	dry
0	75.43±2.82 b	7.20 ± 0.56 a	12.45 ± 0.80 b	142.70 ± 5.13 b	44.03 ± 1.95 b
5	67.93±1.81 b	7.40 ± 0.51 a	12.77 ± 0.70 b	145.01 ± 2.68 b	45.42 ± 1.74 b
10	101.23±3.58 a	7.80 ± 0.86 a	16.50 ± 0.83 a	216.27 ± 2.09 a	70.01 ± 2.02 a
F-test	**	ns	**	**	**
C.V. (%)	14.36	9.19	14.29	20.43	22.72

** = significantly different at the 99 % (p<0.01) respectively
ns = Not Statistically Significant
Means with the different letter are significant different test with Duncan's multiple range test

Table 3. Size and weight of Pure White Hokkaido sweet corn pods

Biochar Content (%)	Length (cm)	Diameter (mm)	Weight (g)
0	13.83±0.71 b	36.57±1.53 c	61.96±2.07 b
5	14.07±0.57 b	37.19±1.13 bc	62.83±2.37 b
10	15.45±0.68 a	39.98±1.11 a	106.25±2.06 a
F-test	**	**	**
C.V. (%)	6.58	4.98	25.99

** = significantly different at the 99 % (p<0.01) respectively
ns = Not Statistically Significant
M eans with the different letter are significant different test with Duncan's multiple range test

Table 4. Size and weight of Pure White Hokkaido sweet corn pods

Biochar Content (%)	Length (cm)	Diameter (mm)	Weight (g)
0	13.79±0.560d	41.31±1.05 d	107.61±2.66 c
5	14.33±0.75 b	42.07±1.18 cd	108.43±1.96 b
10	16.21±0.66 a	46.61 ± 1.34 b	139.45±2.31 a
F-test	**	**	**
C.V. (%)	8.22	6.03	12.65

** = significantly different at the 99 % (p<0.01) respectively
ns = Not Statistically Significant
M eans with the different letter are significant different test with Duncan's multiple range test

The reproductive growth of the Queen Ruby Siamese sweet corn strain grown in biochar-containing planting material in different ratios is shown in Table 4. There was a significant difference (p¡0.01) in biochar ratios of 0% and 5% with average pod lengths of 13.79 and 14.33 cm, respectively Corn pod diameter and weight tend to be in the same direction as corn pod length. Sweet corn grown with 10% biochar has an average diameter and weight of 39.98 mm and 145.35 g, respectively. There is a significant difference ($p > 0.01$) in biochar ratios of 0% and 5% with pod diameters of 36.54 and 37.19 mm and pod weights of 110.40 and 128.23 g, respectively. However, no significant differences were found between corn grown with 0% and 5% biochar mixture in length, diameter and weight of corn pods.

4. Discussion

The study compared the ratio of Longan wood biochar to growing soil to the growth of Pure White Hokkaido sweet corn and Siamese Ruby Queen corn. It was showed that both varieties of sweet corns were effectively grown with a biochar ratio of 10% as planting material. The growth of height, stem, diameter, fresh and dry weight were the highest, and there was

a significant difference ($p > 0.01$) from the use of 0% biochar ratios and 5% of planting material. It is consistent with a study by Intanoo and Kongklay [13] which was found that the height and stem size of both eggplant and kale had higher growth than using planting material without biochar as an ingredient. It is also found that the length diameter and weight of both varieties of sweet corn cob corresponds to an increased biochar blend rate. Due to the high porous properties of biochar, the surface area is a gap for air circulation, absorb water and plant nutrients [7]. As a result, the concentration of nitrogen, potassium, iron and zinc are more abundant than planting materials containing no biochar [14]. Watering causes some nutrients to leach away from the planting material. However, biochar is also a source of microorganisms that help break down organic matter from organic matter [15; 16] into smaller molecules into nutrients that plants can use for growth. Microbial activity also contributes to the growth of root length [17]. As a result, the roots have a higher efficiency in the absorption of nutrients, which has a direct influence on the growth of the above-ground parts, including corn pods as well [18]. In [18][18][18]addition, biochar has a low decomposition rate [19] and can be reused to reduce the cost of planting material and help to make good use of agricultural waste obtained from pruning Longan [20; 21].

5. Conclusion

From the experiment of growing Pure White Hokkaido sweet corn and Queen Ruby Siam corn and comparison of the biochar ratio in planting material that affects stem growth and creeping, it was found that the biochar ratio of 10% of planting material gave the best results in terms of stem diameter, fresh and dry weight, aboveground and root parts. The growth stages include length, diameter, and weight of sweet corn pods. Biochar plays an important role in the growth of sweet corn, which is related to the nutrients of the bush and microbial activity. The results show the relationship between biochar content and the growth of sweet corn that can be used as an ingredient to improve planting material quality.

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