RAVTE
Regional Association of Vocational and Technical Education in Asia

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ICT and Digital Technology for Education

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Message from Rajamangala University of Technology Thanyaburi
and
Regional Association of Vocational and Technical Education in Asia

On behalf of Rajamangala University of Technology Thanyaburi and Regional Association of Vocational and Technical Education in Asia (RAVTE), it is my great pleasures to welcome you most cordially in the 5th International Conference on Innovative Education and Technology (ICIET 2020).

I would like to express my appreciation to our distinguished keynote speakers for giving us special lectures, updating us about the latest trends on technology, innovation and educational change today to provide us broader range of advance skills that something we can teach to our students. For them to be able to learn more effectively and equip them with skills when they enter the workforce.

Furthermore, Technology integration truly is an international partnership. In the knowledge economy and information society, teachers and students need to be able to search for, analyze and manage huge amount of information; they also must be able to use that information to solve complex problems and create new knowledge and cultural products. Therefore, the application of information communication technology on innovative education to manage information and solve problem is an important set of skills. Also, various applications of information technology can support the pedagogical changes that are needed to implement new curricular visions.

Subsequently, this colloquium marks another important step in enhancing updated current development trends in the world on how technology dominates every aspect of education and innovation in the digital economy including online learning management and social networking community. Digital economy has a direct impact on our educational systems. This poses a serious challenge to educators around the globe to develop the state-of-the-art learning innovations.

I strongly admit that "Learning innovation is the most powerful tool for every level of education in the digital age"

Finally, I would like to take this opportunity to express my sincere appreciation to all the distinguished keynote speakers, distinguished guests and participants for their valuable contributions that make this conference successful. May I also express my sincere thanks to the Faculty of Technical Education and Universitas Pendidikan Indonesia (UPI) for hosting this event.

My warmest welcome and regards to all.

Asst. Prof. Dr.Sommai Pivsa-art
President, Rajamangala University of Technology Thanyaburi
President, Regional Association of Vocational and Technical Education in Asia

Message from Universiti teknologi Malaysia

السلام عليكم ورحمة الله وبركا ته and Sincere Greetings to All,

It is my pleasure to welcome all of you to the 5th International Conference on Innovative Education and Technology (5th ICIET 2020). I would also like to congratulate the Faculty of Technical, Rajamangala University of Technology Thanyaburi, Pathurn Thani, Thailand for the great efforts in planning and organizing this conference.

ICIET is one of the platforms to build a global network, improve collaboration and initiate sharing of ideas in research with the aim to improve the quality of education, mainly on Innovative Education and Technology (ICIET) and other related issues in education.

Malaysia has embarked on various initiatives to propel the country towards its goal of becoming a high income nation and developed economy by 2020. The cornerstone of this aspiration is the availability of highly skilled human capital. In this context, ICIET plays a pivotal role in providing skilled workforce to fit the demand for the country's economic transformation.

The Tenth Malaysia Plan (RMK-10) for the period from 2011 to 2015 showed a significant change in the system of education and technical and Vocational Training in Malaysia. The goal is to provide creative, innovative and skilled human capital in the 21st century towards the economic prospects of the plan and the strategic direction of the country. Pool of ideas and strategies on the basis of achievement and improvement in foreign countries such as Korea and Germany as well as the results of research that have been done by scholars in the country will be able to propel Malaysia to continue to stride forward to compete in the global market. Hence, this conference, provides an opportunity for students and participant in particular to discover their creative and innovative talents in the world of research and sharing of knowledge in order to contribute to the development of academic, social and economic situations. This is also a platform for the university in the country to find creative solutions for improvement in technical and vocational education and training in Malaysia. The results presented in the conference should be used as a reference for continuous improvement in TVET. That is to say, this should not be a mere paper presentation.

Therefore, this conference is an opportunity for academicians from local and international institutes of higher education, postgraduate and undergraduate students from various disciplines in ICIET to present, share, exchange opinion and discuss research ideas to promote Innovative Education and Technology. As co-organiser, this conference is one of the significant contributions of Rajamangala University of Technology Thanyaburi, Thailand in ensuring that the national agenda to become a high income country will be a success.

I sincerely hope that this conference will achieve its objectives in providing a platform for researchers in ICIET to share research findings, knowledge and latest development in ICIET.

Thank you.

Prof. Datuk Ir. Dr. Wahid bin Omar

Vice-Chancellor, Universiti Teknologi Malaysia

Message from Universitas Pendidikan Indonesia

First and foremost, let us praise to Allah, the almighty and the most merciful God, for His love and affection so we can be together present in this occasion, the 5th International Conference on Innovative Education and Technology (ICIET) 2020.

As the Rector of *Universitas Pendidikan Indonesia* (Indonesia University of Education), I would like to welcome all invited speakers, distinguished guests and presenters as well as honorable all participants of the International Conference on Innovative Education and Technology (ICIET) 2020.

Universitas Pendidikan Indonesia (UPI) with its vision to be a leading and outstanding university in education, is committed to encourage all the members to create academic atmosphere and develop academic activities to realize the vision as well as the mission of UPI through integrating knowledge and skill across various fields and activities, either individually or collaboratively.

In this occasion, I would like to congratulate all of you and let you know that I get a great honour to extend to all of you a very warm welcome to the joint conference with RMUTT Thailand, UPI Indonesia, UTM Malaysia and National Pingtung University of China.

Since 2017 UPI has formed a partnership with this conference. I would like to thank RMUTT for choosing UPI to be the co-host of the conference.

UPI is a member of the Regional Association of Vocational and Technical Education in Asia (RAVTE), so this collaboration cemented the university's role in the development of TVET. It is an opportune time for all of us to renew contacts and discuss problems of mutual interest in the field of Technical and Vocational Education and Training, Innovation and Engineering Education, Social Sciences and Humanities, General and Applied Sciences, Educational Pedagogy and Methodology with fellows across the globe.

I am pleased that as a part of the joint conference series, this conference has successfully brought together actors of the global TVET sector for exchange of knowledge and examples of good practice of collaboration in TVET at all levels. We all are proud that having done so and this conference has been a role model for other conferences.

Finally, I would like to express our heartfelt thanks to the Scientific and Organizing Committee for enabling this to take place and to everybody who comes to this conference. To all the participants, please enjoy the valuable occasion. I wish we will have a very productive and successful conference.

Thank you

Prof. Dr. M. Solehuddin M.Pd., M.A
Rector of Universitas Pendidikan Indonesia

國立屏東大學
National Pingtung University

Message from National Pingtung University

On behalf of National Pingtung University, I sincerely congratulate all the participants on successfully contributing expertise in different field in the 5th International Conference on Innovative Education and Technology (ICIET2020). Especially, I would like to thank the host university, who makes a lot of efforts to organize this excellent event to let outstanding scholars from many places joining together under pandemic condition. I hope this conference makes every participant and unforgettable time I strongly believe that our closed collaboration makes the conference prosperous and may the result extend to your university, faculty members and students.

Once again, I wish our friendship through this event last forever
Congratulations to everyone and welcome to NPTU, Taiwan.

Prof. Dr. Mike Y. K. Guu
President, National Pingtung University

CONTENTS

Living Between Two Worlds

A Systematic Review of Twice Exceptional (2e) Learners

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Abstract— Twice exceptional (2e) learners are an extremely unique and rare population. They are students who possess both extraordinary ability and show disability in one or more areas simultaneously. Despite their high potential, 2e students have difficulties in areas such as socio-emotional development (as seen in students with autistic spectrum disorder or ASD), adaptive behaviors (as seen in students with attention deficit hyperactivity disorder or ADHD) and learning skills (as seen in students with specific learning disability or SLD). As such, they are caught in the middle of the world of "giftedness" and the world of "disability"; yet, numerous studies have found that 2e students neither felt belong in the former nor the latter world. Using systematic reviews as research methodology, this study aimed to identify emerging themes from empirical studies on gifted students with learning disabilities. Upon reviewing empirical research published in five databases (i.e., SCOPUS, PsycINFO, ERIC JSTOR and Web of Science) from 2010 to 2019, 37 studies were found to meet the selection criteria. Four themes emerged from content analysis: identification practices, cognitive and achievement profiles and learning characteristics, self-perception and life experiences, and support from significant others. Implications for practice to support 2e students are discussed.

Keywords— twice exceptional learners; twice exceptionality; gifted students; learning disabilities; systematic review

I. INTRODUCTION

General perceptions about gifted students are that they are high achievers and well-adjusted socially; however, there are gifted students who are underachieved due to coexisting disabilities [1]. This special group within the gifted population is generally referred to as "twice exceptional" or "2e" students and is defined as students who demonstrate "…extraordinarily abilities and talents as well as the challenges they encounter in learning, attention, and behaviors…" (p. 217) [2]. Twice exceptionality can be categorized in to several sub-groups based on types of disability, such as giftedness with specific learning disabilities (SLD), giftedness with Autism Spectrum Disorder (ASD), giftedness with Attention Deficit/ Hyperactivity Disorder (ADHD) or Attention Deficit Disorder (ADD), and giftedness with Behavioral and Emotional Disorder (EBD) [3]. With combination of giftedness and disability, these students are neither viewed as being truly gifted nor disabled. Hence, they are caught in the middle of the two worlds – one with a focus on the elevation of high abilities and the other on remediation of deficit [4]. They remain hidden within the general education population, generally being viewed by teachers as underachievers or average learners [5]. Even though interest in this special sub-group has been increasing over time [6], research on twice exceptionality is scarce and scattered in comparison to other groups of special education population. The present study attempted to bridge this gap by conceptualizing the existing body of knowledge on gifted students with learning disability (GLD). Specifically, it sought to systematically review empirical studies published in educational databases over a ten-year period in order to identify emerging themes from existing literature on gifted students who had specific learning difficulties related to basic literacy and numeracy skills.

II. LITERATURE REVIEW

The awareness of twice exceptionality has been raised in the U.S. as early as 1975s by the Council for Exceptional Children with an aim to push for professionals to recognize and respond to the unique nature and diverse needs of GLD learners [6]. Representing approximately 2% - 7% of the special education population [7], GLD learners are among the most underserved students in schools [8].

Gifted individuals are defined as "students, children, or youth who give evidence of high achievement capability in areas such as intellectual, creative, artistic, or leadership capacity, or in specific academic fields, and who need services and activities not ordinarily provided by the school in order to fully develop those capabilities" [9]. The identification of giftedness generally relies on intelligence tests (IQ tests); however, the full-scale cutoff score ranges from 120 to 130 or above (on tests that have a standard score of 100 and standard deviation of 15 [10]). Some researchers proposed that the cutoff

score used to identify GLD students should be less stringent given that their giftedness might be masked by their deficits [6].

Students with learning disabilities are referred as those who displayed a severe discrepancy between their intellectual abilities (as assessed by an IQ test) and their academic achievement (as assessed by an achievement test) resulting in their academic performance being inconsistent with their cognitive ability [9]. Diagnostic criteria devised by American Psychiatric Association (i.e., DSM-5) detailed that specific learning disorder is demonstrated by difficulties in learning and using academic skills [11]. These deficits can be manifested in three domains: (1) reading/ dyslexia (i.e., word reading accuracy and fluency, recognizing means of words or texts, reading fluency, or reading comprehension), (2) written expression (i.e., spelling, grammar usage, or composition), and (3) mathematics/ dyscalculia (i.e., number sense, memorizing arithmetic facts, calculation accuracy or fluency, or mathematic reasoning). These learning deficits are not caused by intellectual disabilities, visual or auditory problems, mental or neurological disorders, psychological or socio-emotional difficulties, lack of ability in language that is used in schools, or insufficient exposure to education [11]. Among students receiving special services, over 50% had specific learning disabilities [12].

There are two major approaches to the identification of GLD students. First, the ability-achievement approach, which is a traditional and most predominant approach, compares a student's cognitive ability (i.e., a full-scale IQ score) to his achievement/ performance in a subject area (i.e., a domain score from an achievement test) [8]. The observed discrepancy between cognitive ability and performance (generally with performance being 1 to 2 SD below cognitive ability) dictates the 2e status [8],[9]. This approach has been criticized as a "wait-to-fail" approach given that students have to exhibit low performance relative to their intellectual ability prior to receiving individualized learning support [8]. In addition, there is still a debate whether the ability-achievement discrepancy criterion should be relative (i.e., impairment relative to a student's IQ) or normative (i.e., impairment compared to other students or a normative sample) [9]. Two dyadic observations can be made from this debate. One, students who were identified using the relative ability-achievement discrepancy criterion would be allowed to receive individualized learning support despite their weaknesses being average or above average in comparison to the norm; or their disability is not recognized or remediated because their score is not low enough for special education services [10]. Second, GLD students who were identified by the normative ability-achievement discrepancy criterion are rare [8] because of the "masking effect" where their disability is compensated by their superior intellectual ability [12]. The "masking" mechanism prevents teachers to see GLD learners' learning difficulties [13],[14]. Another possible, albeit contrasting, scenario is that potentially gifted students with learning disabilities visible to teachers are not identified as gifted; therefore, not considered a candidate for a program for gifted students [2],[15].

The second approach to the identification of GLD students is Response to Intervention (RtI), which is considered an alternative approach to screening 2e students in inclusive classrooms [16],[17]. In contrast to the ability-achievement approach where psychologists take charge in the identification process, RtI allows teachers to continuously monitor at-risk students throughout the school year using a multitiered assessment system [8]. Classroom teachers use curriculum-based instructions followed by assessments (tier 1). Those who perform below grade level are given small group instructions in the areas of need (tier 2). After receiving instructions, those who continue to struggle receive individually tailored interventions and support (tier 3) [5],[16]. Despite its promising philosophy, the use of RtI to screen GLD students has been criticized [8],[16]. Similar to the ability-achievement approach, RtI is challenged by the masking effect [8],[17]. Without scores from nationally normed standardized tests (e.g., individual IQ tests), it is more likely that GLD students appear average in grade placement because their learning deficits are masked by superior cognitive ability and vice versa. Therefore, they are rarely referred to either special education services or gifted education programs [15],[18].

GLD students are found to show strengths in higher order thinking skills, metacognitive skills, abstract reasoning and problem-solving skills, and divergent thinking skills [4]. They demonstrated advanced vocabularies and strong spatial skills. However, they generally exhibit inferior basic processing skills, resulting in poor performance in tasks that require basic skills (e.g., decoding and spelling) [5]. Their short-term and long-term memory is generally weak, which hinders the ability to memorize simple facts or information [14]. Because of the processing deficits, they may appear to think and work slowly and lack organizational and study skills [5]. Their fine and/ or gross motor skills are not well-developed causing poor hand-writing, clumsiness, and problems completing writing tasks [5]. The coexistence of giftedness and disability in GLD students not only affect their learning skills but also their psychological well-being. They had low self-esteem, were confused about their identity, and avoided school tasks [5]. Frustrations with school are expressed by anti-social behaviors and inappropriate behavioral responses such as anger, withdrawal, or denial of problems [1].

III. Methodology

This study employed a systematic review as research method. It aimed to survey existing empirical research from 2010 – 2019 from five academic databases in order to systematically analyze research findings on GLD students.

There were three stages in the selection and exclusion of samples as follows:

Stage 1: Search procedures. Five most prominent electronic databases in social sciences, humanity and education,

which were SCOPUS, PsycINFO, ERIC, JSTOR, and Web of Science, were searched. Articles included in this review were those published in academic peer-reviewed journals and were published between 2010 and 2019. They can be either quantitative or qualitative studies and had to be written in English. Upon database searches, the following keywords were used in combination: "twice exceptional", "2e", "gifted", "learning disability", "specific learning disability" and "gifted learning disabled". All the keywords were used to searches of the title and abstract to limit irrelevant entries. This process yielded a total of 1,259 hits.

Stage 2: Study selection. To ensure that relevant studies were selected, they were filtered by screening abstracts and full text, to determine whether they addressed the topic of GLD. Studies whose subjects were not in grade schools and those without methodological information and/ or empirical findings were excluded. Studies that were not available online or not accessible were also eliminated. This procedure resulted in the exclusion of 1,186.

Stage 3: Elimination of duplicated entries. Duplicated entries were excluded. This resulted in 37 relevant studies for analysis.

IV. Results

Upon reviewing empirical research from 2010 - 2019 from five academic databases, 37 studies were found to satisfy the selection criteria. Results are presented in two parts; demographic analysis and thematic analysis.

A. Demographic Analysis

Data was quantitatively analyzed based on year of publication, journal, research methodology, and country where research was conducted. Within the span of 10 years, the year 2015 had the largest number of publications on GLD (n=9), followed by 2010 (n=6), 2013 (n=5), and 2014 (n=4). Other years had three publications or less on twice exceptionality. The larger number of publications were evident in 2015 and 2013 because of special issues on twice exceptionality in Gifted Child Today and Gifted Child Quarterly, respectively.

From Table I, the top three academic journals with the highest number of publications about GLD were Gifted Child Quarterly (n=12), followed by Roeper Review (n=7), Gifted Child Today (n=3), and Journal for the Education of the Gifted (n=3). It is interesting to note that these journals are top-tier journals that provide content that targets giftedness and talent development specifically.

In terms of research methodology, quantitative research method (n=18) and qualitative research method (n=17) were employed relatively equally. Two studies used a mixed method research design. Not surprisingly, more than half of the available publications were conducted in North America (n=24), followed by Australia (n=3), Singapore (n=3), and The Netherlands (n=2). Other countries (i.e., England, Hong Kong, Taiwan, Japan, and Jordan) had published one manuscript each.

TABLE I. Number of Publication By Journal (N=37)

Journal	No. of publications
Gifted Child Quarterly	12
Roeper Review	7
Gifted Child Today	3
Journal for the Education of the Gifted	3
Journal of Advanced Academics	2
Journal of Learning Disabilities	2
Annals of Dyslexia	1
Gifted and Talented International	1
Interdisciplinary Journal of Teaching and Learning	1
International Journal of Educational Research	1
International Journal of Science Education	1
Journal of Psychoeducational Assessment	1
Learning and Individual Differences	1
The Journal of Educational Research	1

B. Thematic Analysis

Data from 37 publications were qualitative analyzed and classified into themes based on their research objectives and major findings. Four distinctive but related themes were discovered: (1) identification practices, (2) cognitive and achievement profiles and learning characteristics, (3) self-perception and life experiences, and (4) support from significant others. Table II shows themes and sub-themes of the thematic analysis.

TABLE II. Themes and Subthemes

Themes (n)	Sub-themes
1. Identification practices (7)	1. Criteria for identification in the traditional approach 2. Alternative identification procedures
2. Cognitive and achievement profiles and learning characteristics (7)	Cognitive and achievement profiles in reading ability, written language ability, mathematics ability and science learning styles
3. Perception of self and life experiences (12)	1. Self-concept and self-perception 2. Life experience narratives
4. Support from significant others (11)	1. Support in the home context 2. Support in the school context

Theme 1: Identification practices

Seven publications were dedicated to examine identification practices for the GLD population. Data from this theme was categorized into two sub-themes, which were (1) criteria for identification in the traditional approach (n=3) and (2) alternative identification procedures (n=4).

The first sub-theme, criteria for identification in the traditional approach, involved issues around identification criteria based on the ability-achievement discrepancy model

[9],[19] and underrepresentation of giftedness in the LD population [5].

In practice, a variety of identification criteria were used to identify GLD [9]. For giftedness, the most common cutoff was 120, followed by 125 and 130. Some studies used Full-Scale IQ (FSIQ) while others used either verbal composite scores (VIQ) or performance composite scores (PIQ). For learning disabilities, both relative ability-achievement discrepancy model (i.e., achievement relative to own IQ) and normative ability-achievement discrepancy model (i.e., achievement relative to other students) were adopted. It was evident that GLD students' achievement scores were in the average range (i.e., scores between 93 and 112) indicating that they might not have learning impairment when comparing to the normative sample. Therefore, it was suggested that the use of normative ability-achievement discrepancy (i.e., a cutoff of a standard score of 85) was deemed a suitable criterion to identify learning disability. However, a large-scale study [19] proposed that using the 1.5 times the standard error of estimate of observed-score discrepancy allowed for the identification of the largest number of potentially GLD students. Therefore, it was recommended that a school-wide identification model be initiated. Students are screened using potential giftedness indicators (i.e., high verbal reasoning, or spatial ability, or high achievement in one or more areas), followed by an application of the ability-achievement discrepancy criterion to examine possible twice exceptionality. Then, students who perform at or below grade level despite above average performance are assessed using normative criterion. Finally, possible GLD students will be further evaluated using psychoeducational procedures to determine if individualized education plan (IEP) and/ or enrichment activities are required [19].

The issue of underrepresentation of giftedness among learning disabled students was presented in a large-scale study of 11,337 students with disabilities [5]. There was evidence of high academic ability (i.e., scored at the 90th percentile or higher on an achievement test) among subjects who were identified as having special needs (N=330). Within this potentially gifted group, only approximately 11% participated in programs for academically advanced students. Therefore, a large number of disabled students who had high achievement scores did not have educational services appropriate for their learning needs. In particular, in comparison to students with visual, hearing, and speech impairments, students with learning disabilities were less likely to score at the 90th percentile or higher in the achievement test. As such, potentially GLD learners were more likely to be overlooked as candidates for a program for the gifted because of their lower achievement scores [5]. These findings posit a caution of using a single measure to identify a GLD student which may cause underrepresentation of GLD students in gifted and talented programs.

Journal articles on the second sub-theme discussed identification procedures that can be alternatives to traditional method. Dynamic assessment [20], conceptually similar to RtI [17], is an identification practice that is "… an interactive approach to conducting assessments within the domains of exceptional (e.g., gifted, dyslexic) and nonexceptional learners that focuses on the ability of the learner to respond to intervention" (p. 129). It is carried out by a "test-intervene-retest" method, in which students, regardless of their ability level, are given assistance to complete a task. Teachers observe the change in students' learning potential and cognitive processes in response to the intervention provided. Using dynamic assessment with primary schoolers, a significant progress in mathematical problem-solving ability was observed, indicating that the student participants profited from the instruction they received in the intervention phase. Consistent with other studies, students who were mathematically gifted with learning disabilities did not perform in the superior range with the overall school achievement scores ranged from 67-100% (M = 82.5%). This score did not place them in the top 5% of the school population which showed that twice exceptional students' achievement was adversely affected by their learning disabilities and that their mathematic precocity was masked by their language disabilities [20].

Apart from alternative identification procedures, research has emphasized the use of multidimensional assessment in identifying GLD students. Multidimensional assessment, in which psychometric test scores were used together with data from various sources, was advised [21]. Such sources included intelligence test scores; information from parents about medical, familial, physical, psychosocial backgrounds; information from teachers about student's work, school performance, and work habit; and scores from standardized tests and other informal assessments. Even though data from psychometric test scores allow for an understanding of their cognitive profiles, the use of other sources add in-depth information about the child's internal and external context which is necessary to plan and develop appropriate teaching strategies in response to his learning needs. The use of multidimensional assessment was emphasized by an identification process for potentially gifted preschoolers [22]. The proposed comprehensive identification process had three stages. Stage 1 (Screening I) employed such instruments as checklists of gifted traits by parents and teachers; interviews with parents; observation on children's behaviors and characteristics; and group intelligence test. Those who showed high potential from Stage 1 were progressed to Stage 2 (Screening II) in which an individual intelligence test (i.e., Wechsler Preschool and Primary Scale of Intelligence – Revised; WPPSI-R) was administered. Students who scored at or above the 93th percentile on either the PIQ, VIQ, or FSIQ were admitted to the next stage. Stage 3 (Identification) involved in-depth, structured observations during a 5-day enrichment program where the use of high-level thinking, traits of giftedness and talent, and social adjustment abilities were assessed. Children participated in the enrichment program were given tasks assessed their problem-solving ability in six domains of intelligence based on the theory of multiple intelligences, including logical–mathematical, linguistic,

naturalistic, musical, spatial and bodily-kinesthetic. It was believed that a more comprehensive approach to identification would better serve the learning needs of young children regardless of their talent areas, disabilities, socio-economic status, or cultural backgrounds. Overall, children showed progress in their problem-solving abilities as evident from the use of more advanced problem-solving types. They displayed favorable cognitive characteristics such as intellectual curiosity, task commitment, and openness to challenging tasks. Positive peer interactions and adaptability to a new environment were also observed. Findings also revealed that a number of preschoolers who were previously identified as having learning difficulties (e.g., hearing impairment, autism/ Asperger's, visual impairment, ADHD, and dyslexia) showed advanced cognitive and problem-solving abilities. With these 2e students' "gifts" being observed and identified, the three-stage identification process and multiple assessment tools had proven to discover learning potential and specific talent areas for children despite their disabilities.

Theme 2: Cognitive and achievement profiles and learning characteristics

Publications in this theme examined profiles of GLD students, particularly on their cognitive abilities, achievement patterns, and learning styles. There were seven publications that specifically examined cognitive and achievement profiles of gifted students with dyslexia [4],[12],[13],[14],[23], gifted students with written expression [4],[8], and gifted students dyscalculia [4],[13]. One study investigated GLD students' learning styles in a science classroom [24]. Comparisons were made between the performance of GLD students and that of LD students [4],[14],[16],[23], average ability students [14],[24], academically gifted (GT) students [4],[13],[14], and other groups [4],[8],[23].

Overall, data from achievement tests revealed a consistent pattern. The GT group had the highest score (in the above average to high average range) followed by the GLD group (in the average range) and the LD group (in the below average range) [4],[19]. Performance on higher level processing demand tasks (e.g., phonological processing, reading comprehension, written expression, and application of math concepts) of the GLD group was comparable to that of the GT group. However, distinctive cognitive profiles were obtained by comparing reading, writing and math scores among the GLD sub-groups [4]. For examples, GLD students who had reading difficulties performed in the above average range in both writing and math; and GLD students who had deficits in mathematics (with or without a reading or writing disability) were above average in Reading, Decoding, and Reading Fluency. Therefore, unlike students with LD who displayed average performance across academic subjects, the GLD students had specific areas of weakness. GLD students who displayed difficulties in reading, writing, and math exhibited deficits across all three academic domains had scores similar to those of LD students [4].

Cognitive profiles of GLD students who were dyslexic were generally similar to those of LD/ dyslexic students in terms of their areas of deficits/ weaknesses (e.g., Phonological Awareness and Rapid Automated Naming) and those of GT students in their strengths (e.g., Verbal Short-Term Memory, Working Memory, grammar, and vocabulary) [14],[23]. From these findings, GLD students' literacy performance were in between that of LD and average ability students; their performance may be below average but not necessarily the lowest in their cohort [12]. However, their achievement was lower than anticipated on the basis of their intellectual capacities [14]. The strengths in general language skills (e.g., grammar and vocabulary) may be used to compensate for the deficits. Therefore, their struggles in reading and spelling were masked by superior verbal reasoning resulting in dyslexia being undetected [14].

An incongruent pattern of literacy ability is also evident among GLD students with written expression deficits. They showed significantly higher scores on verbal cognitive ability than on written language performance [8]. Specifically, they displayed difficulties in writing fluency, processing speed, and fine-motor functioning. These areas of difficulties contributed to the written language performance in that fine-motor functioning inhibited GLD students to enjoy practicing writing and engaging in tasks involving written expression [8].

In terms of learning styles, 2e students (i.e., GLD, ADHD, and high-functioning autism) preferred "spontaneous style", which was characterized by having high scores on creative competence in science but low scores on general competence in science and competence in natural science, whereas average ability students preferred "solid style", which was characterized by having high scores on general competence in science and competence in natural science but low scores on creative competence. The spontaneous learning style, which was subscribed by the 2e group, is regarded as a creativity-driven learning style. This is congruent with the higher-level thinking repertoire of 2e students [4].

Theme 3: Self-concept and life experiences of 2e students

Twelve publications examined the inner world of 2e students. These studies were categorized into two sub-themes: (1) self-concept and self-perception (n=5) and (2) life experience narratives (n=7).

For the first sub-theme, self-concept and self-perception, studies collected data from teachers and parents [25],[26], and from 2e students [25],[26],[27] using semi-structured interviews [25],[26],[27], a self-report measure of self-concept [28], demographic questionnaires [26],[28], or secondary data on adolescent well-being [29]. These studies collected data on self-concept and self-perception of gifted students who had LD [26],[27],[28],[29], EBD [27], ASD [28], ADD/ ADHD [26],[27], and/or physical disability in visual and auditory disorder [25],[27]. Student subjects were in primary

[28], secondary [25],[26],[28],[29], or postsecondary [26] schools.

From an analysis of content, it is worth noting that the majority of the studies in the self-concept sub-theme put an emphasis on factors that influenced self-concept rather than on self-concept scores per se. Interestingly, four studies that specifically investigated self-concept of 2e students [25],[27],[28],[29] yielded conflicting findings. In one study, 2e students reported to have high academic self-concept [27] whereas another study found that the overall self-concept profiles were in the average range [28]. Other studies found less positive self-concept of the 2e subjects in comparison to the gifted counterparts [25],[29].

Factors that influence the inflation and deflation of self-concept of 2e students could be categorized into two types: intrapersonal and environmental factors. Several studies have described intrapersonal factors that positively influenced the self-concept and self-perception of 2e students [25],[26],[27]. Focusing on academic strengths, rather than on deficits, was one of the most recurring narratives given by 2e students. They understood that their disabilities were unrelated to a lack of intelligence [26]; therefore, they felt empowered to aim high and find educational and professional aspirations that suited with their areas of strength [26],[27]. With the recognition of their strengths, they deliberately devoted their time and effort to interact with subjects of high achievement and interest to boost their confidence [25],[27] and redeem their self-esteem from being called "lazy" or "stupid" [26]. This profound sense of self-understanding resulted in them instigating changes for self-improvement, such as goal setting, developing coping strategies, and advocating for themselves [26]. However, there was evidence of a negative intrapersonal factor (i.e., denial of the 2e status) which had aversive effects on self-understanding and self-improvement. By denying the existence of giftedness or disabilities, individuals were less likely to be vocal about their educational rights and seek appropriate support [26].

For the environmental factors, studies have specified the role of parents and teachers in supporting or undermining the healthy self-concept of 2e students. Several studies highlighted the importance of school environment, especially the effect of teachers and peers [25],[26],[27]. Teachers who had special education background and who saw unique potential had a significant impact on 2e students [26]. In terms of educational services, a 2e student who received special remedial lessons in classrooms together with attending a program for gifted students reflected that he recognized and acknowledged his academic strengths and found school achievement to be possible [25]. More importantly, being accepted into a gifted program allowed 2e students to gain social support from like-minded friends [25],[26]. Environmental factors that had negative influence on self-concept of 2e students included a lack of support from a maternal figure in the 2e journey [29] and social norms that stigmatized twice exceptionality as being disabled rather than gifted [26].

The second sub-theme, life experience narratives, contained seven publications. Among these studies, all [30],[31],[32],[33],[34],[35],[36] collected data from 2e students and two [32],[33] collected data from parents of 2e students. All studies used semi-structed interviews. Some used demographic questionnaires [30], [36], a learning related questionnaire [34], and/ or background documents [30],[31],[33]. The majority collected data from 2e students in secondary school [30],[31],[32],[34],[35],[36]. One collated data from primary school students [33] and two collated data from postsecondary school subjects [33],[34]. There was a wide variety of types of 2e students being investigated: LD [30],[32],[34],[35],[36], EBD and traumatic brain injuries [30],[36], ADHD and ASD [30],[32],[34], auditory processing disorder [31],[32],[34], sensory impairment [31],[34], and dyspraxia [31],[32],[33].

Narratives of life experiences related to 2e students were diverse; but can be grouped into five clusters as follows:

(1) Effect of disability stigma. While 2e students had a positive view on giftedness as being unique, enhancing their self-esteem, and giving them more opportunities in life [30],[36], they reported feeling "isolated", "ostracized", and being "different" from friends as a result of their disability [30],[31],[32],[36]. Those who attended special education classes did not feel belong and tried to conceal their disability status [30]. They also reported several incidents of being physical, social, or verbal bullied by peers and teachers because of their disability [31]. They were stereotyped as incapable by teachers [31],[32] and were ousted by friends because having friendships with "special kids" would possibly result in the friends being stigmatized also [31].

(2) A lack of sense of belonging due to being double labeled. Being identified as twice exceptional, 2e students did not appear to have a strong group identity with neither gifted children nor those with disability. This lack of in-group identity with either group showed that the children lacked possible emotional support and reference to others with similar experiences. Therefore, the sense of belonging and self-understanding was compromised by being double labeled [32].

(3) School experiences. 2e students reported their school experiences mostly in a negative light. There was a perceived lack of support from teachers to accommodate and cater for their giftedness and disability needs [32],[33],[36]. Some studies reported incidents of teachers being hostile towards 2e students by embarrassing them for the inability to keep up in class, messy handwriting, or incomplete tasks in timed activities, causing the students feeling unsafe, vulnerable, and unsupported [30],[31]. There was a small number of exemplary teachers who contributed to 2e students' healthy self-concept. These teachers took time to build positive relationships with 2e students, saw their potentials, gave support for their success in school, and had high expectations on them [30]. Specifically, 2e learners preferred teachers who gave them choice and flexibility in leaning pace and assessment (i.e., choosing how to demonstrate their learning) [34].

(4) Coping strategies. In order for 2e students to function in schools, they reported to use several coping strategies. There were three major strategies used by 2e students. First, they used strengths to circumvent deficits. Being well-aware of their unique nature, they sought ways to balance their coexisting exceptionalities through functional strategies, such as asking for help, writing note before discussion or presentation, recording lessons on electronic devices [34],[35]. Second, they looked for external support to assist them with learning. This was manifested in several forms ranging from seeking advice from adult figures (i.e., parents, teachers, counselors/psychologists) [31] to joining support networks or out-of-school social groups [30],[31], socializing with like-minded friends [31], having study buddies [35], and attending IEP meetings [30]. Despite negative experiences, they maintained the will to continue in school and make progress in their learning [32]. These coping strategies worked as protective factors for 2e students to continue to attend school, take part in social events, engage in activities on a daily basis, and to be resilient in adverse situations.

(5) Career and education concern. 2e students were anxious about limited life choices due to their disability [30],[36]. They aspired to pursue postsecondary education in the area of strengths but were worried about their ability to accomplish in their courses because of their respective disability, disability labelling, and a lack of accommodation in higher education [36].

Theme 4: Support from significant others

Eleven publications explored the roles and experiences of people who closely involved with 2e students. These studies were categorized into two sub-themes: (1) support from the context of home (n=5) and (2) support from the context of school (n=6).

In the first sub-theme, support from the context of home, preliminary analyses showed that parents, mostly mothers [37],[38],[39],[40],[41], were primary informants. Semi-structured interviews [37],[38],[40],[41] and/or email correspondence [38] were data collection methods of choice. One study, which was an experimental research, collected data from audio recordings [39]. Several types of 2e students were included in this sub-theme: LD and ASD [37],[38],[39],[40],[41], EBD [38], ADHD [38],[39],[40],[41], auditory and visual processing disorder [40], and OCD [37].

Advocacy experiences of parents gave rich narratives from the moment they realized the unique nature of their child. Parents were aware of their child's precocious abilities at an early age and noticed discrepancies in the development later on [37],[41]. Consequently, they sought professional help to obtain a diagnosis to better understand the coexisting learning disabilities and intellectual precocity in order to balance exceptionality appropriately [41]. Parents in these studies put an emphasis on their child's strengths rather than weaknesses and were adamant that their child's potential was not overshadowed or masked by the disability [37],[38],[40]. Despite their ongoing attempts to advocate for their child's education, they reported frustration and struggles with school systems [37],[38],[41]. They felt that school staffs had inadequate knowledge and expertise in identification and educational services for 2e students and that teachers neither advocated for their child's disability nor enhanced their child's giftedness [37],[38]. With a lack of support and resources from schools, parents in these studies looked for knowledge and support elsewhere [37],[38],[40],[41]. Most parents were willing to pay in order for their child to receive special services (e.g., private assessments, enrichment activities, private tutoring, and therapy sessions) [37],[38],[41]. In terms of their approach in raising their 2e child, parents indicated that they pursued supportive parent-child relationships. They did not push their children to perform well academically [41] but maintained high expectations for the child's performance [40]. Parents also taught their child to self-advocate, persevere, and determine their own success [40],[41]. In an experimental study [39], parents of young 2e students were trained to use higher level questions during shared reading with their children. Results indicated that all parents were able to learn and implement the strategy, with an increase in the use of higher-level questions over time. In addition, parents reflected that shared reading not only enhanced their children's interests and gifts but also improved mother-child relationships. This study gave evidence to the notion that with appropriate trainings, parents are capable of providing their 2e children with opportunities to enhance their child' learning potential at home [7].

In the second sub-theme, support from the context of school, demographic data revealed a variety of stakeholders associated with 2e students in the school context: teachers [42],[43],[44], school counselors and psychologists [42],[44], parents [42],[43],[45], and 2e students [43],[46],[47]. Information was collected by means of demographic questionnaires [44],[45], semi-structed interviews [42],[43],[47], or school records/ reports [43]. One study, which was an experiment research, collected data from tests and classroom observations [46]. Several types of 2e students were included in studies in this sub-theme: LD [42],[45],[46],[47], EBD [45],[47], ADHD [43],[47], Asperger's [43],[45], OCD [43], auditory and visual processing disorder [47], and multiple disabilities [42].

A content analysis revealed that teaching and instructional design had a significant effect on the well-being and academic achievement of 2e students. A study that investigated the effect of multisensory-enrichment approaches on math learning for 2e students found that 2e students who were exposed to math classes with enrichment lessons outperformed their counterparts who were taught by the regular teaching approach [46]. They also showed significantly more class engagement [46]. It is concluded that classes that were enriched with new ideas, focused on problem solving skills, and used visual, auditory and kinesthetic tools to stimulate senses enabled 2e students to make meaningful academic and

participation progress in math learning. Another enrichment-based program designed for 2e students was also found to make significant contributions to 2e students' academic and psychosocial development [45]. A summer camp program employed enrichment approaches (i.e., critical and creative thinking, problem solving, and reflection) in art and sciences. It also built on the concept of safe learning environment to ensure that social and emotional well-being of 2e campers were emphasized. Activities were designed to accommodate for an individual student's interest, ability, and learning style. It also used scaffolding in which lessons were broken into smaller units or tasks were divided into multiple stations. It was found that enriched and individualized activities, scaffolding, and group work not only enabled 2e students to see their potential and engage in self-directed learning, but also gained friendships with like-minded peers which was important for socio-emotional development [45].

Apart from teaching approaches, school cultures that provide safe environment for cognitive, social and emotional growth were crucial for 2e students' well-being. School environment where diversity is celebrated was key to a sense of psychological safety [43]. In this light, teachers needed to understand and accept that each student had different rates of learning and that growth took time to incubate [43]. In so doing, teachers employed accommodation strategies to help their students learn better (i.e., providing class notes, allowing choices of assessment and extended test time, or giving advice on organizational skills) [42]. It is important that gifted educators who were familiar with twice exceptionality and special educators who were familiar with remedial instructions join forces to make significant changes to the students' school experiences [44]. More importantly, schools that believed in strengths-based philosophy where gifts and talents were celebrated and encouraged through curriculum and teaching had made a positive impact on 2e students' confidence and self-efficacy [42],[43]. Especially, students in schools that advocated equity reflected that their experiences in programs for gifted students (i.e., Advanced Placement) were encouraging. Schools that were more flexible in their entry guidelines were more likely to accept applications from 2e students despite their disabilities than did schools with less flexible entry guidelines [42].

The support from teachers and peers were appreciated by 2e students [47]. They believed that external support from parents, teachers, and friends assisted them in their academic endeavor. Teachers and peers took different supportive roles in their lives. While teachers contributed to their successes by guiding them through learning strategies and providing them with necessary accommodations, peers influenced their academic engagement and commitment to learning. Teachers motivated them to keep going and see beyond their limitations; and friends encouraged them to study hard and brought joy to their school lives [47].

V. Conclusions and Discussion

In this study, a systematic review of empirical studies was conducted in order to investigate and synthesize the existing body of knowledge on twice exceptionality. Four themes emerged from the analysis of 37 research publications that matched the selection criteria. The four themes were identification practices, cognitive and achievement profiles and learning styles, self-concept and life experiences, and support from significant others. The four themes, which appear distinctive to one another, are, in fact, closely related to every waking moment of a 2e child's life. These themes intertwine into complex issues of defining and conceptualizing twice exceptionality, the perception of self and interpretation of life events, identification and diagnosis issues, teaching and educational services, and promoting psychosocial well-being. What has been evident from these studies is that living between the world of giftedness and the world of disability is never simple. One would expect that people whose identities belong to two groups would benefit from interpersonal exchanges. Ironically, in the case if 2e students, the sense of belonging to either group was sacrificed.

Drawing from findings, there are several recommendations for practice when working with 2e learners. First, strengths-based approach should be the essence of educational practice. Strengths-based model of education emphasized on balancing between attending to a child's giftedness and maintaining a challenging curriculum, yet also remediating and compensating for deficits [16]. It takes into considerations 2e students' cognitive profiles, learning preferences, and areas of interest or talent in order that competency is developed by expanding on strengths [42],[43].

Even though there is a lack of consensus on identification criteria and practices that can be used to screen 2e students in the most accurate fashion [10], it is important that multiple sources of information are used and paraprofessional are involved in the identification and educational planning process [5]. Information from parents, teachers, and, in some cases, peers are pieces of the puzzle that allow for a comprehensive landscape of a 2e student [22]. In addition, getting stakeholders to collaborate as a team on identification and individualized educational planning is proven to be necessary to ensure data-driven decision making [48].

Each GLD student has distinctive learning profiles [4]. It is recommended that cognitive and achievement profiles be used to tailor the instructional program to develop skills of 2e students individually [12]. Apart from targeting on developing language or math skills, other learning skills, such as attention, memorizing of facts, self-monitoring, and goal setting, are important for the sustainability of remedial instructions [49]. Due to advanced intellectual ability, 2e students also need their gifts and talents enriched by challenging activities. Higher order thinking skills, authentic problem solving, and inquiry-based learning are highly encouraged to be implemented with 2e students to promote learning engagement and self-efficacy [49].

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Community Accounting: Model of Providing Academic Services of Accounting Program to Develop Instructional Packages Workshop for Ban Wan Community, Nam Kham Sub-district, Mueang District, Sisaket Province

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Abstract*— The research of Community Accounting: Model of Providing Academic Services of Accounting Program to Develop Instructional Packages Workshop for Ban Wan Community, Nam Kham Sub-district, Mueang District, Sisaket Province aimed to 1) study model and process of providing academic services to community on accounting aspect and 2) study the participants' satisfaction in accounting workshop. The instruments used in this research were: 1) Instructional packages of community accounting and 2) Satisfaction survey form of the participants in community accounting workshop. Regarding the model and process of providing the workshop, it met people's needs with overall satisfaction of the participants at very satisfied level ($\overline{X}$ = 3.78). The population were members of the religious and cultural tourism villages living in Ban Wan Community, Nam Kham Sub-district, Mueang District, Sisaket Province. The findings revealed that the instructional packages of community accounting conforming to the needs of the Ban Wan Community were obtained for the Accounting Program. They were created from understanding and learning of the community and were practical and easily understandable as needed. The model and process of providing academic services on community accounting conforming to the needs of the Ban Wan Community consisted of 2 models: 1) Model 1: The integration of knowledge gained from academic services with related courses and 2) Model 2: The integration of related courses with knowledge of academic services to train students how to be able to transfer knowledge of accounting by themselves.

Keywords — Community Accounting; Academic Services; Accounting; Model

I. INTRODUCTION

A mission in the 20 years Rajabhat University Strategy (B.E. 2560-2579) or (2017-2036) on local development is described that "To develop local region according to potential, problems and real needs of the communities by transferring knowledge and technology as well as applying royal initiatives into action" by linking to Strategy 1: Local Development. In addition, the 3rd strategy is to integrate teaching and learning management, students' research, teachers and local development based on the project forms of: 1) Research, 2) Training/academic services, 3) Relationship activities and 4) Other activities (Office of the Rector's Meeting, Rajabhat University, 2018)

The academic services to the communities are the main mission of the higher education institutions under the responsibility of personnel in higher education institutions. They are important processes in bringing expert knowledge of each department to publicize and transfer to the communities in the form of projects or activities based on the needs of the communities.

Therefore, the Accounting Program, Faculty of Business Administration and Accounting, Sisaket Rajabhat University, is one of the higher education institutions focusing on local development mission. We have integrated cooperation within university and outside including the government sector, private sector and civil society in order to conduct academic service projects. Our program consists of integrated teaching and learning, students and lecturers' research in area-based development. Moreover, providing of academic services to the communities are not solely from the needs of higher education institutions, but mainly from the needs of the communities with a variety of academic services based on the context of providing academic services and the needs of the communities.

Obviously, the process of academic services to the communities is an important factor of contributing cooperation among higher education institutions, various sectors, academic

staff and support staff. Furthermore, students in Accounting Program working in the area can bring academic knowledge in accounting derived from the community needs survey to use in development through the process of transferring knowledge using various skills, such as speaking, writing, presenting and using digital media. In addition, it is an integrated classroom teaching and learning based on real community situations integrated with research. It also results in local economic development and Thai desirable characteristics enhancement through career, income, self-reliance and family support.

II. Objectives

1. To study model and process of providing academic services to community on accounting aspect.
2. To study the participants' satisfaction in accounting workshop.

III. Research Extents

A. Materials and Methods

Based on the concept of action research, the researcher used concepts, theories and literature reviews to develop instructional packages for community accounting workshop. The purposes were to develop and improve operations toward utmost efficiency and effectiveness emphasizing on the application of knowledge and technology to apply to teaching and learning quality development. (Virayut Chatakarn, 2010). However, the process of Participatory Action Research (PAR) was a reflection cycle and practice starting from observation, reflection, knowledge exchange and planning for change. Later, conducted as the plan, observed the results and repeated planning until changes occurred to be better. (Amavasee Ampansirirat, et al., 2017)

B. Population and Samples

The population in this research consisted of 470 members of the religious and cultural tourism villages living in Ban Wan Community, Nam Kham Sub-district, Mueang District, Sisaket Province. The samples were 222 village committees and members of Ban Wan Community selected by Purposive Sampling method.

The scope of content: the instructional packages of community accounting and community entrepreneurship were created by integrating knowledge of accounting principles including the process of creating community accounting through academic services derived from the survey of needs and satisfactions after the workshop through the form and process of knowledge presentation as the instructional materials.

C. Instrumentation

Step 1: The population in this research consisted of 470 members of the religious and cultural tourism villages living in Ban Wan Community, Nam Kham Sub-district, Mueang District, Sisaket Province. The samples were 222 village committees and members of Ban Wan Community selected by Purposive Sampling method.

Step 2: The instruments used in this researcher were created as follows:

2.1 Needs survey form on community accounting and community entrepreneurship workshop with more than one answer option

2.2 Satisfaction survey form of the participants in community accounting workshop based on accounting principles and process of creating community accounting through academic services

2.3 Instructional packages of community accounting

2.4 Community accounting workshop

D. Data Collection

The researcher created instructional packages of community accounting consisted of community accounting and community entrepreneurship and conducted workshop as follows:

1. In March 2020, the researcher used synthesized results data derived of the needs survey on community accounting workshop to discuss with the 4th year Accounting Program students and considered the courses that conformed to the knowledge.

2. In April - May 2020, the researcher synthesized data from item 1 to analyze the content of community accounting and community entrepreneurship defined integrated activities in section 5 lesson plan of TQF 3. Then, designed suitable teaching materials based on the needs of community.

3. In June 2020, the researcher assigned the 4th year Accounting Program students as assistants, created instructional packages of community accounting and organized workshop which students transferred methods and techniques to the community. The researcher allowed students to research and learn, then discussed the phenomenon starting from the academic administration knowledge and techniques derived from real practice until being able to transfer knowledge.

4. In July 2020, the satisfaction survey on workshop was conducted for the members of the religious and cultural tourism of Ban Wan Community, Nam Kham Sub-district, Mueang District, Sisaket Province. The workshop consisted of content and process of providing academic services to the community on community accounting.

5. In August 2020, the participants' satisfaction survey data was summarized and analyzed and improved the instructional packages.

6. In September 2020, the 4th year Accounting Program students followed up the result from the workshop by on-site interviewing and observing the participants regarding income and expenditure accounts and breakeven point.

7. The researcher and 4th year Accounting Program students participated in the performance evaluation of workshop project and decided to add pretest and posttest in the

next workshop to measure the level of accounting knowledge gaining from the workshop.

Data Analysis

1. Analyzed the needs survey of 222 people from Ban Wan Community, Nam Kham Sub-district, Mueang District, Sisaket Province by finding the mean and percentage.

2. Analyzed the satisfaction survey of 222 participants in community accounting workshop by finding the mean. Then, summarized and improved the instructional package before providing the next community accounting workshop.

Statistics

The criteria used for needs survey and satisfaction survey of Ban Wan Community, Nam Kham Sub-district, Mueang District, Sisaket Province, was interpreting the mean in the result discussion by determining the importance level of perceived service quality and calculated the range of the class interval. The result was 0.50 per range. Boonchom Srisa-ard. (2002): 103).

IV. Results

Objective 1: To study model and process of providing academic services to community on accounting aspect. The result of the needs survey for workshop on community accounting and community entrepreneurship revealed that there was no community accounting and community entrepreneurship manuals for Ban Wan Community. On the other hand, there was OTOP accounting manual of the Cooperative Auditing Department, but had not been implemented yet due to the obligation of producing products for sale. Another reason was due to the complication of the accounting manual that caused difficulty for people in Ban Wan Community. Some community members prepared only income/expenditure accounts without any systematic procedure, such as lacking of reference, lacking of withdrawal/payment evidence and lacking of inventory control. As a result, it was impossible to know the quantity of products each month which affected to the sale amount. Therefore, the 4th year Accounting Program students analyzed data from those community problems and provide participatory exchange in the meeting to design the instructional packages based on the community needs as shown in Table 1. In addition, the information obtained from the needs survey on the community accounting workshop in various aspects, such as topic and period, was found that most of the workshop participants were women aged between 41 - 50 years old who educated secondary school level with lower than 300 baht income and had never done accounting before. The process of academic services providing to Ban Wan Community on the development of instructional packages on community accounting workshop for Ban Wan Community, Nam Kham Sub-district, Mueang District, Sisaket Province was the integration of academic services with teaching and learning. It can be summarized as follows: 1) The Accounting Program students participated in the workshop project and also participated in the creation of the needs survey on community accounting workshop, 2) The needs survey on community accounting workshop was launched, 3) The students summarized and analyzed the results together with the researcher, 4) The students were assigned as assistants of the lecturer in the course related to academic services, 5) The researcher analyzed the content, set up lesson plan, learning achievement and adjust the order of topics for both theoretical and practical parts to be consistent with the tasks assigned to students, 6) The suitable instructional packages and materials were created for the community accounting workshop based on community context, 7) The problems obtained from the academic services were defined as the research topic, 8) The workshop project on community accounting was performed, 9) The satisfaction survey on community accounting was evaluated on the aspects of the academic service model and process, 10) The result of satisfaction evaluation was summarized and analyzed and 11) Instructional packages on community accounting was improved for the next workshop.

Objective 2: To study the participants' satisfaction in accounting workshop the satisfaction results of the Ban Wan community, Nam Kham Subdistrict, Mueang District, Sisaket Province. It was found that the average satisfaction evaluation on the content was 3.75 on the from the evaluation of the content of community accounting, providing academic services facilities and process aspects as shown in Table 1-3.

TABLE 1: The mean and standard deviation of the satisfaction level of Ban Wan Community, Nam Kham Sub-district, Mueang District, Sisaket Province on the content of community accounting aspect.

Satisfaction evaluation aspect: Content of community accounting	$\bar{X}$	S.D.	Satisfaction level
1. Knowledge and understanding before training	3.75	0.74	Very satisfied
2. Knowledge and understanding after the training	3.84	0.36	Very satisfied
3. Consistency of the content and the needs	3.78	0.64	Very satisfied
4. Ability to indicate the benefits	3.74	0.46	Very satisfied
5. Ability to explain the detail / process	3.73	0.52	Very satisfied
6. Ability to apply the knowledge in community activities	3.86	0.53	Very satisfied
7. Ability to transfer knowledge	3.86	0.70	Very satisfied
Overall	**3.78**	**0.52**	Very satisfied

From Table 1, the overall satisfaction level of the participants in the community accounting workshop on the content of community accounting aspect was at a very satisfied level ($\overline{X}$ = 3.78, S.D = 0.52), with the highest average on the ability to apply the knowledge in community activities ($\overline{X}$ = 3.86, S.D = 0.53), followed by the ability to transfer knowledge ($\overline{X}$ = 3.86, S.D = 0.70) and the least average on the ability to explain the detail/process ($\overline{X}$ = 3.73, S.D = 0.52).

TABLE 2: The mean and standard deviation of the satisfaction level of Ban Wan Community, Nam Kham Sub-district, Mueang District, Sisaket Province on providing academic services facilities aspect.

Satisfaction evaluation aspect: Providing academic services facilities	$\overline{X}$	S.D.	Satisfaction level
1. Cleanness and suitability of place	3.84	0.36	Very satisfied
2. Place arrangement	3.75	0.74	Very satisfied
3. Duration of the workshop	3.73	0.64	Very satisfied
4. Service of the workshop team	3.74	0.46	Very satisfied
5. Coordination of the workshop team	3.78	0.52	Very satisfied
6. Advices / inquiries	3.86	0.53	Very satisfied
7. Training model/activities	3.86	0.70	Very satisfied
Overall	**3.75**	**0.38**	Very satisfied

From Table 2, the overall satisfaction level of the participants in the community accounting workshop on providing academic services facilities was at a very satisfied level ($\overline{X}$ = 3.75, SD = 0.38), with the highest average on training model/activities ($\overline{X}$ = 3.86, SD = 0.70), followed by advices / inquiries ($\overline{X}$ = 3.86, SD = 0.53) and the least average on duration of the workshop ($\overline{X}$ = 3.73, SD = 0.64).

TABLE 3: The mean and standard deviation of the satisfaction level of Ban Wan Community, Nam Kham Sub-district, Mueang District, Sisaket Province on process aspects.

Satisfaction evaluation aspect: Process	$\overline{X}$	S.D.	Satisfaction level
1. Public relations / informing details of the workshop	4.38	0.56	Very satisfied
2. Readiness of the lecturer team	3.65	0.89	Very satisfied
3. Ability to transfer knowledge of the lecturer team	3.61	0.58	Very satisfied
4. Explanation on content of lecturer team	3.57	0.70	Very satisfied
5. Use of appropriate and understandable language	3.63	0.59	Very satisfied
6. Providing clear answer	3.40	0.62	Moderately Satisfied
7. Appropriateness of training materials	3.57	0.73	Very satisfied
8. Priority arrangement of the content	3.49	0.56	Moderately Satisfied
9. Use of materials to transfer knowledge	3.56	0.70	Very satisfied
10. Opportunity to ask questions	4.15	0.72	Very satisfied
11. Time management of the lecturer	3.86	0.76	Very satisfied
Overall	**3.71**	**0.27**	Very satisfied

From Table 3, the overall satisfaction level of the participants in the community accounting workshop on process aspects was at a very satisfied level ($\overline{X}$ = 3.71, SD = 0.27), with the highest average on public relations / informing details of the workshop ($\overline{X}$ = 4.38, SD = 0.56), followed by the opportunity to ask questions ($\overline{X}$ = 4.15, SD = 0.72) and the least average on time management of the lecturer ($\overline{X}$ = 3.86, SD = 0.76).

V. SUMMARY AND DISCUSSION

Regarding the instructional packages of community accounting workshop for Ban Wan Community, Nam Kham Sub-district, Mueang District, Sisaket Province, the community needs survey revealed that people the most needed training was financial statements topic for 33 percent with the training duration not more than 2 days/time during Saturday and Sunday from 1:00 pm to 4:00 pm by 39 percent.

On the aspect of satisfaction of Ban Wan community, Nam Kham Subdistrict, Mueang District, Sisaket Province, the overall was very satisfied at 3.75 on average. Considering each aspect, it was shown that: 1) Content of community accounting aspect was very satisfied level at 3.78, 2) Providing academic services facilities aspect was very satisfied level at 3.75 and 3) Process aspect was very satisfied level at 3.71.

Regrading the teaching and learning process organization, it was dealing with academic services generated from developing the research question from the academic

services in order to use the research result to develop the academic services for systematic operation. According to the aforementioned operation, it conformed with Gus Makason. (2010) who studied integrated learning in the Accounting Seminar course at Chiang Rai Rajabhat University. The finding was found that the teaching model focused on integrated learning was able to encouraged students' interest to be enthusiastic and involved throughout the learning period. Moreover, they were able to plan sequentially and continue doing research. They studied happily, increased good attitude towards accounting, had fun, expressed opinions freely and were able to link knowledge in accounting fields from various subjects that had studied before. These conformed with Songkran Gaivong. (2012) who studied the development of teaching and learning model for community accounting and integrated project creation activity with practice, the finding revealed that teaching and learning by using the integrated project creation activity and practice resulted in the most satisfied level of student satisfaction. It also resulted in student's achievement who got more than 60 points. This activity was useful to the community as accounting system was a part of sustainable operation of community affairs. Furthermore, the accounting system designed by students was be able to use as a model in accounting for other communities. The researcher would like to discuss the results as following aspects:

On the content of community accounting aspect, there was no record in community accounting at Ban Wan Community as the Accounting Manual of the Cooperative Auditing Department. There were only income/expenditure records. This conformed with Saratnuch Boonvut (2015) who found that the problem state of community enterprises was to create only an income/expenditure account. The document storage was messy of personal expenses and business expenditures. There was no number indicated the delivery note which resulted in control system when customers paid by transfer to the account and caused poor internal control system. In addition, the members did not have basic knowledge of accounting and lacked of data collection.

The model and process of providing academic services on community accounting must be consistent and meet people's needs and the real community context. The participation in instructional packages development makes people in the community understand easily because it helps accounting to be more accurate and reliable. People know the profit and loss, keep document systematically, easily examine and can be applied.

On providing academic services facilities aspect, the place for workshop project was suitable with good arrangement. The excellent coordination between Accounting Program students and the community was continuous and sincere. The convenient period of workshop was on Saturday and Sunday during 1.00-4.00 pm due to morning work such as working in farm with cattle/buffalo, watering vegetables in the garden and working in the rice fields or orchards.

On process aspect, there was an improvement on relevant questions and priority arrangement of the content due to moderately satisfied level of satisfaction. Therefore, the results of the level of satisfaction were used to improve for the next academic services process by allowing Accounting Program students who participated in the workshop to perform role-play in order to prioritize the related contents including the performance of asking and answering questions to make them clearer and more relevant.

Regarding the students' achievements from the integration of academic services and lesson. Students created a special place to learn the accounting profession. (producing products / purchasing). They focused on creating a learning experience emphasizing on accounting performance. They applied their learning experience to creative jobs and various skill activities by measuring and evaluating the learning outcomes of the courses that focused on building professional competencies in accounting which promoted and developed community and local region in the future.

Hence, the best practice in the model of providing academic services to the community of Accounting Program, Faculty of Business Administration and Accounting, Sisaket Rajabhat University is a model for academic services in accounting that should provide strategic plan for providing academic services to meet the real needs of the community in the dimension of giving or earning. Furthermore, the sustainable academic services planning to the community should implement, promote and support personnel to have opportunities to work with networks outside the university in order to bring knowledge and experience to develop current work as well as create acceptance of the community and society as shown in the following Figure 1-2

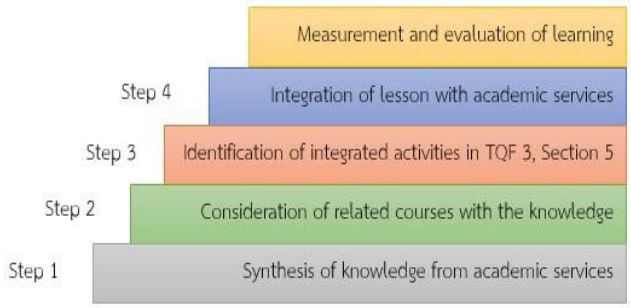

Figure 1: Model 1 of the integration of knowledge gained from academic services with related content courses

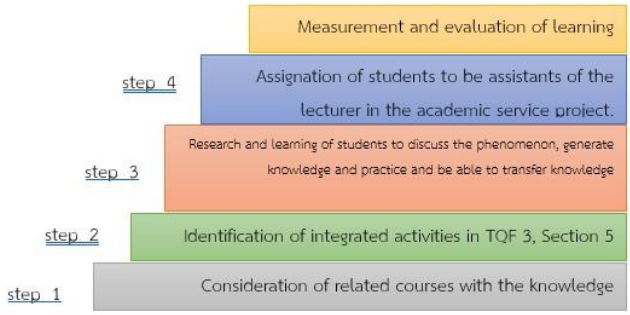

Figure 2 : Model 2 of the integration of related content courses with knowledge of academic services and practice for students to transfer accounting knowledge by themselves

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The English Development Project for Monks and Novices by Utilizing Communicative Approach

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Abstract: English is an official language used as a working language for Association of Southeast Asian Nations or ASEAN. Since Thailand participated in ASEAN, English has been important for communication in daily life of Thais. It also involves all aspects of life including religion. Because of the importance of English, Western Department, Faculty of Liberal Arts, Rajamangala University of Technology Thanyaburi aimed to organize the English development project for monks and novices by utilizing communicative approach. There were two main objectives including 1) to establish a positive attitude towards participants and train participants comprising of monks, and novices to communicate; and 2) to improve participants' English skills for religious tourism. The participants comprised 190 monks and novices joining the project on April 17, 2019. As for the procedures, participants were divided into five groups. Every groups studied with both Thai and foreign teachers when they were rotated from a topic to another topic: greeting, telling dates and time, making requests, describing things, and telling directions. The instrument for data collection used in this project was a questionnaire. The result was useful to the participants. The percentage of a positive attitude towards English increased to 82.35, whereas the percentage of English improvement increased to 90.20. Furthermore, the participants felt confident in speaking English, and they were able to transfer English knowledge to others.

Keywords: the English development project, Monks and Novices, Communicative Approach

INTRODUCTION

At the present time, English is involving more than one country. People in Brunei, Combodia, Indonesia, Laos, Malaysia, Myanmar, the Philippines, Singapore, Vietnam, and Thailand are members of the Association of Southeast Asian Nations (ASEAN). Not only persons who have positions of authority in an organization use English, but also the citizens in these ten countries use it in daily communication. Thus, it is essential for everyone to use English as a tool in communication. (Suarsaraha S. 2017: 46-51)

Panya Nantharam temple was established in 1985 as a nonprofit organization to serve as a center for religious and communities. It is located in Klong Hok subdistrict, Klong Luang district, Pathum Thani Province and founded by the former abbot, Phra Phrom Mangkalajan or as Thais know he is Luang Por Panya Nantaphikkhu. Nowadays, it is famous because the Princess Bajrakitiyabha went to a meditation retreat at the temple and Her Royal Highness Princess Maha Chakri Sirinthorn went there twice. In addition, it is a tourist destinatination of Pathum Thani province because of the quiet atmosphere, Bodh Gaya Pagoda Model, and the Asoke Pillar. Rajamangala University of Technology Thanyaburi has taken part in volunteer development. As presented in sculpture and three dimensional painting.

Western Language Department, Faculty of Liberal Arts, offered the free academic service, The English Development Project for Monks and Novices by Utilizing Communicative Approach, to the temple.

Objectives of the Study

The objectives of the study were as follows:

1. To establish a positive attitude towards participants and train participants comprising of monks, and novices to communicate in English.
2. To improve participants' English skills for religious tourism.

Significance of the Study

This research will be beneficial as follows:

1. It encourages teachers to use communicative approach as a method of teaching conversation.
2. It can be used as a guideline to improve students' speaking ability.
3. It can motivate researchers and instructors to do research following the same research model.

Scope of the Study

The study involved 190 monks and novices joining The English Development Project for Monks and Novices by Utilizing Communicative Approach on April 17, 2019 at Panya Nantharam Temple as participants in the study.

Definition of Terms

1. The English development project is a free academic service organized by Western Department, Faculty of Liberal Arts, Rajamangala University of Technology Thanyaburi.
2. Monks and novices refers to monks and novices who ordained on April, 2019 at Panya Nantharam Temple.
3. Communicative approach defines as a speaking and listening teaching method.

In summary, it is essential for everyone to communicate in English because it is an international language. This research aims to study the effects of using communicative approach as a method of teaching speaking and listening to monks and novices at Panya Nantharam Temple.

LITERATURE REVIEW

The review of the related literature is divided into three parts: vocabulary and vocabprofile program, communicative approach, and previous studies concerning teaching English by using communicative approach as a method of teaching.

1. Vocabulary and VocabProfile Program

In this section, vocabulary and vocabprofile profile program are shown because it is a background information. Moreover, vocabprofile program is useful to detect participants' language development.

In the first part of vocabulary, it is categorized into vocabulary learning and vocabulary use. First, there are different types of vocabulary learning: tutored, untutored, intentional, and incidental learning. Tutored and intentional learning are systematic learning which are prepared by teachers. In contrast, untutored and incidental learning are free from formal instruction. They focus on the use of language such as speaking, writing, reading, and listening activities. All types of learning above play an important purpose in vocabulary acquisition. Another, vocabulary use is grouped into receptive and productive vocabulary. Receptive vocabulary can be understood when they occur in the content of listening and reading. Productive vocabulary is defined as words or messages that learners can directly produce in speaking and writing. Suwannathep (2006) mentioned that receptive vocabulary is important more than productive vocabulary. If the learners have limited number of receptive vocabulary, they cannot produce these words into speaking or writing.

In the another part of vocabprofile program, vocabprofile refers to a computer software program. This program is used to analyze learners' vocabulary use in writing skill. Vocabprofile divided words into vocabulary level, word token, word type, and word family (Suarsaraha.S, 2017). In the section of vocabylary level, vocabprofile classified words into four levels as stated by the frequency of word usage. Furthermore, word token defines to the amount of words in the written words. Word type is the different words in a text. One word is counted on its type. And word family, it refers to a headword in word forms. To summarize, vocabprofile is a computer software program used as a tool to discover the amount of learners' vocabulary development.

2. Communicative Approach

Communicative approach or communicative language teaching (CLT) is started in 1970. In Europe, English instruction was needed because many refugees fled across the border to dwell there. Council of Europe had to develop English instruction curriculum. Then, communicative approach was considered. The reason is communicative approach is not focus on the acquisition of grammar and vocabulary. It highlights the importance of communication. In addition, communicative competence is the ability in speaking and understanding without worrying about grammatical correctness.

Silpakityan (2017) stated that there are three steps in English communicative language teaching consisting of presentation, practice, and productive. She clarified that presentation is a learning and understanding step, practice is a repetition step, and productive is an application step. Furthermore, she also mentioned that Thai Ministry of Education offers five steps English communicative language teaching to both primary and high school teachers comprising of warm up, presentation, practice, production, and wrap up. To sum up, whatever steps it takes, the goal is the same. That is, it emphasizes practicing and application in real life situation.

3. Previous Studies Concerning Teaching English by Using Communicative Approach

There are various related studies concerning teaching English by using communicative approach. Many researchers have presented these studies' results as the following:

Phopum (2018) studied 30 high school students in Surin province through English communicative teaching. The instruments used in this research were pretest and posttest. Moreover, a t-test is used in this study. The research results revealed that students ability in communication before and after the experiment was significantly different at the level of .01.

Apaiso (2018) studied the students' English communication competence after learning the Buddhist content-based English lessons through the communicative language teaching. 18 First year students were asked to do the observation form based on D.P. Harris' English speaking competence assessment and Likert's five-point rating scale questionnaire on the student's opinions toward the Buddhist content-based English lessons through the communicative language teaching. Mean, percentage, and standard deviation were used for data analylis. The result shown that the students' English communicative competence was increased at a high level of mean 3.98. Besides, the recommendation of the research was presented that Buddhism should be should be integrated into all English subjects.

Silpakiyan (2017) studied development of teaching process based on communicative approach as perceived by 32 kindergarteners in Cholpratansongkroh school. A test and anecdotes were used as the instruments in this research. Moreover, authentic mean, standard deviation, repeated measures ANOVA included a content analysis were used in the study. The research results revealed that there was significant difference at the level of .05. This was because, variety of techniques and group activities made kindergarteners enthusiastic about reacting to the conversation.

Munchoei (2015) compared communicative approach and traditional approach in teaching English for conversation at Samutsakhon technical college. Teaching materials, lesson plans, and 60 four-multiple-choice tests were used as the research instruments. Littlewood's framework(1981) were applied to be the teaching materials. 30 students were taught about shopping, directions, travelling, and telephoning. After students taking the post tests, the results revealed that there was a significant difference through communicative approach and traditional approach at level of .05. Moreover, the results also presented that students' scores after learning through the communicative approach was higher than the traditional approach. The communicative approach is appropriate for English conversation instruction.

Panphao (2015) studied English listening achievement through communicative approach. Lesson plans, English listening achievement test, and questionnaire were the instruments. 25 secondary school students at Kositwittaya school, Petchaboon province, were participants in the study. Percentage, mean score, standard deviation, and t-test were statistically analyzed. The findings revealed that the effects of English listening instruction through communicative approach was significantly different at .05 and the students' satisfaction was at high level. Furthermore, after teaching English listening through communicative approach, students were able to communicate English effectively in their daily life.

Boonsomsri (2012) also compared 86 students' English speaking and listening performance through the teaching method based on communicative approach and total physical response with the authentic materials. The participants were secondary school students at Sisaketwittayalai school, Sisaket province. Lesson plans, English listening-speaking test, and t-test were instruments used in the study. The findings revealed that the students' English listening-speaking performance through both techniques were significantly higher than before the experiment at the .01 level.

Phutthacuchat (2006) compared students' English speaking ability before and after learning through communicative language teaching. 20 students in Buddha Kosaya Widdhaya school, Phrae province were taught Buddhist content-based English lessons. Mean and standard deviation were used to analyze the data. The finding found that students' English speaking ability was increased from a low level to a moderate level after using Buddhist content-based English lessons through communicative language teaching.

METHODOLOGY

In this chapter, the participants, procedure, instrument, and data analysis are presented.

1. The Participants: The participants of this study were 190 monks and novices joining the project on April 17, 2019 at Panyanantharam temple.

2. Procedure: The participants were divided into 5 groups. Every groups studied English in 5 topics consisting of greeting, telling dates and times, making requests, describing things, and telling directions with both Thai and foreign instructors from Western Department, Faculty of Liberal Arts, Rajamamgala University of Technology Thanyaburi.

3. Instrument: A questionnaire was used as the instrument for data collection.

4. Data Analysis: Percentage and mean were used to analyzed.

In addition, the researcher also used KM TOOLS in the English development project for monks and novices. KM TOOLS or knowledge management tools comprising of 3 steps: plan, do, and check.

In the first step of plan, the researcher found English instructors, members of the project, set the meeting, and contacted the abbot in Panyanantharam Temple.

In the second step of do, the researcher organized the project. The participants registered, and they were divided into 4 main groups consisting of greeting, telling dates and time, making requests, and describing things. Then, the participants practiced telling directions in the authentic atmosphere.

In the last step of check, the participants were asked to do the questionnaire after English instruction by using communicative approach at Panyanatharam Temple.

Fig 1. Monks and novices registered for the English development project.

Fig 2. Thai and foreign instructors taught English to monks and novices.

FINDINGS

In this chapter, the findings of the study are presented according to the objectives of the study.

Table 1. Findings

The objectives	Findings
1. To establish a positive attitude towards participants and train participants comprising of monks, and novices to communicate in English.	1. Participants got positive attitude 70.59%
2. To improve participants' English skills for religious tourism.	2. Participants improved their English skills for religious tourism 90.20%

CONCLUSION

The conclusion is shown as the following.

Conclusion

The English Development Project for Monks and Novices by Utilizing Communicative Approach was organized by Western Department, Faculty of Liberal Arts, Rajamamgala University of Technology Thanyaburi. 190 monks and novices joining the project on April 17, 2019 at Panyanantharam temple. The results were revealed that participants got positive attitude 70.59% and improved their English skills for religious tourism 90.20%.

In summary, monks and novices could develop their ability in English speaking after the instruction. Moreover, they also got positive attitude about English. Thus, it can be said that there was an effectiveness of utilizing communicative approach in teaching English conversation.

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Predicting entry-level salary: A machine learning approachs

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***Abstract*—The problem of low wages for young people is serious in Taiwan. Real starting salaries have fallen over the past few years. Most student expect a college education to equip them with profession skills for better salaries. However, university students have started to doubt the higher education can improve their competitiveness in the job market. Using data from the 2019 survey of recent college graduates, this study developed a computational model based on Logistic regression, SVM and decision forest models to predict entry level salary. A sample of 760 recent graduates, from a university in Taiwan, participated in this stud**

The results implied that the number of credits taken, profession certificates and match, job satisfaction, academic performance, English ability, gender and social network were significantly associated with the salaries at career entry. Results also indicated the predictive model show a good performance in predicting students' entry level salaries. All performance metrics were similar across methods. The results demonstrate effectiveness and usability of the methodology. This study contributed to provide a model to evaluate student's characteristics and to outline recommendations in University strategy.

Keywords—Entry level salary ; Machine learning; Predict modelcomponent; formatting; style

I. INTRODUCTION

The problem of low wages for young people is serious in Taiwan. Real starting salaries have fallen over the past few years. Most student expect a college education to equip them with profession skills for better salaries. However, university students have started to doubt the higher education can improve their competitiveness in the job market. According to a survey conducted by 1111 Job Bank (2019), a job service website in Taiwan, new college graduates in Taiwan have lowered their expectations for starting salaries for the third consecutive. On average, college graduates hoped for a starting monthly salary around 31,000 new Taiwan dollars.

The skills requirements and qualifications demanded for job entry are rising. The starting salary of a fresh graduate is considered a potential indicator of career advancement [1]. Sumner &. Brown pointed out differences in entry level salary expectations were associated with gender-linkage of college major [2]. Toumanoff used single- and multiple-equation regression models that control for gender, date of hire, experience and degree attained, rank, characteristics of the position being filled, inflation, and academic department. The study found an unexplained and statistically significant differential in salary-at-hire between men and women, and it finds that the unexplained male–female differential in salary-at-hire has increased since 1990 [3]. On the other side, Formby, Gunther & Sakanou used the results of a survey of entry level economists to investigate whether gender or age influence beginning salaries once other determinants of earnings are taken into account. However, gender was found to have no significant effect in their study. [4].

Previous studies on prediction have used traditional statistics techniques (e.g. linear regression and logistic regression). Machine learning is an efficient way of analyzing large quantities of data and identifying hidden associations in complex data sets [5]. It is a computational method for automatic learning from experience and improves the performance to make more accurate predictions [6].

Organizational researchers have developed some comprehensive models of career success using demographic, human capital, work- family, motivational, organizational, and industry variables [7]. This study draws on the social capital theory, human capital theory, student characteristics to predict entry level salary. Moreover, this study developed a computational model based on Logistic regression, SVM and decision forest models to predict entry level salary.

II. LITERATURE REVIEW

A. *English proficiency*

English language requirements are in many business sectors. English proficiency would improve the chances of getting a job. Some universities set rules requiring students to pass standardized English proficiency tests and even made English proficiency as a graduation requirement in Taiwan. They believe that the policy will help motivate students to improve their English skills. The analysis results indicate that English proficiency had significant effects on college graduates' starting salaries, their probability of changing permanent residence status from rural to urban, and their future earning potential in China [8].

B. *Gender issue*

Prior research identified women estimated significantly lower salaries at career entry [9] The existence of a salary differential between men and women who are accountants has been noted in many countries. For US and Australia, the results support the existence of a gap in salary between male and female accountants [10]. Although females state salary requests to a larger extent than males do, they ask for lower salaries, and are offered lower starting salaries also for the same request [11].

C. *Social capital*

Bourdieu [12] views social capital as an investment of the individuals in a network to engage in mutual recognition and acknowledgment so as to preserve a group's dominance and maintain solidarity amongst its members. Mok & Wu found that the social capital has impacted on graduate employment and social mobility as higher education has massively expanded in China [13].

D. *Human Capital*

Generic human capital refers to general knowledge possessed by entrepreneurs accumulated through their formal education and professional experience [14].

The human capital means the aptitudes such as the knowledge and the skill to be obtained by the manpower. That professionals in the jobs requiring more firm-specific human capital are paid more than those in jobs requiring less firm-specific human capital [15]. Dalmazzo, & Blasio indicated that human capital is positively correlated with wages even after controlling for individual worker characteristics [16]. Becker even argued that education or training raises the productivity of workers by imparting useful knowledge and skills and raising workers' future income by increasing their lifetime earnings [17].

E. *Education–job match*

Although a job candidate's GPA is a problematic metric for prospective employers [18], most employers use academic performance to screen job candidates [19].

The compatibility between person and organization is a judgement on how well a person matches an organization. The individuals whose values are a good match to the organizational values will have more success and will reach performance [20]. Lee & Sabharwal research implied that education–job match increases job satisfaction [21].

14 factors related from literature review related to entry-level salary were identified form literature review.

1. School, Gender**,** Time to find a job
2. Human capital**:** English proficiency, IT certificate, Credit taken, Academic Performance (GPA), Internship, Joining student organization, Profession certificate, Academic program
3. Education–job match**:** Profession match, Job satisfaction,
4. Social Capital: Network

III. METHODOLOGY

The study was based on the evaluation and comparison of three classification models. The chosen models are Logistic regression, SVM and decision forest models. Logistic regression is one of the simpler classification models. It has been around for a long time but is still widely used. Decision trees have become one of the most powerful and popular

Furthermore, chi-square and correlation methods were also used in this study.

A. *Data collection*

Using data from the 2019 survey of recent college graduates, 760 recent graduates (graduated in 2018), from a university in Taiwan, participated in this study.

B. *Machien Learning*

The study is based on the evaluation and comparison of three classification models. The chosen models are Logistic regression, SVM and decision forest models. Logistic regression is one of the simpler classification models. It has been around for a long time but is still widely used. Decision trees have become one of the most powerful and popular approaches in data science. Decision forest aims to improve the predictive performance of a single decision tree by training multiple trees and combining their predictions [22]. SVM approach automatically controls the flexibility of the resulting classifier on the training data. Due to its remarkable generalization performance, the SVM have attracted attention and gained extensive application [23].

C. Performance evaluation

The dataset was split into two groups: training and testing. In this regard, a set of test and training data were performed on the models in such a way that 70% of the data was for training, and 30% was utilized for the test data set. To evaluate the performance of models, classification criteria accuracy, ROC namely (AUC, area under curve), F1 score, precision and recall were computed

IV. Results and Discuaaion

A. Cross-Tabulation With Chi-Square Analysis

Cross-tabulation tables were used in research to describe the relationships between categorical predictor and outcome variables. In this study, gender (table1), finding job time (table2), network (table3), professional certification (table4) and joining student organization (table5) are the categorical presictor and salary is the outcome variable. Chi-square analysis was used to examine associations among taste phenotypes, genotypes, ethnicity and gender. As expected, significant associations were observed from Chi-square analysis between gender and entry level salary ($p < 0.0001$), finding job time and entry level salary ($p < 0.0001$), network and entry level salary ($p < 0.0001$) as well as profession certificate and entry level salary ($p < 0.0001$). In addition, the result indicated that there was no significant relationship between joining student organization and entry level salary.

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TABLE I. SALARY BY GENDER

		Revenue		**Total**
		<3000	>=3000	
Gender	Female	238	238	746
	Male	100	184	284
Total		338	422	760

. TABLE 2. SALARY BY FINDING JOB TIME

		Revenue		**Total**
		<3000	>=3000	
Finding job time	< 6 months	323	382	705
	>= 6 months	15	40	55
Total		338	422	760

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. TABLE 3. SALARY BY NETWORK

		Revenue		**Total**
		<3000	>=3000	
Network	No	240	243	483
	Yes	98	179	277
Total		338	422	760

. TABLE 4. SALARY BY PROFESSION CERTIFICATE

		Revenue		**Total**
		<3000	>=3000	
Profession certificate	No	255	269	464
	Yes	83	213	296
Total		338	422	760

. TABLE 5. SALARY BY JOINING STUDENT ORGANIXATION

		Revenue		**Total**
		<3000	>=3000	
Joining student organization	No	305	388	682
	Yes	33	45	78
Total		338	422	760

B. Correlation

Correlations of the predictor variables with the predicted variable were reported as Pearson correlation coefficients. The number of credits taken, profession certificate, profession match, job satisfaction, academic program, academic performance (GPA), English proficiency, IT certificates, gender, finding job time and social network are significantly associated with the salaries at career entry.

C. Experimental results

Accuracy is the simple ratio between the number of correctly classified points to the total number of points. SVM with an average prediction accuracy of 70.6 % performed better on these datasets than Decision forest with an average prediction accuracy of 66.2 % and logistic regression with an average prediction accuracy of 68.9 % . Another criterion used to determine the efficiency of a classification model is the AUC criterion. The AUC represents the surface area below the graph ROC [24]

The ROC curve is a graph showing the performance of a classification model at all classification thresholds. The ROC curve showed that AUC for the logistic regression model is better than other models.

A. *Decision Forest:*

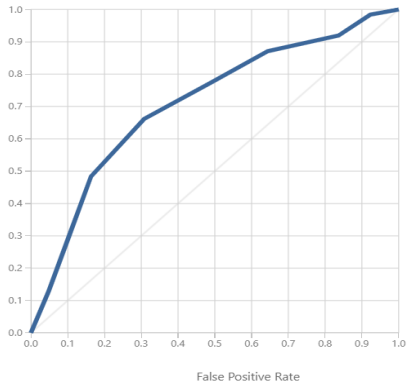

Fig. 1 Decision Forest ROC

Table 6 Performance of Decision Forest algorithm

Accuracy	Prevision
0.662	0.716
Recall	F1 score
0.629	0.710

B. *Logistic Regression*

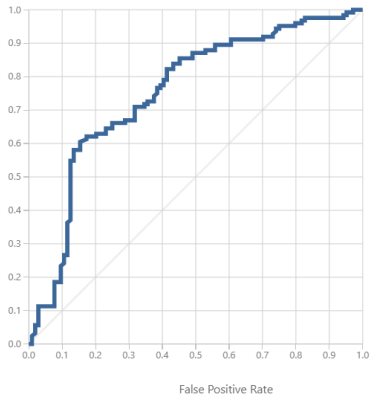

Fig. 2 Logistic Regression ROC

Table 7 Performance of Logistic Regression algorithm

Accuracy	Prevision
0.689	0.709
Recall	F1 score
0.726	0.717

C. *SVM*

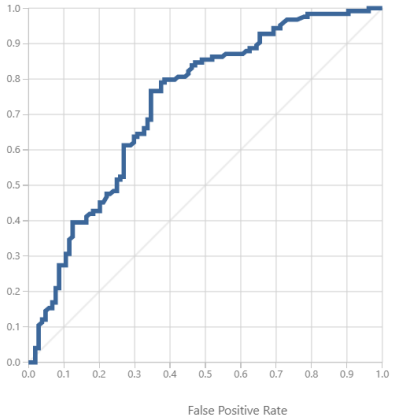

Fig. 3 ***SVM*** *ROC*

Table8 Performance of SVM algorithm

Accuracy	Prevision
0.706	0.714
Recall	F1 score
0.766	0.739

Table 9 AUC comparison for each algorithm

	Decision Forest	Logistic Regression	SVM
AUC	0.706	0.753	0.730

V. CONCLUSION

This paper discusses the performance of four different machine learning algorithms (Decision tree, Logistic Regression and SVM) in the prediction of daily global solar radiation. The study considers various input data (human capital, social capital, profession training, and student's characteristic are used as attributes) from the new graduates in Taiwan. To evaluate the performance of the machine learning algorithms, seven metrics (Accuracy, Prevision, Recall, F1 score and AUC) are discussed in this study. The evaluation has been seen that three algorithms give very close results, considering the accuracy and AUC metrics.

This study shows that the entry-level salary can be predicted by measuring and analyzing the data of student's characteristic, education–job match, social network, and human capital. The results support the salary expectations of university students relate to human capital theory and public policy of higher

education [25]. The results also consistent with Atalay's finding that the basic condition of developing the human capital is the education [26] and the lifelong learning and that women, on average, receive less pay than men do [27]. Matsunaga even [28] argued social capital increases a person's wage income even as human capital does.

This study has a number of implications for education and students. This study presents students who own richer social capital can earn more than others can as well. English language skill is one of the most powerful things people can do to support their career advancements. High academic performance and profession certificate can have an impact on future earnings. When students pursue university degree, the students need to be equipped with profession skills and knowledge that they can apply to the workplace. In addition, the result appears that academic programs are meeting much of the needs for entry-level workers. Universities should offer more career-enhancing programs for students, and provide them with the essential skills.

The present study also contains limitations and suggestions for future research. In this study, this study used only university students' perspective and was thus somewhat restricted. Sample size (data set) is too small to indicated that which model show the good performance. Research can be carried out continuously with more data. Further research also may perform college comparisons and re-examine the relation with entry level salary.

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Analysis of Errors in Paragraph Writings of Thai EFL Students

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Abstract: This study aims at investigating grammatical errors in 60-paragraphs written by 30 second-year English major students. The purpose of this study is to investigate common errors in paragraph writings produced by English major students. The five most common errors in the paragraphs were: punctuation (P), unnecessary word use (X), wrong word use (WW), capitalization (CAP) and spelling (SP). After analyzing the results of the paragraphs, the 16 grammar chapters were revealed in the analysis. It was apparent that the outcomes of the study emphasize grammatical errors from the learners in order to enhance distinct improvement in the learners' achievements. This study utilizes grammatical errors analysis as a pedagogical tool for helping English language beginners. It can reduce the difficulties of paragraph writings. It can be applied to improve writing lessons for graduate students as well.

***Keywords*— analysis of errors; paragraph writings; Thai EFL learners**

I. Introduction

A. Background of Study

It is undeniable that English is being widely employed in the age of globalization in Thailand, so that people around the world are able to communicate with each other more easily. In the Thai educational context of EFL learners in the curriculum of Bachelor of Arts (English for Business Communication) at Burapha University, Chanthaburi Campus, the English major students in this department have to enroll in four English writing courses in order to graduate: English Writing for Communication, Writing I, Writing II and Business Writing. In comparison with other language skills, written language is relatively permanent while speech is associated with a fleeting moment. Accordingly, writers are expected to plan and edit their writing more than spoken language (Cook, 2004). However, a majority of Thai students have encountered serious writing problems. Chamcharatsri (2010) and Rattabadilok & Othman (2015) have mentioned that most Thai students translated and replaced Thai words with English in English essays resulting in chronic problems. Consequently, writing an effective paragraph makes a special demand on the writer for grammar skills leading to a clear understanding for the reader.

B. Statement of the Problem

Although the department provides a variety of compulsory writing courses, the majority of learners still do not reach the standard of satisfaction expected. There are, however, several research studies attempting to assist students with writing proficiency. One study, for example, focuses on the major problem of Thai students' errors in English news headline translation because they had deficient knowledge of grammar (Sa-ngiamwibool, 2010).

To better understand the written language, knowledge of grammar rules is required for expanding and developing ideas which can be rather complex (Robinson & Modrey, 1986). English Grammar is vital for students who are interested in successful English writing. Therefore, unless students study grammar rules, they are likely to lack the ability to use grammar associated with writing production adequately. When learners can embark on effective writing strategies, it facilitates the development of learning English for communication. According to Ellis (1994), it was pointed out that improving accuracy and fluency through syntax is related to grammar acquisition and the relationship between grammar and learners. As far the topic of language learning is concerned, it is undeniable that English grammar structure is essential for EFL learners. Regarding this, Khalifa (2018), found that the results of grammatical error analysis was to enable an analytical examination of learners' errors and led to more effective preparation of teaching materials. As to the EFL classroom in Thailand, it is apparent that Thai learners focus more on grammar and reading skills in English language institutions in order to prepare themselves to successfully take the university entrance test (Wongsothorn et al., 2002). Perhaps more importantly, Richards and Renandya (2002) noted that the accuracy of grammar use can be enhanced and developed through grammar practice exercises and drills which are beneficial for learners particularly when taught in a

small group. In terms of linguistic level, the purpose of writing skill is to employ grammatical rules accurately.

This research aims to emphasize error analysis of grammar occurring on paragraph writings because the researcher needs to explore common errors in paragraph writings produced by English major students in order to help them improve their particular weaknesses.

C. The Purpose of the Study

1. To investigate common errors in paragraph writings produced by English major students

D. Research questions

1. What common grammatical errors in paragraph writings of activity 1 and activity 2 produced by 30 English major undergraduates are frequently committed?

II. Literature Review

A. English writing errors of international EFL learners

Altameemy and Daradkeh (2019) revealed that 80 EFL learners made grammar errors in punctuation which showed the most errors; therefore, curriculum design should be reviewed and a variety of grammar tasks should be implemented. Sitoresmi and Alicia (2019) investigated eleventh grade students and explained that almost everyone failed basic grammar with the most common five errors being verb tense (present tense and past continuous tense), prepositions, pronouns, articles and quantifiers. In addition, Lasaten (2014) and Sawalameh (2013) revealed verb tense was the most frequent grammatical error. Sawalameh (2013) investigated 32 essays compiled by 32 Arabic-speaking Saudi learners of English and the results of this study showed that the participants were not attentive to verb forms in sentences. Wu & Garza (2014) also pointed to, subject-verb agreement, fragments, singularity and plurality and verb tense as the most common errors committed by grade six students on writing tasks which was quite similar to Merizawati (2018), where subject-verb agreement, singularity and plurality and verb tense errors were found in paper presentations written by 124 Indonesian EFL sophomores. Ratnaningsih & Azizah's (2019) research results also state that 30 eleventh grade students produced frequent capitalization, word choice, verb tense, word form and singular-plural errors. Furthermore, the writing tasks in the TOEFL iBT written by 16 candidates found that the most common errors were in subject-verb agreement, verb tense, and sentence structure followed by punctuation (Nurhayati & Nurdini, 2019). According to English writing errors of international EFL learners, many researchers focus on improving grammar for developing writing. Most common errors are found in many research articles are verb tense, subject-verb agreement and singular-plural errors.

B. English writing errors of Thai EFL learners

Watcharapunyawong and Usaha (2013) and Suwangard (2014) found that most errors were errors in verb tense. Watcharapunyawong and Usaha (2013) have revealed verb tense as the most common error in past tense structure because Thai does not change the verb form to indicate time like English and after Suwangard (2014) compared the errors in exercises and the follow-up test, the results showed that most grammatical errors of her 30 first-year English major students at Uttaradit Rajabhat University were verb forms. Nguyen (2019) also found that verb tense and word choice were the most frequently committed errors by 65 fourth-year English-major students in an intermediate level. Moreover, Nguyen (2019) has mentioned that some problems in learners' English writing could be the results of Thai culturally-based English learning styles. Suvarnmani (2017) investigated the essays of 18 Arts students and she also supported that direct translation affects Thai students' English writings and it has a negative impact on writing with problems such as word choice, word order, vocabulary and so on. Rattabadilok, & Othman (2015) investigated 40 second- and third-year undergraduates on 40 narrative essays and found that verb tense, verb form, pronouns, preposition and articles were common errors.

On the other hand, Khumphee and Yodkamlue (2017) have revealed that the use of punctuation is the most error by second-year English major students at Nakhon Ratchasima Rajabhat University because of the omission of punctuation and lack of knowledge. Moreover, other errors of Thai students' writing were found as follows: parts of speech, determiners, sentence structure and subject-verb agreement. It can be seen that all of these are grammatical errors, but with the most frequent grammatical error found in both Thai and international learners being verb tense, followed by verb form, punctuation, prepositions, pronouns, articles, and sentence structure. More importantly, some Thai EFL learners have limited language proficiency on writings, thus they normally translate it word for word from Thai to English because of the occurrences of Thai language influence.

III. Methodology

A. Participants

There are 30 Thai English major undergraduates at the beginner level at Burapha University, Chanthaburi Campus.

B. Tasks

- The paragraph writing was divided into 2 activities: 'Read the Topic and Write a Paragraph' (A1): 'What is the most difficult thing about learning English for you? What is the easiest or most fun? Why do you want to know English? How might you use it in the future?' and 'Watch the Video Clip and Write a Paragraph' activities (A2): Doraemon: "The War of the Steel Robot", URL: https://youtu.be/EgeUH7ScZNc

It was found that the topic of activity 1 was relevant to every student. Besides, for activity 2, a cartoon was used as consideration points for the learners' paragraphs. These two activities can elicit the students' ideas and English writing

skills, thus their paragraph writings can be considered as showing sufficient data for the analysis. Similarly, the video clips were employed to facilitate the teaching process attracting EFL learners, especially in language teaching (Bajrami & Ismaili, 2016). If interesting activities or materials are employed in the EFL classroom, these will help the learners express their thoughts contextually (Putra *et al*., 2018).

C. Data collection procedure

1. Error analysis from students' paragraph writing.

All participants were requested to produce a paragraph writing for activity 1 (A1) in an hour. Then, the participants received activity 2 (A2), spending an hour-watching the video and an hour writing about it on another day. Each paragraph then underwent error analysis.

2. Data analysis

The data for the study were gathered using a quantitative approach. The statistics used were as follows:

- Frequency, mean scores and percentages were used as descriptive statistics in order to find the frequency of errors in the paragraphs.

IV. Results

In this section, the results and statistical analysis of 60 paragraphs will be presented in order to figure out the most common errors. This chapter will use abbreviations to represent the two tests as follows:

1. 'A1 Topic' refers to activity 1: 'Read the Topic and Write a Paragraph'

2. 'A2 Cartoon' refers to activity 2: 'Watch the Video Clip and Write a Paragraph'

Table 1. Errors found in paragraph writings of activity 1 topic and activity 2 cartoon

Error Types	Frequency	Mean	Percentage
Punctuation (P)	351	8.84	12.92
Unnecessary word (X)	340	8.95	12.52
Wrong word (WW)	232	6.74	8.54
Capitalization (CAP)	221	7.13	8.14
Spelling (SP)	214	5.71	7.88

The five most common errors on the paragraphs of activity 1 and activity 2 are presented in Table 1. Punctuation (P) 12.92% was found to be the most frequent error in both activities. The four most frequent errors were unnecessary word (X) 12.52%, wrong word (WW) 10.22%, capitalization (CAP) 8.14%, spelling (SP) 7.88%, respectively (see Table 1).

After analyzing the results of the paragraph writings, the 16 grammar chapters were found follows: verb tenses, word choices, sentence structure, articles, prepositions, modal/auxiliary verbs, singular/plural forms, fragments, verb forms, pronouns, run-on sentences, infinitives/gerunds, transitions, subject-verb agreement, parallel structure and comparisons. In addition, there were some grammar details that did not show in the lesson because the lecturer gave them some examples during the class, such as punctuation (P), unnecessary words (U) and spelling (SP).

Moreover, the explanations of errors are shown in Table 2.

Table 2. The example of explanations of errors

Errors Types	Explanations of Errors
Unnecessary word (X)	**Incorrect**: **And in** working in this profession has to use English as a beginner level. **Correct**: Working in this profession has to use English as a beginner level. **Incorrect**: English is crucial because you need to communicate with foreigners **in** every day. **Correct**: English is crucial because you need to communicate with foreigners every day.
Punctuation (P)	**Incorrect**: Moreover the word which I use should be related to my story. **Correct**: Moreover**,** the word which I use should be related to my story. **Incorrect**: How do you feel if you cannot speak English**.** **Correct**: How do you feel if you cannot speak English**?**
Subject-verb agreement (s/v agr)	**Incorrect**: English **increase** your chance of getting a good job. **Correct**: English **increases** your chance of getting a good job. **Incorrect**: The skills I learn **is** applied to my career. **Correct**: The skills I learn **are** applied to my career.
Wrong word (WW)	**Incorrect**: I'm happy **on** my job. **Correct**: I'm happy **with** my job. **Incorrect**: I can communicate with **foreigner** teachers. **Correct**: I can communicate with **foreign** teachers.
Wrong word from (wf)	**Incorrect**: Nobita has a **happiness** day in the new land. **Correct**: Nobita has a **happy** day in the new land. **Incorrect**: She was good at English and her **succeed** surprised everyone. **Correct**: She was good at English and her **success** surprised everyone.

V. Discussion

Throughout this study on helping EFL learners with grammatical errors by investigating on grammatical errors, the most typical errors in paragraph writing produced for 30 English major students at the beginner level shows punctuation (P) 12.92%, unnecessary word (X) 12.52%, wrong word (WW) 10.22%, capitalization (CAP) 8.14%, spelling (SP) 7.88%, respectively. Therefore, the study can focus more on teaching process which will be designed by error analysis. This means the lecturers were able to design pedagogical tools in order to solve particular problems.

The activities selected in the writing paragraphs activity 1 'Read the Topic and Write a Paragraph' and activity 2 'Watch the Video Clip and Write a Paragraph' were offered in order to examine the learners' abilities in writing skills. Activity 1 provided a topic which was relevant to every student. Activity 2 was a cartoon that learners could enjoy in a creating relaxing environment (Tanasy, 2017). Even though watching cartoons was enjoyable, reactions to the cartoons were conveyed through paragraphs. Thus, this activity was quite complicated compared with activity 1.

VI. Conclusion

The particular problems of grammatical errors will be solved if the lecturers understand the learners' difficulties. Lecturers who understand the learners' difficulties can design useful grammar materials leading to effective classroom learning (Singh *et al*., 2017). More importantly, learners need to experience more practice to enhance their grammatical knowledge and to increase their writing ability (Ratnaningsih & Azizah, 2019). Besides, the lecturer was supposed to be a facilitator who has the ability to deliver appropriate materials and elicit the content for the learners (Sitoresmi & Alicia, 2019). Ratnaningsih & Azizah (2019) also agree with Sitoresmi & Alicia's statement relating to providing proper remedial courses considered by lecturers. Thereby, the lecturer has to identify the learners' errors and their causes.

It can therefore be seen that this study can extend the idea of how the lecturer helps learners to use grammar suitably in order to produce paragraphs because the lecturer has to play

an important role by understanding students' weaknesses in the writing tasks. The lecturer then fulfills grammatical knowledge needs based on grammar errors and learners' needs (Singh *et al*., 2017). Eventually, the results of collecting grammatical error analysis can be applied to improve lessons for graduate students (Zafar, 2016). It is necessary for both learners and lecturers to participate in grammatical error analysis for valuable teaching time and better learning achievement.

A. Recommendations for further study research

1. Further studies should use a larger number of participants in order to gain several more grammatical error types. Not only English major students could be studied, but also non-English major students.
2. The results of the paragraph writings in this study should continually improve and be developed for grammar lessons.
3. Two activities of paragraph writings in this study should be compared in order to see the differences between activity 1 and activity 2.

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Investigating Vocabulary Size and Depth of English-Major Students at a Thai University

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***Abstract*—The present paper investigated two dimensions of English vocabulary knowledge: vocabulary size and depth of 52 English-major students at Rajamangala University of Technology Isan, Surin Campus, selected through convenience sampling. The Vocabulary Level Test (VLT) Version 2 and the Depth of Vocabulary Knowledge Test (DVK) of 2000 – 3000 word level were the main instruments of the present study. Results of the test revealed that the average vocabulary knowledge of the participants were moderate, while their depth of vocabulary knowledge was classified as being fair. Moreover, the results suggested that there was a significant moderate relationship between students' vocabulary knowledge and depth of vocabulary knowledge (r = .49), predicting the connection between the two variables to some extent.**

***Keywords*—vocabulary size; vocabulary breadth and depth; vocabulary level test**

I. INTRODUCTION

Vocabulary is one of the most crucial elements of language. Vocabulary knowledge is a key predictor of one's language proficiency [1][2] and plays an influential role in communication. As Wilkins [3] asserts, "Without grammar, very little can be conveyed; without vocabulary, nothing can be conveyed;" in other words, language production and comprehension are not likely to be possible if the speaker does not have sufficient lexical skills of the target language. For L2 learners, there is no doubt that vocabulary knowledge is essential in the development of target language skills [4][5]. According to [6] a high lexical knowledge is crucial for effective language use, while low word knowledge may hinder learners from achieving language communication. As a result, vocabulary knowledge is a key indicator of one's language proficiency.

Vocabulary knowledge entails a variety of dimensions and aspects of knowledge of knowing a

word [7][8]. However, one of the most recognized conceptualization of vocabulary knowledge which classifies vocabulary knowledge into two types: vocabulary breadth and depth. On the one hand, vocabulary breadth (or size), as defined by Nation [8], is the amount of words a language learner knows at a particular level of language proficiency. On the other hand, vocabulary depth is how well one can use the target words [9]. In a nutshell, vocabulary breadth and depth is the ability of how one demonstrates knowledge of form-meaning relationship of words. In order to be able to communicate both speaking and writing, it is necessary that the person know a great number of vocabulary and how to use the words effectively.

For language learners, it is necessary that their vocabulary knowledge be measured with regards to size and depth. One of the best-known tests of vocabulary knowledge is the Vocabulary Level Test (VLT) which was firstly developed by Paul Nation [10] and later updated by Schmitt, Schmitt, and Clapham [11]. VLT is comprised of words in different word-frequency levels, ranging from high-frequency word class (2000 word-level) up to low-frequency word class (10,000 word level).

Rajamangala Univsersity of Technology Isan, Surin Campus (RMUTI Surin) offers an undergraduate program called "English for International Communication" (henceforth EIC) which emphasizes students' perception in English language basics, skills, and usage. As parts of the university's policy, it is mandatory that all students in all majors take a language proficiency test designed by the university called the Exit Examination (with the cut point of 60 marks for non-English majors and 65 marks for EIC program) at least once in their fourth year. Results of the previous Exit Examinations have shown that a notably low number of the students, including English-major students, passed the tests. Presumably, one of the factors of such a circumstance may be linked to insufficiency of vocabulary knowledge. In order to examine this situation, this pilot study was conducted addressing the following research questions:

1. What are the levels of students' vocabulary size and depth?
2. Are there any relationship between students' vocabulary size and depth?

II. LITRATURE REVIEW

Vocabulary size is an essential factor influencing learning and using English for all skills for ESL/EFL students. Insufficient vocabulary size may result in difficulty in using a language [13]. The first threshold level of vocabulary size was 3,000 word families which was the basic requirement for students to have adequate comprehension in reading texts as well as to be able to guess the meaning of unknown words from context. Therefore, measuring vocabulary size is necessary in language learning. A number of methods in assessing learners' vocabulary size have been introduced, but one of the most common method is called the Vocabulary Level Test developed by Nations [10]. The VLT is a test that measures the extent to which a language learner knows word meanings and how to use those words effectively.

Apart from vocabulary size, another important aspect of vocabulary knowledge is the depth of vocabulary or how well one is able to use words in the target language. Qian [14] put forward that in addition to breadth of vocabulary, there should be another dimension of vocabulary teaching, and he used the terms "depth of vocabulary" to refer to the aspect of vocabulary that could involve such components as pronunciation, spelling, meaning, register, frequency, and morphological, syntactic, and collocational properties, each interacting with the others so that the best comprehension can be achieved.

III. METHODOLOGY

Research Instruments

In the present study, 2 types of test: the Vocabulary Level Test (VLT) and the Depth of Vocabulary Knowledge Test (DVK) were used as the main instruments.

1. The Vocabulary Level Test (VLT) Version 2

In the present study, a set the Vocabulary Level Test (VLT) Version 2 developed by Nation (1983) and improved by Schmitt, Schmitt, and Clapham in 2001 [15]. The test contains 60 words divided into10 groups (A-J) of 6 words. In each group, 3 out of 6 words are distracters, while the other 3 words have a definition each. Every level of the VLT follows the same format. Every level of the VLT follows the same format. The VLT has been used by other researchers to measure learners' vocabulary size. It has been successful because it has shown itself to be a quick, reliable and effective tool for measuring the type and amount of vocabulary that students know.

2. The Depth of Vocabulary Knowledge Test (DVK)

The Depth of Vocabulary Knowledge Test (DVK) is used to measure how well one knows how to use words. It was originally a word association test developed by Read [16] and later revised in 2004 to assess vocabulary depth knowledge. The DVK assesses two dimensions of depth of vocabulary

knowledge: a) polysemy and synonymy, and b) word collocation. In the present study, the DVK test included 10 items. Each item consists of one stimulus word which is an adjective and two columns in which each column contains four words. The column on the left is the word meaning section and the word collocation section is in the right column. One item has 4 correct answers. Among the four words in the left column, one to three words can be synonymous to one aspect of, or the whole meaning of, the stimulus word. Meanwhile among the four words in the right column, it could be one to three words which collocate with the stimulus word.

Data Collection Procedure

A period of 50 minutes were provided to the participants: 30 minutes were allocated for the DVK test and 20 minutes for the VLT.

Data Interpretation

The scores from both VLT and DVK tests are interpreted as explained below.

1. Vocabulary Level Test: One score was given for a word which was matched to a correct definition. The scores were counted separately at each level providing a maximum score of 30. According to Nation (2008), knowing at least 27 out of 30 words at a given level is considered satisfactory. The cut-off point for each score range is shown in Table I.

Score	Percentage (%)	Interpretation
26 – 30	90	Very high
21 – 25	80	High
16 – 20	70	Moderate
11 – 15	60	Fair
1 – 10	50	Low

TABLE I. Score Interpretation for the VLT

2. Depth of Vocabulary Knowledge Test: The correct answer of each word is given one point, meaning that a maximum possible score is 40 points for 10 items or 4 correct answers per item. The cut-off points of the score ranges for the present study are shown in Table II.

Score	Percentage (%)	Interpretation
36 – 40	90	Very high
31 – 35	80	High
26 – 30	70	Moderate
21 – 25	60	Fair
1 – 20	50	Low

TABLE II. Score Interpretation for the DVK Test

IV. Results

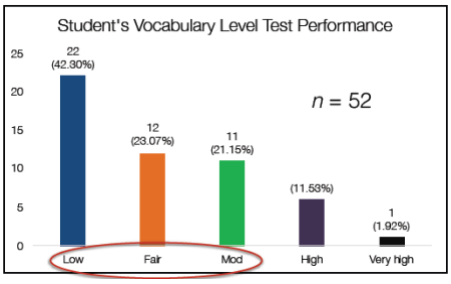
The results of the students' performance on both VLT and DVK tests are shown in Table III.

Table III Overall students' performance on VLT and DVK tests

Test	Full Score	Mean	SD	Level
VLT	30	17.48 (58.26%)	4.68	Fair
DVK	40	22.69 (56.72%)	7.08	Fair

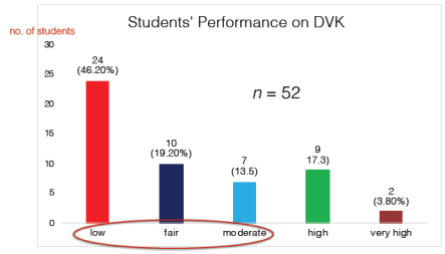
As shown in Table III, the overall score of the students' performance on vocabulary size test was 17.48 marks (58.26%) out of 30, and the overall score for vocabulary depth test was 22.69 marks (56.72%) out of 40. The data suggest that most of the students had a fair level of vocabulary size and depth. In a more profound interpretation of students vocabulary size, the results suggest that most of the students had a vocabulary size of 0.58 × 3,000 = 1,740 words on average. With regards to vocabulary size and depth in separation, very few students achieved the threshold level of suggested vocabulary size and depth in the 2000 and 3000-word level as shown in Table IV and V, respectively.

Table IV Students' performance on the Vocabulary Level Test



As shown in Table IV, only seven students out of fifty-two achieved a high level of 2000 and 30000-word level, which is comparably low. Similarly, the number of students achieving high level of vocabulary depth was comparatively low, that is only eleven out of fifty-two, as demonstrated in Table V.

Table V Students' performance on the Depth of Vocabulary Knowledge Test



3. Relationship between VLT and DVK

As shown in Table VI, students' vocabulary size and vocabulary depth had a moderate level of positive correlation (r = .492, p < .01) which indicates that these two aspects of vocabulary knowledge are interrelated. In other words, an increase (or decrease) in vocabulary size may result in an increase (or decrease) in vocabulary depth and vice versa.

Table VI Correlation between students' performance in VLT test and DVK test

Correlations

		VLT30	DVK40
VLT30	Pearson Correlation	1	.492**
	Sig. (2-tailed)		.000
	N	52	52
DVK40	Pearson Correlation	.492**	1
	Sig. (2-tailed)	.000	
	N	52	52

**. Correlation is significant at the 0.01 level (2-tailed).

V. Discussion

The results revealed that most of the participants could not achieve the threshold level of both vocabulary size and depth of basic language learners. One factors of such a deficiency in vocabulary knowledge may be due to their language proficiency, even they were English-major students. Another factor might be a result of the use of monolingual version of the tests, i.e. the only English version, which may have caused difficulty in understanding the tests. The findings in the present study, moreover, were similar to those reported in the work of Srimongkontip & Wiriyakarn [17], in which the participants, Thai high-school students did not achieve the threshold level of vocabulary size of 3000 words. However, the relationship between the size and the depth was observed, indicating that the more words the learners know, the more likely they are able to describe a stimulus word in greater depth. The findings also suggested a significant relationship between vocabulary size and depth, meaning that each vocabulary aspect are predictors of each other. This can be possibly explained by the notion of Vermeer [18] who asserts that the interrelation between vocabulary size and depth may be a logical consequence of the fact that the mental lexicon consist of interrelated nodes in a network, which specify the meaning of an element" (p. 231).

All in all, the present study has shown that vocabulary knowledge of the participants is slightly lower than the threshold level and a moderate relationship between vocabulary size and depth. It is advisable that teachers teach vocabulary in such a way that enable learners to connect the meaning and the depth of use. Also, these two dimensions should be taught in combination in the target language contexts.

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Effectiveness Evaluation of Fluorescein Sodium as Fluorescent Tracer in Shaly-Sandstone Reservoir

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***Abstract*—Fluorescein sodium (FluNa), one of the most widespread fluorescent tracers used in petroleum and geothermal applications, is an organic xanthene-derivative fluorochrome and available in the form of crimson powder. It absorbs light in the blue spectrum and emits light in the green-yellow spectrum. In this study, static and dynamic investigations of FluNa solution with shaly-sandstone were performed. FluNa solutions were stirred with untreated and treated shaly-sandstone powders for six hours at room conditions. This test showed that the effects of shaly-sandstone itself was significantly stronger than the effects of hydrocarbon and/or drilling fluids. At 1-ppb FluNa concentration, fluorescence detection was completely disturbed by the effect of shaly-sandstone, and this effect was diminished as FluNa concentration increased and stopped at the concentration of 100 ppm. As the concentration increased above 100 ppm, FluNa adsorption onto shaly-sandstone could be observed. Next, coreflooding system was used to perform a flow test of FluNa solution through shaly-sandstone core sample with an injection rate of 0.5 cm^3/min at 26°C. Breakthrough time of 1-ppb FluNa solution was almost identical to ideal breakthrough time of any liquid flowing through the core sample, whereas breakthrough times of 100-ppb and 1-ppm FluNa solution was 10 min longer than that of 1-ppb solution due to FluNa diffusion into irreducible water of the core sample and FluNa adsorption onto shaly-sandstone. Interestingly, the presence of salts could amplify fluorescence intensity. At FluNa concentration of 500-ppt with salts, its maximum intensity was almost the same as that of 1-ppb FluNa solution without salt, meaning that 500-ppt FluNa concentration could still be detected in the presence of shaly-sandstone. Therefore, appropriate FluNa concentration used in the pilot project could be in a range of 500 ppt to 1 ppb depending to the type of made-up water.**

Keywords—Fluorescein sodium; Shaly-sandstone; Clay; Salt; Coreflooding system

I. INTRODUCTION

The word "tracer" can be described as any substance that can be either found naturally in the reservoir with known concentration or is non-existent in the reservoir and being added into injected fluids, and can be eventually detected in very trace amount. Fluorescent tracer is one subtype of chemical tracers that contains fluorescent molecules or fluorochromes which can illuminate themselves after exposure to light [1]. Fluorescein sodium (FluNa), one of the most widespread fluorescent tracers used in petroleum and geothermal applications, is an organic xanthene-derivative fluorochrome and available in the form of crimson powder. It absorbs light in the blue spectrums and emits light in the green-to-yellow spectrums. From our previous study, FluNa concentrations above 10 ppm was inversely proportional to fluorescence intensity, whereas the concentration below 10 ppm was directly proportional to the intensity. Fluorescence wavelength at maximum fluorescence intensity became a function of FluNa concentration until wavelength of about 512 nm at 1 ppm and there was no longer reduction of the wavelength beyond this value at lower concentration. Detection limit of FluNa using deionized water as solvent could be lowered to 1 ppb. FluNa could be photodegraded and affected in acidic pH, but it was unaffected by petroleum reservoir temperatures in a range of 30-70°C up to 12 days. Recommended storage was inside amber-colored glass bottles with pH 7 or above [2]. In this study, detection limit of FluNa could be lowered further down to 500 ppt.

Shaly-sandstone, which is sandstone with 10% or more clay content, is a detrital sedimentary rock with alternate layers between sand-size and clay-sized particles formed during transgressive and regressive cycles. In the petroleum industry, clays in shaly-sandstone can cause wrong interpretation of water saturation and porosity, and production loss due to formation damages by clay swelling and fine migration [3][4]. Moreover, clays contain negatively charged surface that can adsorb cations in the reservoir fluid, and since they have high cation exchange capacity, they can exchange adsorbed cations with new cations in the fluid, and those released cations can affect other compounds being susceptible to positively charged ions, e.g. surfactants. Therefore, in this study, an effectiveness of FluNa solution being used as fluorescent tracer would be evaluated with shaly-sandstone in both static and dynamic investigations.

II. Theory

Clay is a member of phyllosilicates that composes of sheet-like structures of silica tetrahedra (SiO_4^{4-}) with other elements presented in the earth's crust as fundamental structural units. Clays can be classified into two types – detrital and authigenic clays. Detrital clay was formed by clays that deposited during sedimentaion and encapsulated with rock matrix, whereas authigenic clay was formed by clays that precipitated from underground liquid and adsorbed onto rock matrix [5].

Silica tetrahedron consists of one silicon (Si^{4+}) at the center bonded with four oxygen anions (O^{2-}) at each apex of tetrahedron as shown in Fig. 1. Silica tetrahedral sharing their oxygen anions in the same plane forms interconnected hexagonal linkage so-called silica tetrahedral sheet with repeating unit of $Si_2O_5^{2-}$ and remain negatively charged. Some cations such as magnesium ions (Mg^{2+}), ferrous ions (Fe^{2+} and Fe^{3+}), and aluminum ions (Al^{3+}) can act as coordinating cations that can bond to oxygen anions or hydroxyl groups (R-OH) of silica tetrahedral sheet and form octahedron structure as shown in Fig.2, and a group of octahedra in interconnected horizonal linkage by sharing oxygen anions is called octahedral sheet. The combination of silica tetrahedral sheets and octahedral sheets bonded by sharing oxygen anions form aluminosilicate layers which have many arrangements, resulting in different types of clay.

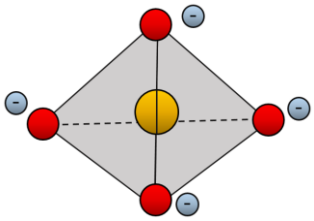

Fig.1. Silica tetrahedron structure. Red circles represent oxygen anions, whereas yellow circle represents silicon.

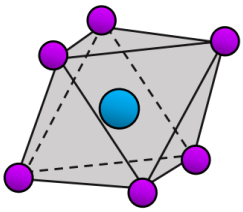

Fig. 2. Octahedron structure. Purple circles represent oxygen anions or hydroxyl groups, whereas blue circle represent coordinating cation.

Isomorphous substitution is a process that replaces cations with other exchangeable cations with similar crystal ionic radii. Si^{4+} at the center of silica tetrahedron can be replaced by Al^{3+}, and Al^{3+} or Mg^{2+} at the center of octahedron can be replaced by Fe^{2+} or Fe^{3+} without interfering the crystal structures. The replacement of higher-valence cations by lower-valence cations results in negatively charged, whereas the replacement of lower-valence cations by higher-valence cations results in positively charged. Typically, negatively charged replacement exceeds positively charged replacement, resulting in net negatively charged surface of clay. Since clays have cation exchange capacity, which is capacity of clay to adsorb, retain, and release cations, negatively charged surface is stabilized by adsorption of cations presented in the fluid at the interlayer space [6].

III. Materials and Methodology

A. Materials

FluNa in the form of fluorescein sodium salt was used in this study. Deionized was used as a major solvent. Acetone was applied to clean all laboratory glassware before and after the experiments. Formation water used in this study was based on chemical composition of formulation obtained from Sirikit Oilfield (S1) operated by PTT Exploration and Production Public Company Limited. Total dissolved solid of formation water was 14,098 ppm and was prepared by using NaCl, KCl, $MgCl_2$, $CaCl_2$, and $NaHCO_3$.

B. Characterization of Fluorescein Sodium Solution

Cary Eclipse fluorescence spectrophotometer was the key instrument used to characterize FluNa and was available at Supramolecular Chemistry Research Unit, Department of Chemistry, Faculty of Science, Chulalongkorn University. Photomultipliers (PMT) voltage was between 400-800 V and slit sizes for both excitation and emission filters were 5 and 10 nm. Rectangular quartz cuvette with size of 12.5 mm × 12.5 mm × 45 mm, path length of 10 mm, and nominal volume of 3.5 mL was used to contain the sample inside fluorescence spectrophotometer.

C. Preparation of Shaly-Sandstone Samples

Shaly-sanstone core sample obtained from Sirikit Oilfield (S1) operated by PTT Exploration and Production Public Company Limited was used in this study. The core sample was cleaned by using toluene followed by methanol in Soxhlet apparatus and dried in oven for 24 h. After that, the core sample was saturated by using coreflooding system until the sample was fully saturated with formation water before used in dynamic investigation of FluNa solution with shaly-sandstone. Physical properties and elemental composition of the core samples were listed in table I and table II, respectively. Shaly-sandstone cuttings at the same depth as the core sample were also collected and ground into powder. The powder was prepared into two different ways which were treated and untreated. Untreated powder was directly obtained from grinding of the cuttings, whereas treated powder was cleaned by toluene followed by methanol.

D. Static Investigation of Fluorescein Sodium Solution with Shaly-Sandstone

Static investigation of FluNa solution with shaly-sandstone was performed to observe the interactions between shaly-sandstone and FluNa. Determination of maximum FluNa adsorption was expected to obtain in this step to identify appropriate concentrations for dynamic investigation. First, 1,000-ppm FluNa solution was prepared by using deionized water as solvent. Then, the solution was diluted down to 100

ppm, 1 ppm, 100 ppb, and 1 ppb. The solution of 30 mL at each concentration was placed into amber-colored glass bottles. Deionized water of 30 mL was also used to assess baseline of the results. Next, 2 grams of untreated and treated powders were added into each bottle separately. Mixtures of FluNa solution and shaly-sandstone were mixed by using magnetic stirring bars on magnetic stirrer at room temperature for six hours which was an optimal time of shaly-sandstone to reach an equilibrium with added chemical substances [7]. After that, the mixtures were filtered using 125-mm filter papers and finally filtrates were characterized by using fluorescence spectrophotometer.

Table I. Physical properties of shaly-sandstone core samples.

Property	Value	Unit
Diameter	3.80	cm
Length	8.15	cm
Cross-sectional area	11.34	cm^2
Weight	188.95	g
Bulk volume	92.43	cm^3
Pore volume	19.37	cm^3
Effective porosity	0.21	fraction
Permeability	168.03	mD

Table II. Elemental composition of shaly-sandstone core samples.

Element	Percent Composition
Silicon (Si)	49.647 %
Iron (Fe)	21.597 %
Potassium (K)	12.294 %
Aluminum (Al)	8.031 %
Titanium (Ti)	5.158 %
Calcium (Ca)	1.367 %
Other trace elements	1.906%

E. Dynamic Investigation of Fluorescein Sodium with Shaly-Sandstone

Dynamic investigation of FluNa solution with shaly-sandstone core sample was performed to determine actual interactions between shaly-sandstone and FluNa solution, and appropriate FluNa concentrations used in the pilot project. Coreflooding system was used to perform a flow test of FluNa solution through shaly-sandstone core sample. Appropriate concentrations of FluNa solution obtained from the previous section were prepared and filled inside accumulator. The core sample was then placed in the coreholder and formation water was injected to fill in the flowline as well as the core sample prior to the test. Confining pressure of 1,500 psi was used to confine an area surrounding the core sample to prevent by-passing of the liquid. The solutions at different selected concentrations were injected with an injection rate of 0.5 cm^3/min at 26°C through the core sample. Effluent of 5 mL was collected every 10 min starting from the beginning until 110 min (11 samples in total). Finally, the effluent was characterized by using fluorescence spectrophotometer.

F. Evaluation of Salt Effect on Fluorescein Sodium Solution

Salt effect on FluNa solution was evaluated to observe a change of fluorescence intensity of FluNa solution in the presences of salts. First, formation water and individual salt with the same amount in formation water were prepared using 1-ppm FluNa solution as solvent. Next, the 1-ppm FluNa solution without salt was diluted down to 1 ppb, 500 ppt, 100 ppt, and 10 ppt. Formation water prepared by using deionized water as solvent was added equally into each diluted FluNa solutions during the solution dilution. Finally, they were then characterized by using fluorescence spectrophotometer and compared the results to the solutions at the same concentration in an absence of salt.

IV. Results and Discussion

A. Static Investigation of Fluorescein Sodium Solution with Shaly-Sandstone

As shown in fig. 3 and fig. 4, fluorescence detections of deionized water and 1-ppb FluNa solution stirred with both untreated and treated shaly-sandstone powders for 6 hours were completely disturbed by the effects of shaly-sandstone, hydrocarbon, and/or drilling fluids. Moreover, all spectra for the filtrates showed peaks at 527 nm which might be due to the presences of natural fluorochromes in shaly-sandstone. Therefore, FluNa solution at concentrations of 500 ppt or below stirred with the powders was impractical as fluorescence detection might be disturbed by shaly-sandstone, natural fluorochromes as well as several chemicals from hydrocarbon and/or drilling fluids. Next, the detection of 100-ppb FluNa solution stirred with untreated and treated powders could be clearly distinguished from 100-ppb pure FluNa solution; however, the spectra of stirred mixtures had higher maximum fluorescence intensity than the pure solution as shown in fig. 5. This behavior might be linked with the presence of shaly-sandstone, hydrocarbon and/or drilling fluids which could still be observed at wavelengths before 495 nm. In fig. 3 to fig. 5, all spectra for untreated mixtures had higher intensity than those of treated mixtures, meaning that the effects of shaly-sandstone, hydrocarbon, and/or drilling fluids were stronger than the effect of shaly-sandstone only.

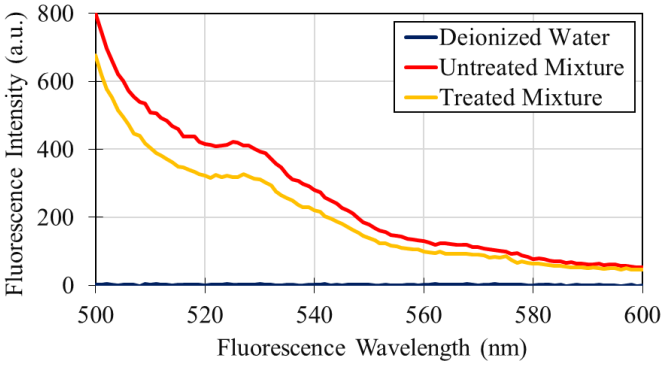

Fig. 3. Fluorescence spectra of deionized water in static investigation of FluNa solution with shaly-sandstone with PMT voltage of 600 V and slit size of 10 nm.

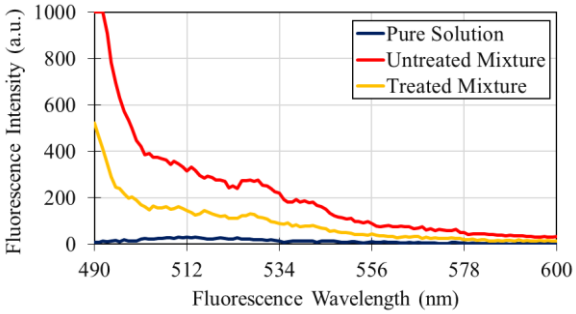

Fig. 4. Fluorescence spectra of 1-ppb FluNa solution in static investigation of FluNa solution with shaly-sandstone with PMT voltage of 700 V and slit size of 5 nm.

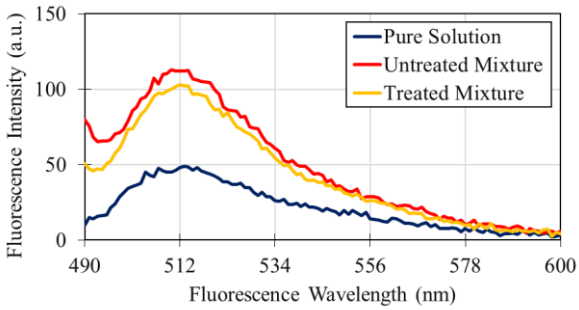

Fig. 5. Fluorescence spectra of 100-ppb FluNa solution in static investigation of FluNa solution with shaly-sandstone with PMT voltage of 500 V and slit size of 5 nm.

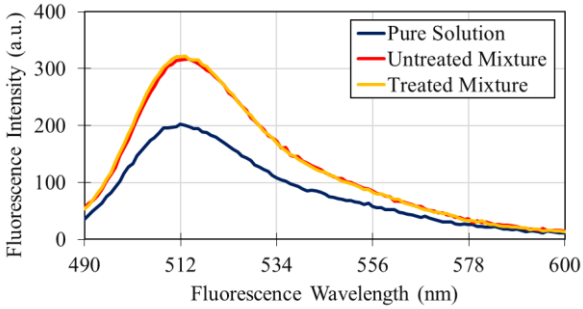

Fig. 6. Fluorescence spectra of 1-ppm FluNa solution in static investigation of FluNa Solution with shaly-sandstone with PMT voltage of 450 V and slit size of 5 nm.

Subsequently, as shown in fig. 6 and fig. 7, the spectra of 1-ppm and 100-ppm FluNa solutions stirred with untreated and treated powder were almost identical. The spectra of 1-ppm mixtures still had higher maximum intensity than 1-ppm pure FluNa solution, whereas the spectra of 100-ppm mixtures had almost the same maximum intensity as 100-ppm pure FluNa solution, meaning that the effects of shaly-sandstone, hydrocarbon, and/or drilling fluids nearly stopped at this concentration. As mentioned earlier that FluNa concentrations above 10 ppm was inversely proportional to fluorescence intensity, the increase of maximum intensity of 1,000-ppm mixtures than that 1,000-ppm pure FluNa solution, as shown in fig. 8, indicated a reduction of FluNa concentration which could be due to FluNa adsorption onto shaly-sandstone. Additionally, the spectrum of treated mixture was higher than that of untreated mixture, meaning that treated powder might have more surface area to adsorb FluNa molecules, resulting in more reduction of FluNa concentration.

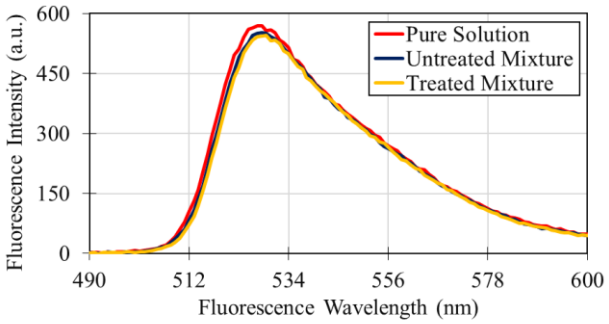

Fig. 7. Fluorescence spectra of 100-ppm FluNa solution in static investigation of FluNa solution with shaly -sandstone with PMT voltage of 500 V and slit size of 5 nm.

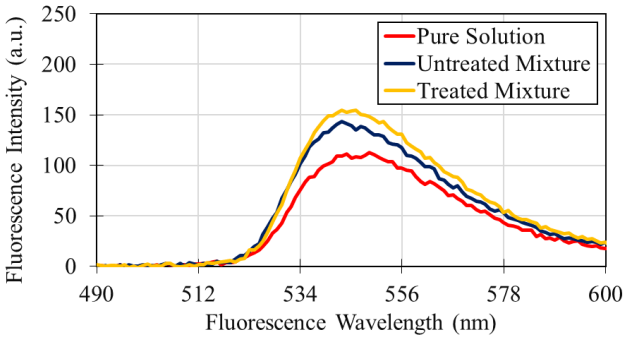

Fig. 8. Fluorescence spectra of 1,000-ppm FluNa solution in static investigation of FluNa solution with shaly-sandstone with PMT voltage of 500 V and slit size of 5 nm.

By plotting semi-log plots of maximum intensity as a function of FluNa concentrations, as shown in fig. 9, fig. 10, and fig. 11, an equivalent FluNa concentration of FluNa solution stirred with untreated and treated powders could be determined and summarized in table III and table IV, respectively, except for 1-ppb mixtures which could not be determined.

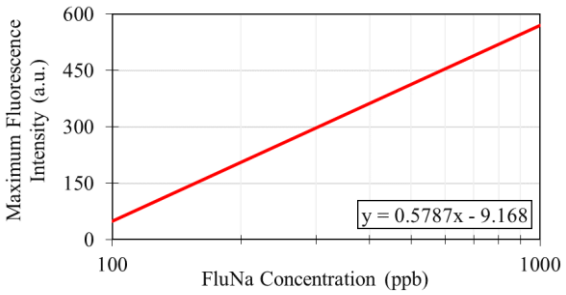

Fig. 9. Semi-log plot of maximum fluorescence intensity as a function of FluNa concentration in a range of 100 to 1,000 ppb (1 ppm) with PMT voltage of 500 V and slit size of 5 nm.

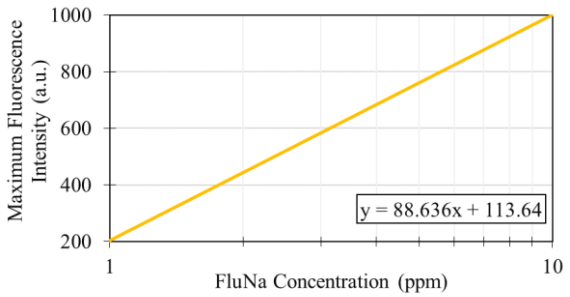

Fig. 10. Semi-log plot of maximum fluorescence intensity as a function of FluNa concentration in a range of 1 to 10 ppm with PMT voltage of 450 V and slit size of 5 nm.

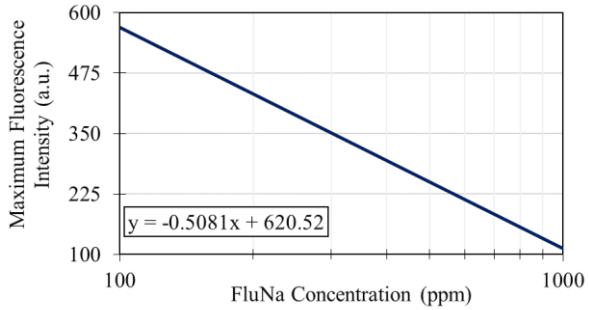

Fig. 11. Semi-log plot of maximum fluorescence intensity as a function of FluNa concentration in a range of 100 to 1,000 ppm with PMT voltage of 500 V and slit size of 5 nm.

Table III. Equivalent FluNa concentration of FluNa solution stirred with untreated shaly-sandstone powder.

Initial FluNa Concentration (ppm)	Equivalent FluNa Concentration (ppm)	Change in Concentration (ppm)	Percentage Change (%)
0.10	0.21	+0.11	+111.17
1.00	2.29	+1.29	+128.58
100.00	132.57	+32.57	+32.57
1,000.00	938.70	-61.30	-6.13

Table IV. Equivalent FluNa concentration of FluNa solution stirred with treated shaly-sandstone powder.

Initial FluNa Concentration (ppm)	Equivalent FluNa Concentration (ppm)	Change in Concentration (ppm)	Percentage Change (%)
0.10	0.19	+0.09	+94.16%
1.00	2.36	+1.36	+135.74%
100.00	148.77	+48.77	+48.77%
1,000.00	917.07	-82.93	-8.29%

Then data from table III and table IV were used to construct a semi-log plot of percentage change in equivalent FluNa concentration as a function of initial FluNa concentration as shown in fig. 12, which showed that 1-ppm mixture had the highest percentage change due to the presence of shaly-sandstone, hydrocarbon, and/or drilling fluids, implying that FluNa concentration of 1-ppm solution could be astonishingly amplified more than 100% of its initial concentration. Fig. 12 also showed that untreated and treated powders had nearly the same results, meaning that the presences of hydrocarbon and/or drilling fluids diminutively affect FluNa solution compared to shaly-sandstone itself. Therefore, shaly-sandstone core sample saturated with hydrocarbon would be ignored in the next section. Since 1-ppb FluNa solution stirred with shaly-sandstone powders could not be evaluated in this section, it would be then further evaluated in the next section. Finally, representative FluNa concentrations for next section were selected to be 1 ppb, 100 ppb, and 1 ppm. Higher FluNa concentrations were not selected as FluNa adsorption was undesirable.

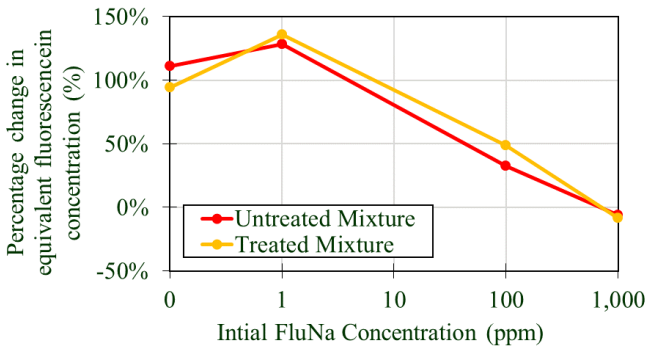

Fig. 12. Semi-log plot of percentage change in equivalent FluNa concentration as a function of initial FluNa concentration.

B. Dynamic Investigation of Fluorescein Sodium Solution with Shaly-Sandstone

First, for fluorescence spectra of 1-ppb FluNa solution as shown in fig. 13., the effects of shaly-sandstone were not as obvious as in static investigation where maximum fluorescence intensity of FluNa at 512 nm could still be detected; however the effects from shaly-sandstone had the highest intensity at 55 min and inverse trends at about 495 nm could still be detected in all spectra. By plotting a histogram of maximum fluorescence intensity as a function of sample collecting time for 1-ppb solution as shown in fig. 14, it illustrated that fluorescence intensity sharply increased from 25 to 35 min and went to maximum at 45 min. After 45 min, maximum intensity tended to lower down until 100 min which was because the effects from shaly-sandstone might be alleviated with time for this concentration.

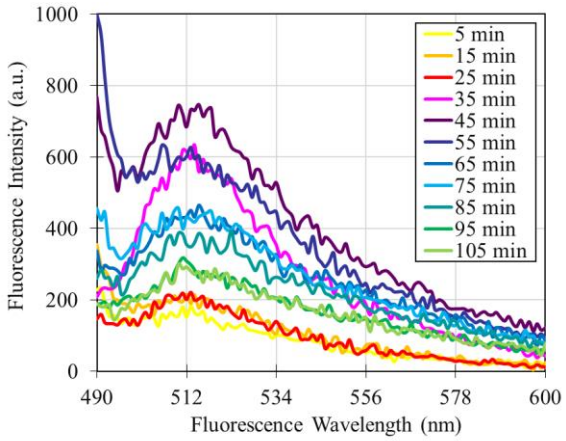

Fig. 13. Fluorescence spectra of 1-ppb FluNa solution in dynamic investigation of FluNa solution with shaly-sandstone with PMT voltage of 700 V and slit size of 5 nm.

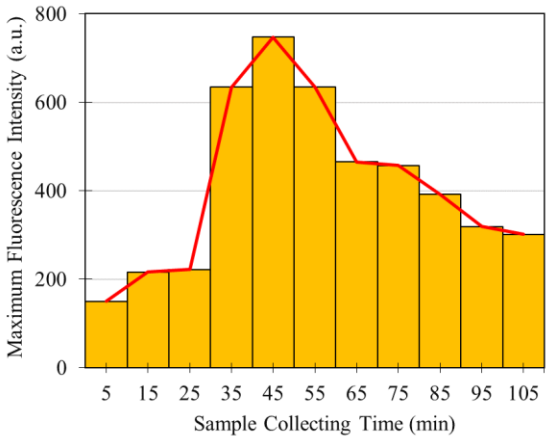

Fig. 14. Histrogram of maximum fluorescence intensity as a function of sample collecting time for 1-ppb FluNa solution in dynamic investigation of FluNa solution with shaly-sandstone with PMT voltage of 700 V and slit size of 5 nm.

From Fig. 14., it could be explained that FluNa solution from the injection process might arrive at the production end in the period between 25 to 35 minutes. Using mathematical method, an approximated breakthrough time of 1-ppb FluNa solution was about 29.31 minutes. However, since the system also contained dead pore volume of 4.32 cm^3, the production time required for this volume of 8.64 minutes must be subtracted from the calculated time. Hence, breakthrough time for 1-ppb solution was 20.67 minutes.

The same core sample was consecutively used for the next FluNa solution at higher concentration which was 100 ppb. With an increment by 100 times of the concentration, the effect from previous lower concentration solution on fluorescence detection was neglected. For the spectra of 100-ppb FluNa solution as shown in fig. 15, the effects from the core sample on inverse trends at before 495 nm could not be observed anymore compared to the spectra of static investigation as shown in fig. 5. Furthermore, fig. 16 showed that the intensity sharply increased from 25 to 35 min and even more sharply increased from 35 to 45 minutes. Calculation of appropriated breakthrough time was also applied to this case and the breakthrough time was about 40.38 minutes. By the reduction of the time required for dead pore volume, breakthrough time was 31.74 minutes.

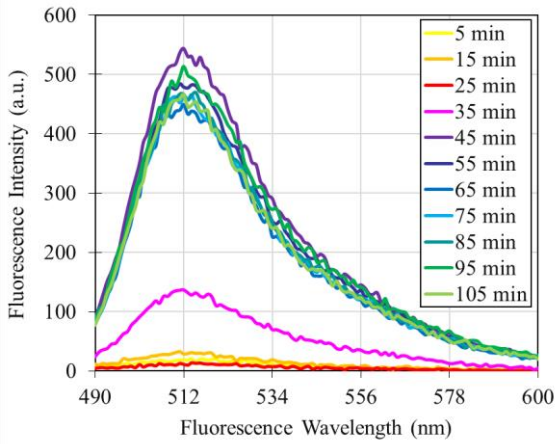

Fig. 15. Fluorescence spectra of 100-ppb FluNa solution in dynamic investigation of FluNa solution with shaly-sandstone with PMT voltage of 650 V and slit size of 5 nm.

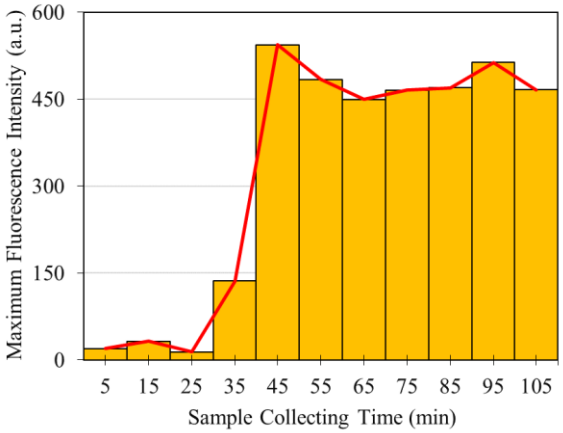

Fig. 16. Histrogram of maximum fluorescence intensity as a function of sample collecting time for 100-ppb FluNa solution in dynamic investigation of FluNa solution with shaly-sandstone with PMT voltage of 650 V and slit size of 5 nm.

Lastly, 1-ppm FluNa solution was injected into the same core sample and due to much different on concentration with previous solution, the effects of 100-ppb FluNa solution on detection of fluorescence was minimized. The spectra of 1-ppm solution at different collecting time were illustrated in Fig. 17. and the maximum intensity as a function of collecting time was plotted in Fig. 18. The intensity sharply increased from 35 min to 45 min, and then increased to maximum intensity at 80 min. Calculated breakthrough time was 42.26 minutes and by subtracting the time required for dead pore volume, the breakthrough time was 33.62 minutes.

Calculated breakthrough times obtained from three solutions were then compared with pore volume of rock sample. From Table II, pore volume of this shaly-sandstone core sample was 19.37 cm^3. Since this core sample had been tested before and irreducible water saturation was found to be 45% [7], movable pore volume of this rock sample would be 10.65 cm^3. By using the injection rate of 0.5 cm^3/min, an ideal arrival time of FluNa solution should be 21.31 min. From calculated breakthrough time, it could be observed that the 1-ppb solution with breakthrough time of 20.67 minutes was the nearest value. For 100-ppb and 1-ppm solutions, the breakthrough times were much longer due to the diffusion of high FluNa concentration into irreducible water part inside the core sample. Even though, this water did not move, FluNa could diffuse from movable pore with higher concentration to the dead-end pore, causing a retardation of FluNa arrival. Together with the results obtained in the previous section, the retardation of FluNa breakthrough time could also be due to FluNa adsorption onto shaly-sandstone where both phenomena would likely occur at high FluNa concentration.

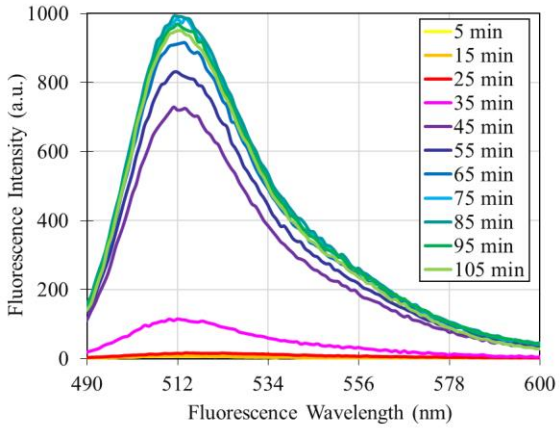

Fig. 17. Fluorescence spectra of 1-ppm FluNa solution in dynamic investigation of FluNa solution with shaly-sandstone with PMT voltage of 550 V and slit size of 5 nm.

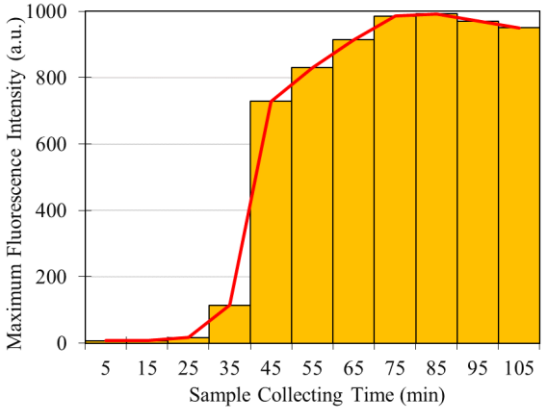

Fig. 18. Histrogram of maximum fluorescence intensity as a function of sample collecting time for 1-ppm FluNa solution in dynamic investigation of FluNa solution with shaly-sandstone with PMT voltage of 550 V and slit size of 5 nm.

C. Evaluation of Salt Effect on Fluorescein Sodium Solution

Although, in static investigations of FluNa solution with shaly-sandstone, FluNa solution stirred with shaly-sandstone powders had higher maximum fluorescence intensity than pure FluNa solutions and it was concluded to be due to the effects from shaly-sandstone, the presences of positively charged ions adsorbed on shaly-sandstone was expected to be the actual reason for this behavior. First, as shown in fig. 19, fluorescence spectrum of 1-ppm FluNa solution using formation water as solvent had higher maximum intensity than FluNa solution using deionized water as solvent. Moreover, as shown in fig. 20, 1-ppm FluNa solution with individual salt in the same content in formation water showed that $NaHCO_3$ had the major effect on the spectra, following by NaCl, $CaCl_2$, and KCl, whereas $MgCl_2$ slightly lowered the spectrum, meaning that the highest contribution to fluorescence intensity amplification comes from sodium ion which was the major cation. Later, as shown in fig. 21, all solutions with salts had higher maximum intensity than the solutions without salts, even though 10-ppt and 100-ppt FluNa solutions with and without salts still had maximum intensity in ranges of formation water and deionized water. Furthermore, maximum intensity of 500-ppt solution with salt was almost the same as that of 1-ppb solution without salt. If 500-ppt solution were used in dynamic investigation, the results might still be possible to be detected. Thus, in dynamic investigation, appropriate FluNa concentration used in the pilot project could be in a range of 500 ppt to 1 ppb depending to the type of injected water.

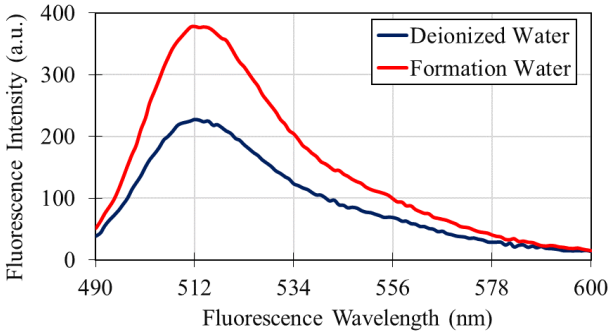

Fig. 19. Fluorescence spectra of 1-ppm FluNa solution in a presence and an absence of salts with PMT voltage of 450 V and slit size of 5 nm.

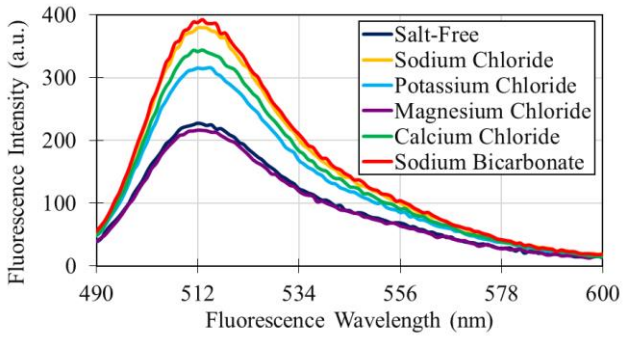

Fig. 20. Fluorescence spectra of 1-ppm FluNa solution with various salts with PMT voltage of 450 V and slit size of 5 nm.

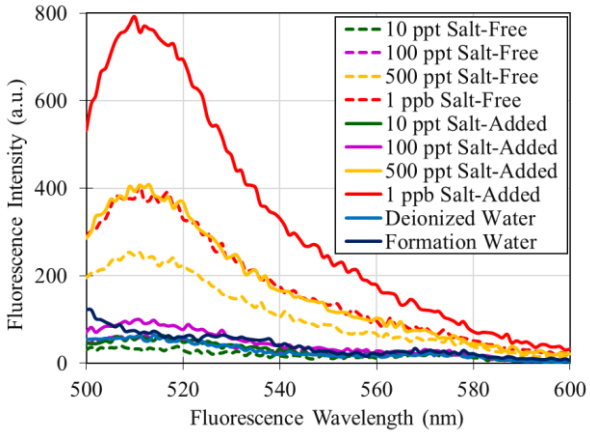

Fig. 21. Fluorescence spectra of FluNa solutions with various salts with PMT voltage of 750 V and slit size of 10 nm.

V. Conclusion

In this study, the interactions between FluNa solution and shaly-sandstone were investigated. In static investigation of FluNa solution with untreated and treated shaly-sandstone powders, both types of the powder showed small difference in fluorescence detection, meaning that the effects of shaly-sandstone itself were stronger than the effects of hydrocarbon and/or drilling fluids. Furthermore, the presence of shaly-sandstone could completely overcome the detection of deionized water and 1-ppb FluNa solution stirred with the powders and could amplify maximum FluNa intensity of the stirred solution compared to pure deionized water and pure FluNa solutions. The presence of natural fluorescence in shaly-sandstone might occur at wavelength of 527 nm. The effects of shaly-sandstone were diminished as FluNa concentration increased and stopped at the concentration of 100 ppm. As FluNa concentration increased above 100 ppm, FluNa adsorption onto shaly-sandstone could be observed. Next, in dynamic investigation of FluNa solution with shaly-sandstone core sample saturated with formation water, breakthrough time of 1-ppb solution flowing through the core sample was about 20.67 minutes which was similar to ideal breakthrough time for any liquid flowing through movable pore volume of the core sample of 21.31 minutes. At higher FluNa concentrations of 100 ppb and 1 ppm, breakthrough times were 31.74 and 33.62 minutes, repectively. Retardation of FluNa breakthrough time for higher concentrations than ideal breakthrough time illustrated that FluNa diffusion into irreducible water parts of the core sample and FluNa adsorption onto shaly-sandstone could occur at high concentration. Moreover, FluNa solution using formation water as solvent had higher maximum intensity than the solution using deionized water as solvent, meaning that fluorescence intensity amplification on FluNa solution with shaly-sandstone was due to the presences of positively charged ions themselves in shaly-sandstone. Sodium ions contributed the highest contribution in the intensity amplification due to its abundance. For very low FluNa concentrations, the concentration of 500 ppt would still be possible to be detected in the presence of shaly-sandstone. Therefore, appropriate FluNa concentration used in the pilot project could be in a range of 500 ppt to 1 ppb depending to the type of injected water.

This study was an initial step of FluNa investigation in applications of petroleum industry. Further investigations shall focus the utilization of FluNa solution in actual shaly-sandstone reservoir. Simultaneous utilization of FluNa with other fluorescent tracers, e.g. rhodamine and eosin, and proper detection methods shall also be investigated.

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Factors Affecting the Participation of People in Community Resources Management

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***Abstract*—One of important element helped leading to community development as planed was allowing chance for all sections and all people to participate in the administration of their community within the scope of their duties. This article aims at studying factors affecting the participation of people in community resources management at Chuea Phloeng sub district, Prasart district, Surin province. The data was collected through 381 sets of questionnaires. The data analysis was made to find means and standard deviation. The internal and external factors affecting the participation of people in community resources management was analyzed with Pearson's Product Moment Correlation Analysis. The analysis for the influence of the independent variables was made with Multiple Linear Regression. The result found that the internal factors affecting the participation of people in community resources management were the public awareness of the leader and community and the family leader supports which showed the highest rate of relationship to the factor of the society benefits and benefit management in a concrete idea. For the external factors, it found that the motivation in resource management of the community leader and the community to create the highest participation responded to the factor of expectation of people to gain benefits from the resource management.**

Keywords—community leader; community resource; participation; public awareness

I. INTRODUCTION

Due to the country development based on the national economic and social development plan, it increased the development of Thailand, However, the structure of Thai economy is connecting to world society more, it is sensitive and it fluctuates towards the external factors with the conditions and environments in terms of economy, society, national resources, and environment both inside and outside the country. They became a pressure for Thailand to adjust herself and conduct the risk management wisely as well as the change to solve the basic problem that is the weak point and the limitation of the country [1].

Sustainable community development is needed to be made with the ability to manage resources. They are human, natural resources, and funds to be able to respond to the current and future needs appropriately. It is needed to be made with confidence that the resources are enough and could be shared or passed to the next generation community [2]. The participation of people is an element increasing the sustainable community development because it allows people to get their rights joining the public policy process in terms of information accessing and sharing, opinion sharing, giving suggestions, and decision participation in the steps. They are policy planning, plan management, the structure that may affect the quality of lives and environment, economic and social development, natural resources and environmental management as well as the implementation, following up, and evaluation based on the policy structure plan or activities [3]. The factors supporting the participation in community activity development include human, community, and organization [4].

The decentralization to local refers to the passing of responsibility to decide for people in the community which supports the rule of democracy allowing people to rule

themselves and provides public services to people in the community [5]. The problems found obstructing the participation is that people lacked acknowledgment of the concept and importance of participation, the lack of skillful workers in using tools creating participation of people. The problem also includes the political culture, and readiness of people and government, and the lack of clear indicators measuring the level of people participation [6]. When the community leaders do not give enough and continuous action to persuade people to participate in management, maintaining, and conserving the resources, environment, and human resources, it may cause the little participation of people in the community [7]. This affects the community continuous lacking people participation in resources and environment management [8]. This may against the rule of good governance which is a big problem for Thai society [9].

The results of previous community development caused both positive and negative consequences. The community and ones who may concern need to understand, evaluate the effect, be aware, and find ways to support the positive consequences and prevent the negative consequences. Therefore, the community and ones who concern need to find a way to encourage the community to change their thoughts and roles to be ones who encourage and enhance people's potential to participate more. This study aimed at exploring factors influencing the people participation in community resources management which is considered as a device increasing the community potential.

II. Conceptual Framework

A. Conceptual Framework

According to the review of the concepts, theories, papers and related researches focusing on the meaning and the characteristic of people participation in community resources management as well as the review of literature on factors influencing the people participation in community resources management found that there were 19 independent variables as shown in figure 1.

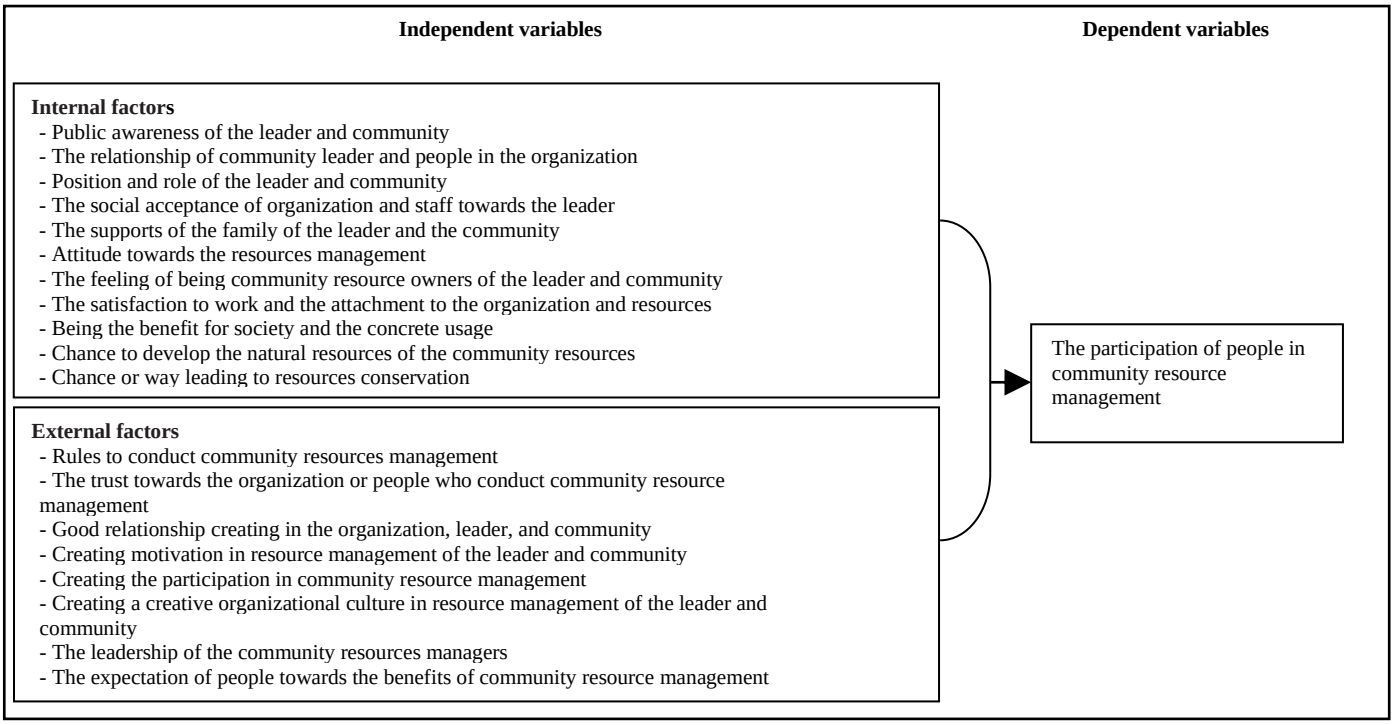

Fig. 1. Conceptual Framework

III. Methodology

This research is quantitative research which was conducted as follows.

A. Population and samples

The population in this study was a total of 7,814 people from 12 villages listed in Prasart sub-district, Prasart district, Surin province. The sample size determination was made using the calculation formula of Taro Yamane and got 381 samples. The random was made in many steps. The first step was setting the area of samples by the village, the second step was the calculation for the proportion of the sample in each village, and the third step was simple random using a computer.

B. Instruments

The instrument used in this study was a set of questionnaires. The development of the instrument was made

by considering the concepts, theories, and related researches. The instrument was developed in three parts as follows.

Part 1; questions were about general information including gender, ages and length of time living in the village, the position in the village, and occupation.

Part 2; the questions were asking about the internal factors influencing the participation of people in community resource management.

Part 3; the questions were asking about the external factors influencing the participation of people in community resource management

Part 2 and 3 questionnaires were the rating scale questionnaires providing five levels of agreement. They were 1) the least agree, 2) less agree, 3) somewhat agree, 4) more agree, and 4) the most agree. The questionnaires were evaluated for the Item-Objective Congruence (IOC) by 3 experts and revised with the suggestions given by experts. The result of the evaluation was between 0.82 and 0.96 which was considered as applicable.

C. Data Analysis

The 381 sets of data collected were calculated and analyzed using statistical software finding mean and standard deviation. The data analysis was made on the factors influencing the participation of people in resource management was made with Pearson Product Moment Correlation. The analysis of the independent variables was made using Stepwise Multiple Regression Analysis.

IV. RESULTS OF THE STUDY

The result revealed that 40.74% of the samples were male and 33.33% were female. Most of them or 29.64% were between 40-49 years old, some of them or 24.69% were between 50-59 years old. They were 11.11% of older than 60 years old and 8.64% of 30-39 years old, respectively.

A. Internal factor influencing the participation of people in community resource management

The result of the analysis on the level of the opinion of people focusing internal factors influencing the participation in community resource management found that the leader and the community rated the importance of the feeling of being community resource owners of the leader and community was at a high level ($\overline{X}$ = 4.37), the satisfaction to work and the attachment to the organization and resources at high level ($\overline{X}$ = 4.20), and the chance to develop the natural resources of the community resources at a high level ($\overline{X}$ = 4.18) respectively. The least high internal factor influencing the participation in community resource management was the chance or way leading to resources conservation ($\overline{X}$ = 3.73).

The correlation analysis made with 11 independent variables gave the result at 0.053 to 0.501 which was considered positive relation significantly at 0.05. After consideration on the internal factors influencing the participation in community resource management, it revealed that 1) Public awareness of the leader and community (X_1) and the supports of the family of the leader and the community (X_5) had the highest correlation rate, 2) Position and role of the leader and community (X_3) and being the benefit for society and the concrete usage (X_9) had the second high correlation rate, and 3) Position and role of the leader and community (X_3) and the social acceptance of organization and staff towards the leader (X_4) had the third high correlation. The supports of the family of the leader and the community (X_5) and attitude towards the resources management (X_6), and the satisfaction to work and the attachment to the organization and resources (X_8) and chance or way leading to resources conservation (X_{10}) had the least correlation rate as shown in Table 1.

TABLE 1. The correlation between variables used in the analysis

Variables	(X_1)	(X_2)	(X_3)	(X_4)	(X_5)	(X_6)	(X_7)	(X_8)	(X_9)	(X_{10})	(X_{11})
Public awareness of the leader and community (X_1)	1	0.261*	0.292*	0.204	0.501**	0.101	0.077	0.074	.099	0.129	0.148
The relationship of community leader and people in the organization (X_2)		1	0.105	0.128	0.200	0.080	0.182	0.097	0.147	0.111	0.409**
Position and role of the leader and community (X_3)			1	0.430**	0.239	0.177	0.194	0.120	0.473**	0.089	0.056
The social acceptance of organization and staff towards the leader (X_4)				1	0.153	0.061	0.067	0.210	0.091	0.140	0.242
The supports of the family of the leader and the community (X_5)					1	0.053	0.107	0.144	0.336**	0.079	0.175
Attitude towards resources management (X_6)						1	0.243	0.214	0.107	0.096	0.214
The feeling of being community resource owners of the leader and community (X_7)							1	0.270*	0.287*	0.262*	0.082
The satisfaction to work and the attachment to the organization and resources (X_8)								1	0.168	0.053	0.188
Being the benefit for society and the concrete usage (X_9)									1	0.093	0.247

Variables	(X_1)	(X_2)	(X_3)	(X_4)	(X_5)	(X_6)	(X_7)	(X_8)	(X_9)	(X_{10})	(X_{11})
Chance to develop the natural resources of the community resources (X_{10})										1	0.133
Chance or way leading to resources conservation (X_{11})											1
Mean	4.00	4.13	3.95	4.00	3.97	4.02	4.37	4.20	3.95	4.18	3.87
Standard Deviation	0.84	0.77	0.96	0.69	0.80	0.79	0.74	0.82	0.81	0.70	0.81

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

Stepwise Multiple Regression Analysis was used to analyze the correlation between people and 11 independent variables. The result found that 4 out of 11 independent variables showed affection towards the dependent variables significantly (Sig < 0.05). They were 1) Public awareness of the leader and community, 2) The relationship of community leader and people in the organization, 3) The feeling of being community resource owners of the leader and community, and 4) Being the benefit for society and the concrete usage which affected positive results at rate 0.102, 0.231, 0.094 and 0.257, respectively. The factor of being the benefit for society and the concrete usage affected the participation in community resource management the most, and the factor of the feeling of being community resource owners of the leader and community affected the participation in community resource management the least. The multiple correlations of the participation of people to 4 independent variables were at 0.883. The 4 independent variables could predict the participation of people at 71.70% as shown in Table 2.

TABLE II. The result of the regressive analysis on factors influencing the participation of people

Variables	Unstandardized Coefficients (B)	Standardized Coefficients (Beta)	t	Sig.
Public awareness of the leader and community	0.102	0.036	0.288	0.040
The relationship of community leader and people in the organization	0.231	0.130	1.086	0.022
Position and role of the leader and community	0.196	0.185	1.561	0.124
The social acceptance of organization and staff towards the leader	0.031	0.016	0.132	0.895
The supports of the family of the leader and the community	0.252	0.121	1.018	0.313
Attitude towards the resource's management	0.089	0.045	0.368	0.715
The feeling of being community resource owners of the leader and community	0.094	0.047	0.388	0.041
The satisfaction to work and the attachment to the organization and resources	0.084	0.036	0.288	0.774
Being the benefit for society and the concrete usage	0.257	0.217	1.840	0.032
Chance to develop the natural resources of the community resources	0.649	0.222	1.897	0.063
Chance or way leading to resources conservation	0.346	0.208	1.617	0.111

$R = 0.883$ $R^2 = 0.717$

B. External factor influencing the participation of people in community resource management

The result of the analysis on the level of the opinion of people focusing on external factors influencing the participation in community resource management found that the community and the leader rated the importance of the good relationship creating in the organization, leader, and community the most at a high level ($\bar{X}$ = 4.25). The second high was the trust towards the organization or people who conduct community resource management at a high level ($\bar{X}$ = 4.15), and creating the participation in community resource management at a high level ($\bar{X}$ = 4.12) respectively. After consideration of the external factors influencing the participation of people in community resource management, the least high internal factor was the expectation of people towards the benefits of community resource management ($\bar{X}$ = 3.97).

The correlation analysis made with 8 variables gave the result at 0.091 to 0.565 which was considered positive relation significantly at 0.05. The correlation of the external factors influencing the participation of people in community resource management was 1) creating motivation in resource management of the leader and community (X_4) and creating the participation in community resource management (X_5) had the highest correlation rate, 2) the trust towards the organization or people who conduct community resource management (X_2) and the leadership of the community resources managers (X_7) had the second high correlation rate, and 3) creating the participation in community resource management (X_5) and the expectation of people towards benefits of community resource management (X_8) had the third high correlation rate as shown in Table 3.

TABLE III. External factors directly influencing the community participation in community resource management

Variables	(X_1)	(X_2)	(X_3)	(X_4)	(X_5)	(X_6)	(X_7)	(X_8)
Rules to conduct community resources management (X_1)	1	0.126	0.090	0.150	0.092	0.105	0.100	0.082
The trust towards the organization or people who conduct community resource management (X_2)		1	0.141	0.135	0.102	0.091	0.545**	0.195
Good relationship creating in the organization, leader, and community (X_3)			1	0.344**	0.123	0.089	0.102	0.344**
Creating motivation in resource management of the leader and community (X_4)				1	0.565**	0.149	0.124	0.132
Creating the participation in community resource management (X_5)					1	0.222	0.118	0.498**
Creating creative organizational culture in resource management of the leader and community (X_6)						1	0.264*	0.155
The leadership of the community resources managers (X_7)							1	0.089
The expectation of people towards the benefits of community resource management (X_8)								1
Mean	3.98	4.15	4.25	4.10	4.12	4.02	4.10	3.97
Standard Deviation	0.83	0.66	0.70	0.71	1.03	0.95	0.95	0.86

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

Stepwise Multiple Regression Analysis was used to analyze the correlation between people and independent variables. The result found that 3 out of 8 independent variables showed affection towards the dependent variables significantly (Sig < 0.05). They were 1) good relationship creating in the organization, leader and community, 2) creating the participation in community resource management, and 3) the expectation of people towards benefits of community resource management which affected positive results at 0.202, 0.134 and 0.237, respectively. The factor of the expectation of people towards the benefits of community resource management affected the positive result of the participation of people the most. Creating the participation in community resource management affected the positive result to the participation of people the least. The multiple correlations of the participation of people to 3 independent variables were at 0.814. The 3 independent variables could predict the participation of people at 70.90% as shown in Table 4.

TABLE IV. The result of the regressive analysis of external factors influencing the participation of people

Variables	Unstandardized Coefficients(B)	Standardized Coefficients (Beta)	t	Sig.
Rules to conduct community resources management	0.093	0.038	0.381	0.704
The trust towards the organization or people who conduct community resource management	0.189	0.142	-0.042	0.967
Good relationship creating in the organization, leader, and community	0.284	0.202	-0.623	0.006
Creating motivation in resource management of the leader and community	0.060	0.017	0.429	0.670
Creating the participation in community resource management	0.194	0.134	0.022	0.012
Creating a creative organizational culture in resource management of the leader and community	0.067	0.049	1.001	0.321
The leadership of the community resources managers	0.091	0.051	3.548	0.101
The expectation of people towards the benefits of community resource management	0.279	0.237	-0.014	0.002

$R = 0.814$ $R^2 = 0.709$

V. DISCUSSION

According to the consideration of the correlation of internal factors influencing the participation of people in community resource management, it was found that 1) Public awareness of the leader and community, and the supports of the family of the leader and the community had the most correlation. Public awareness was a part of the social budget developing a good and strong society, where people share, participate in the responsibilities among the society with the awareness that everyone was a part of the society [10]. The community leader had the concrete role to make sustainable change to the community meanwhile the cooperation of people in the community was needed [11] as well as the effective policy decision must be made based on the information, opinion, and needs of people and stakeholders [12].

The correlation of position and role of the leader and community, and the social acceptance of organization and staff towards the leader were important compositions for the organization, society, and community development to create a learning community. There were many factors affecting

community development, but the most important things were people in the community and the leader of the community. Without these two factors, the development might not be able to succeed. Therefore, to develop the community, there should be the leader with potential and being accepted by people in the community in all aspects [11].

The correlation of internal factors influencing the participation of people in community resource management the most was the factor of being the benefit for society and the concrete usage of natural resources and environment which was the right of everyone in the community to conserve and manage the benefits together sustainably [13]. The achievement of the management began with the local community leader with strength who could create participation of people and fair distribute the benefit to the local [14].

The supports from the governmental organization was an important factor affecting the development of the strength of the community. According to the consideration of the external factors influencing the participation of people in community resource management, it was found that creating the motivation in resource management of the leader and community and creating the participation in community resource management had the highest correlation. The participation of people needed to be made as they had to get the complete information so they could think and analyze the information comprehensively [15] and if the people study the information before the beginning of the process, the people and stakeholders' opinion would be useful and would be made creatively [16].

The correlation between the trust towards the organization or people who conduct community resource management and the leadership of the community resources managers led to the need for human capital especially the leader who had high leadership who could motivate people in the community [17]. to cooperate doing activities which would reduce the conflict of sharing resource.

The correlation between creating the participation in community resource management and the expectation of people towards benefits of community resource management required the community leader who plays an important role connecting networks both local level which would get the impact, social level, and related external organization level with the goal of co-thinking, cooperating, co-maintaining, and co-getting benefit of a community resource. However, the process of participation had to be clear, open up, be able to follow up and checked [18].

The correlation of external factors influencing the participation of people in community resource management the most was the factor of the expectation of people towards the benefits of community resource management. The success of creating participation is that people participate with enthusiasm. Stakeholders could negotiate in making decision setting social goal and resource management to achieve the objectives with their exactly voluntary for the participation [19]. Therefore, allowing all sectors and all levels of people to participate in the administration within their scope of responsibilities, participate decision, using creative thinking, and their expertise in solving problems which would lead to the community development as planned [20].

VI. Discussion

The correlation of internal factors influencing the participation of people in community resource management was the public awareness of the leader and community, and the supports of the family of the leader and the community which had the most correlation. The correlation of internal factors influencing the participation of people in community resource management the most was being the benefit for society and concrete usage.

The correlation of external factors influencing the participation of people in community resource management was creating motivation in resource management of the leader and community and creating the participation in community resource management had the most correlation. The correlation of external factors influencing the participation of people in community resource management the most was the expectation of people towards the benefits of community resource management.

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Generic Green Skills: What Do Employers Anticipate From Prospective Employees?

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Abstract – Employees are the most precious asset for employers. Their significant contributions to industrial development are indisputable. Hence, this study explores employers' expectations from the perspective of employees concerning their generic green skills. A mixed-method comprising qualitative and quantitative approaches was adopted. The sample comprised of 85 respondents from training and recruitment officers and senior supervisors represented staff from middle-level management across 48 industries on the west coast of Peninsular Malaysia. Semi-structured open-ended interview protocols and questionnaires were used as the research instruments of the study. Qualitative data were analysed using thematic analysis while quantitative data by utilising SPSS software version 22. Four core clusters which comprised of ten generic green skills required by employers to enable prospective employees to be employed in the green technology industry. To support green economic success, research on generic green skills among industry workers, be it product manufacturing or service-oriented, should be increased and strengthened.

Keywords – Generic Green Skills; Green Technology Industry; Sustainable Development; Green Employment

I. INTRODUCTION

The pillar of a country's development lies in the competency of its human resource or better known as human capital. Human resources are a precious tangible asset for an organisation the sole resource that leads to superior competitiveness [1]. Generally, excellent human resource development is capable of producing more quality, skilled and efficient employees [2]. In the context of development towards becoming a developed and sustainable country, the required human resource must be highly skilled and equipped with non-technical skills, also known as generic skills, which includes a concern for the environment. These skills that prioritise the importance of safeguarding the environment in a good and healthy condition are called generic green skills.

Industrialisation has led to many of the world's current environmental problems [3] with increasing awareness towards sustainability among industrialists. Nonetheless, empirical research on this issue is still scarce. As mentioned by [4], research on the skills needed for green growth remain patchy. Reference [5] posited that research and referral resources on generic green skills and its relationship with sustainable development in Malaysia are still scarce. Hence, further studies are needed for a more in-depth understanding of the generic green skills profile for workers particularly in the green technology industry [6]. More studies should be conducted to better

understand and stimulate the inclusion of generic green skills in all industries, including green technology-oriented industry to further improve awareness and implementation practices among the parties concerned [7].Closely related to the topic, researchers and academicians seem eager to study the management of human resource and how it will affect sustainability or better know as green employment [8], [9], [10], [11]. However, earlier than this, [12] discovered that awareness of sustainability is inconsistent from one stakeholder to another. Knowing the attribute was crucial in order to implement and practice green skills in industry [13], employers have started looking for manpower with green skills needed for promoting sustainable development across the triple-bottom-line [14]. This is also in conformity with 17 components of Sustainable Development Goal (SDG) or better known as Global Goals [15].

To ensure the productivity of employees, green skills are needed for current and future industry [3]. Unfortunately, many employees perceived green skills as environmental friendliness and have no proper understanding of the role of green skills [16]. Thus far, employees do their best to comply with the requirements of environmental security [16].

Green skills refer to the abilities, values and attitudes needed by humans to support the sustainable and effective utilisation of resources in the workplace ([17], [18]). Green skills that have a significant association with green technology will contribute to sustainable development in terms of the environment, economy and social activities [19].

Reference [20] provided a comprehensive perspective on green skills which composed of three dimensions, namely knowledge (cognitive dimension), skills/abilities (psychomotor dimension) and attitudes/values (affective dimension) needed by workers to promote sustainable development in social, economy and environment. According to him, from the cognitive dimension, the knowledge concerning environmental protection can be regarded as an element of green skills while from the psychomotor perspective, green skills refer to the ability to, for instance, minimise energy consumption or reduce greenhouse gases. Green skills also refer to the affective aspect; for example, the motivation of an individual to conserve natural resources.

The research questions were formulated to focus this study on engaging in an in-depth analysis of the data..

The research questions are as follows:

1. What is the generic green skills profile as anticipated by employers of the green technology-based industry?
2. What clusters constitute the profile of generic green skills?
3. What is the most pivotal skill in generic green skills profile?

II. METHODOLOGY

This study adopted mixed methods ([21], [22]) involving the two-phase model of [23]. A qualitative approach was conducted through in-depth interviews, while a quantitative approach used a questionnaire. Findings from the in-depth interviews were used to produce a fully structured questionnaire. Two instruments were developed, namely the semi-structured open-ended interview protocol to obtain qualitative data and a questionnaire to collect quantitative data. The questionnaire was in a 'closed-ended' format using a five-point Likert Scale. The questionnaire was administered by posting it to the respondents. The qualitative data were analysed by utilising thematic analysis and quantitative data by using SPSS Version 22.

III. FINDING

This section presents the findings from the analysis of the data. Table 1 shows the distribution of mean and standard deviation for each skill.

Table 1: Distribution of mean and standard deviation for each skill

Skills	Mean	Standard Deviation
Socialisation	4.2975	0.49448
Self-Management	4.2569	0.49220
Intra and Inter Personal	4.2514	0.42753
Leadership	4.2034	0.43652
Green Communication	4.1349	0.44543
Sustainable	4.1207	0.53525
Thinking	4.1088	0.54751
Problem Solving	4.1020	0.57107
Life-Long Learning	4.0471	0.53510
Science, Technology, Engineering, Mathematics	3.7951	0.56440

(STEM)		

Note (5 Point Likert Scale):
5 = strongly agreed 4 = agreed
3 = average 2 = disagreed 1 = strongly disagreed

A total of 85 respondents participated in this study. The majority of the respondents were staff from middle-level management, such as training and recruitment officers and senior supervisor. While for the in-depth interview, six respondents were involved. Altogether, 40 industries participated in this study. Most of the industries are involved in electric and electronic-based product manufacturing.

Table 2 shows the core cluster and its related list of generic green skills.

Table 2: Clusters of Skills Profile

Core Cluster	The skills
Cognitive Skill	● Thinking ● Problem Solving ● Life-Long Learning
Scientific Skill	● STEM ● Sustainability
Self-management	● Managerial ● Leadership
Humanity	● Communication ● Inter and intrapersonal ● Socialisation

IV. DISCUSSION AND CONCLUSION

1. *Cognitive Skills*

A thread of increased awareness about environmental sustainability has prompted industry players, especially those who are green technology-oriented, to employ employees who have generic green skills. Concurrently, there is sustained efforts by industry to support the government in its drive towards green economic growth. Nonetheless, no standard can be used as a reference to set the profile of generic green skills for employees. It varies among countries and also in the context of the operations of an industry.

The findings of this study successfully identified ten generic green skills grouped into four main clusters. The four clusters of these skills are cognitive skills, scientific skills, self-managerial skills and humanitarian skills. All four clusters are interconnected and complement each other.

Cognitive skill is a key skill that involves mental activity, which refers to the change in thinking patterns which occurs as a result of learning or natural biological development. It requires the process of receiving input (stimulus), processing and producing output and subsequently translated it into behavioural forms (response). In this cluster, creative and critical thinking skills are very important in solving a problem that arises. It means, when employees faced with any problems, they must be competent in identifying the cause of the problem and identifying realistic immediate solutions with a creative approach. Creative means finding immediate solution without involving high costs while maintaining environmental quality and does not affect factory operations.

Closely related to thinking is learning. Learning is a process central to human behaviour [24]. When someone enters the job market, it does not mean that they have completed their study. As long as we are alive, learning is a continuous process of self-improvement. With that, learning can be defined in a variety of senses. In the context of workplace learning, the definition outlined by [25] is closely related to lifelong learning skill. The theory of transformative learning proposed by Mezirow stated that learning occurs when there is a replacement for the contradiction between the existing input (beliefs and assumptions) in one's knowledge with new input. Through briefings, workshops, field trips and training for up-skilling and re-skilling, employees will be guided and challenged to think in creative and critical ways to solve the problem by the middle-level management staff. The very basic exercise to introduce new employees to the management and operations of the industry is through induction courses. Induction course, daily morning briefings, and training are part of employees' life long learning.

Quoting the words of one of the respondents:

Ah yess…we do have …kind of...orientation. But here we call it as industrial knowledge.

…new workers…will give them briefing about environmental quality.. those things..will keep them informed regularly…or will remind them at daily briefing in the morning (before start working)

Another respondent stated,

We called it as schedule training for safety health and environment. Yes.... we conduct training for them .... continuous improvement.

We use our brain to think, which allows us to master creative and critical thinking. When special skills are enhanced with life long learning, they enable us to solve problems. Interconnectedness of these three skills is grouped together as a cognitive skill, mainly because it involves the power of the brain.

2. Scientific Skills

Scientific skills are those skills which relate to the concept of 'know how and know why' about the sophistication of science, technology, engineering and mathematics (STEM). For further operational definitions of STEM skills, [26] refer to it as engineering-based problem solving, creating relevant inter-disciplinary relationships, engineering-based design skills, scientific process skills, living and career skills, creativity, innovation and digital competency. These STEM skills are very much coherent with sustainability skills. To practice green skills that contribute to sustainability, we first need to become experts in STEM skills.

One of the attributes of STEM skills is a skill in information and communications technology (ICT). How does ICT relate to sustainability? A very obvious example and broad practice in the industry is the implement of paperless management, whereby all office and clerical works are executed in the form of reduced or eliminated paper usage. All kinds of documents, memos, flyers, bulletins are converted into a digital form known as digitisation. Elimination or reduced usage of papers helps save the forest and minimising the use of printing supports industry to contribute towards low carbon society.

When asked how does a company (industry) contribute towards environmental sustainability through digitisation? One of the respondents replied as follows:

…computer skill is a must. Before this all documents are in the form of hard copy, but now…we can save it in soft copy. So… all letters, attachment files can be send via email.

Another respondent added,

On our previous practices, we issue the payslip to every worker… so that they can check their monthly salary. But now, to save cost on paper usage (which indirectly contribute towards sustainability), we install a set of computer at the activity room so that they can access their payslip digitally or online. This means, every workers must know how to use computer.

In today's increasingly threatened planet, to survive not only in your career but also life, computer and digital literacy are critical. Moreover, if someone works in a green technology industry, these scientific skills would be advantages and value-added towards working competency. Employers prioritise the employment of those who are STEM literate.

3. Self Managerial

As individuals working in a large organisation such as industry, employees need to be skilful in managing themselves. Self-management skills which may subsequently lead others to follow our attitudes and behaviours are a form of excellent role model.

One respondent gave a very good example of how they (employers) were prone to employ new workers with these two skills. According to her:

… about the personality, we are looking at… how they concern about environment … awareness to the environment and how they manage their activities so that they will give minimal impact to the environment.

When further asked what kind of activities they (employers) refer to? The respondent answered:

…that 3R...recycle, reduce and reuse…those basic things.

It was elaborated further by her companion:

…ability to understand, operate … after that manageable to do maintenance on tools and systems in an energy efficient manner. Then…considering on minimisation of waste when using utilities. Meaning that… reduce waste… promotes recycling…conserve resources.

Good self-management renders one an example to others. When there is a follower, indirectly, the worker becomes a leader because leadership is when you are capable to influence others to follow your footsteps or behaviours. This was supported by another respondent from a different industry:

..their reaction among friends, how they lead their colleagues… Usually they are in a team, lead by their leader… their leader will demonstrate environmental leadership by complying the environmental laws, regulations and obligations.

Interconnectedness between self-management and leadership can be analogised as two sides of the same coin; two different things but closely related.

4. Humanitarian Skills

The fourth cluster is humanitarian skills which comprised of communication skill, socialisation skill and interpersonal and intrapersonal skills. These skills are more towards decent work behaviour with a focus on keeping and maintaining a good quality of the environment. In order to develop good skills in socialisation, one must have outstanding intrapersonal and interpersonal skills which are deeply rooted in communication skill.

One respondent remarked:

…communication skill (soft skill) is one of them. When we want to conduct something, for instance... environmental policy, of course we need to communicate each other… between top management with the frontliners, and the other way round, we want to disseminate the information…

By and large, communication skills enable us to interact with others. Meanwhile, socialisation involves interaction, meaning that these three skills (communication, socialisation and interpersonal/intrapersonal) are highly interrelated and complement each other.

In this study, green communication could be divided into synchronous and asynchronous ways of communication. Both are non-face-to-face interaction. It requires tools that allow bilateral and multilateral interactions to be executed through a digital medium. In this communication format, ICT skill is critical. Computers and digital gadgets such as smart handphones are widely used to enable various parties to communicate.

Green synchronous communication is communication between staff which occurs simultaneously via computers or any device through video conferencing platforms such as *Cisco Webex*, *Zoom* and *Google Meet.* These platforms are used mainly in a meeting or discussion. Asynchronous communication is communication which occurs non-simultaneously. It has either been recorded in advance, and staff can refer to it at any time. It replaces the old system of using paper for the purpose of disseminating and presenting information such as memos, bulletins and flyers. The use of email is another means that is now common practice. One respondent commented:

… we use email. Lower level staf…they have to use this (email). If they don't have email,.. then use WhatsApp (WhatsApp Messenger)…

Online via internet. We have network. We call it as bulletin, and if it is official…then we use email.

Good communication is the starting point of excellent intrapersonal skills, while interpersonal skills trigger robust social skills. Thus, it can be concluded that intrapersonal skills and interpersonal skills are the backbone of social skills. This is in line with what [27] had mentioned, that strong social skills help facilitate interpersonal interactions which lead to efficient job outcomes. Reference [28] identified long ago that strong social skill can facilitate interpersonal interactions, which can, in turn, lead to effective job outcomes. In related matters, if these skills are associated with efforts to maintain environmental quality, indirectly, we are deliberating about green practices at the workplace. Pertaining to that, one respondent stated the importance of green practices at the worksite. According to him:

… in term of behaviour…err… I mean… in connection with environment …is also kind of direct contact to attitude … beside having the knowledge, if they implement good practice in term of environment… out side of the industry,.. then in the industry, they don't have any problem to practice it… Knowledge has a direct impact to attitude.

This indicates that having good knowledge about the environment, supposedly, someone would not face problems regarding the practice of cleanliness and resource-saving at the worksite, which refers to green practices.

Workers should not be alone, isolating themselves from other groups of employees. On that matter, if we refer to Table 1, social skills became a priority among employers who want to hire new employees. Recent studies showed that social skills are increasingly important in the workplace ([29], [30]). This finding is quite sensible since a few respondents lamented over their dissatisfaction about communication and social skills, as can be seen in the transcript below:

…for foreign workers… mostly they have social problem. Factors that influence them, …well... it depends on what country they are coming from. If Indonesian men, they are more on social factor. If Vietnamese, they can easily influence others. If they don't agreed over something, they will come to a consensus among themselves. If their leader (among them) is not coming to work, then the rest of them will also not turn up for working. That's the problem.

Another respondent voiced:

… communication problem, … socials skill, hard to understand culture…

In facing future challenges and constraints towards green technology and sustainability, employers are bound by various acts and regulations of clean manufacturing practices. Thus employers are looking for employees who are fully and semi-skilled equipped with generic green skills.

If employees use their mind to think (cognitive and scientific skills), followed by decent behaviour (self-managerial and humanitarian skills) towards the job and the environment, it will certainly contribute to the sustainable development of green technology industry. Quoting statements from [31], one of the keys to making sustainable development policies successful in terms of environmental, social and economic outcomes is to ensure that the right skills are available when and where they (the employees) are needed.

To sum up, generic green skills, as anticipated by employers, are those skills (thinking, problem-solving, life long learning, STEM, sustainability, managerial, leadership, green communication, socialisation, interpersonal and intrapersonal) which can be clustered as cognitive skills, scientific skills, self-managerial and humanitarian skills. Each cluster consists of interrelated skills that complement each other, thus making it a holistic package of a competent employee who cares about environmental sustainability and promotes industrial development.

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Optimal Location of Charging Stations and Demand Prediction of Electric Van in Phuket

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***Abstract*— Electric Vehicles (EV) have become an important role to making transportation systems more environmentally friendly and electric vehicles have become a focus of government in many countries. In recently policy of Thailand, Thai government had shown an attention on the electric vehicle (EV) technology and start to launch a policy to promote EV in Thailand. The Thai government try to invest in infrastructure to support electric car in the future.**

In this paper, to support Thai government policy, we presented optimal locations for charging station in Phuket province based on consider the potential trip destinations of public van and we forecast the number of electric van in Phuket by using Gross Domestic Product of Thailand and also calculated the electricity demand of electric van in the future.

Keywords*— *Charging Station, Electric Vehicle, Electric Van, Electricity Demand Prediction, Optimized Location.

I. INTRODUCTION

With the shortage of fossil fuels and environmental pollution problems from Internal combustion engine (ICE) vehicles become global issues, many countries are expected to establish an aggressive strategy in order to reduce emissions and fossil fuels requirement. Among new advanced technologies, Electric Vehicles (EVs) are set to play a crucial role in order to achieve zero emission and reduce pollution from transportation.

In 2017, the global stock of electric cars surpassed 3 million vehicles after crossing the 1 million thresholds in 2015 and the 2 million mark in 2016. It expanded by 56% compared with 2016 [1], as result of supported policy from government in many countries.

Thai government had shown an attention on the electric vehicle (EV) technology and start to launch a policy to promote EV in Thailand for instance, New Excise Tax Scheme for electric vehicles [2], Collaboration with private sector to develop infrastructure to support electric vehicle. With policies from government, the number of registered electric vehicles is 84,236 units in 2017 and the Thai government aims to have 1.2 million electric vehicles nationwide.

In recent years, many papers have begun study about electric vehicle charging infrastructure. Reference [3], a stochastic model was built to find out whether the existing infrastructure is adequate for the charging of many EVs in Japan. Reference [4] was proposed an optimized model to optimize the location of charging stations for electric trucks based on actual tour patterns. Reference [5] studied a two-stage stochastic optimization model to solve strategic optimization problems of car-sharing systems that utilize electric cars. Reference [6] was built the mathematical model to planning location of electric vehicle charging stations which considers the road network structure, vehicle flow information and capacity constraints. Reference [7] were analyzed the impact of different driver charging behavior in Singapore. A model of distribution of charging stations was built considering behavior of driver. Reference [8] were employed the binary gravitational search algorithm, genetic algorithm, and binary particle swarm optimization algorithm to optimize the daily total cost by finding the best location for charging station in Malaysia.

Most of papers has focused on slow-charging station placement for private user but evidence from Norwegian (Norway is the country with the highest electric car penetration), private electric car owners most frequently charge their vehicles at home or at work, relying on slow chargers [9].

Since private car owners rarely charge their car at public charging point, the investment of public charging station for private electric vehicle car is not considered in initial stage in Thailand.

In this paper we mainly considered the location of charging stations for public electric vehicle such as electric bus, electric van. More specifically we determined optimal charging location for public electric vehicles by considered points of interest in considered area.

II. PUBLIC VEHICLES IN THAILAND

A. Vehicle registration in Thailand

According to statistics from the Land Transport Department report as of February 2017, the number of registered vehicles in

Thailand were at around 38 million units [10]. With around 37 million unit as private vehicle and around 1 million as public vehicle.

As a million of public vehicles, we are focus on non-fixed route bus that have route pattern depend on demand and customer

B. Phuket

Phuket, the country's largest island, is in southern of Thailand. Phuket province is one of the World's 30 Best Places to Visit in 2017-18 [11]. Statistics from tourism department report as of 2017, Phuket has over 14 million tourists in a year and

Even though Phuket has highest number of tourists in southern of Thailand, there is not public train or much public bus to support tourist. The mainly transportation for tourist is van that service all over area of Phuket as fixed and non-fixed route with total number registered of 6,967 units in 2017[12].

III. CHARGING STATION

Since Thai government had shown an attention on the electric vehicle (EV) technology and start to launch policies to promote EV in Thailand. One of the policies is Charging Station Subsidy Program. This policy aims to support investment of charging infrastructure and charging station in Thailand. And to support this program the collaboration team from Provincial Electricity Authority, Metropolitan Electricity Authority and Electricity Generating Authority of Thailand was setup to studied about electric vehicles in Thailand. In 2016, collaboration team publish Assessment of Electric Vehicle Technology Development report [13].

As report from Assessment of Electric Vehicle Technology Development report, the province that be selected to be involve in Charging Station Subsidy Program shown in Table.1

TABLE I. PROVINCE IN CHARGING STATION SUBSIDY PROGRAM

Province	Number of support charging station
Phuket	4
Songkhla	4
Nakhon Ratchasima	4
Chonburi	4
UdonThani	3
Khon Kaen	3
Rayong	3
Surat Thani	3

IV. POINTS OF INTERESTS

As an investment support from government that planned to establish 4 charging stations in Phuket and as a research about behavior of private electric vehicle owner that rarely recharge their car in public station [9], the key customer of public charging station will be public van that service in Phuket area.

Points of interests (POIs) represent potential trip destinations of van owners in Phuket and Phuket has a lot of potential destinations. However electric vehicles required at least 30 minutes to recharge with fast type, the considered points of interests in our study are the potential destinations where non-fixed route bus has stop at least 30 minutes

Data collection from survey of 2,048 van-drivers in Phuket shown 33 points of interests where have potential to setup charging station as shown as Table 2.

TABLE II. POINTS OF INTERESTS IN PHUKET

No.	Province
1	Tiger Kingdom Phuket
2	Phuket Zoo
3	Aphrodite Cabaret Show
4	Patong Go-Kart Speedway
5	Phuket Mining Museum
6	Baan Teelanka
7	Siam Niramit Phuket
8	Vanich Farm
9	Hanuman World
10	Peranakan Phuket Museum
11	Phuket Trickeye Museum
12	Muk Phuket
13	Phuket Old Town
14	Phuket fantasy
15	Phuket Simon Cabaret
16	Phuket Bird Park
17	Ogród Botaniczny - Phuket
18	Phuket Aquarium
19	Splash Jungle Water Park
20	Jungceylon Shopping Center
21	Patong Beach
22	Pornthip Phuket
23	Methee Cashew Nut
24	Expo Phuket
25	Central Festival Phuket
26	Robinson phuket
27	Saphan Hin
28	Promthep Cape
29	Rang Hill

30	Ocean Shopping Mall
31	Chillva Market
32	Naka Weekend Market Phuket
33	Big Buddha Phuket

We calculate the distance and duration of travel between each points of interests using the geographical distance. We use excel VBA to collect data from google maps platform. The Distance Matrix API is a service that provides travel distance and time for a matrix of origins and destinations, based on the recommended route between start and end points from google maps service as shown as Fig.1


```
{
   "destination_addresses" : [ "118/88 Moo 7, Kathu, Phuket, Thailand" ],
   "origin_addresses" : [
      "23/2 Soi Pa Lai, Tambon Chalong, Amphoe Mueang Phuket, Chang Wat Phuket 83000, Thailand"
   ],
   "rows" : [
      {
         "elements" : [
            {
               "distance" : {
                  "text" : "13.2 km",
                  "value" : 13228
               },
               "duration" : {
                  "text" : "25 mins",
                  "value" : 1476
               },
               "status" : "OK"
            }
         ]
      }
   ],
   "status" : "OK"
}
```


Fig. 1. Data from The Distance Matrix API service.

The data were collected from the survey about frequency of visit and duration of each visit for each points of interests to analyze and determine 4 optimal locations of charging station.

V. LOCATION OF CHARGING STATIONS

After collected the survey data and analyze data for each points of interests under following consumption:

- Data from survey represent behavior of all van in Phuket.
- There is no area constraint for POIs
- There is no capacity of energy constraint for POIs.
- Traffic in Phuket is not considerable.
- The electric vehicle driver will recharge after the battery level is 10 percent (10 kilometers drive).

We considered optimal locations under 2 criteria as following

- Frequency & Duration of each point of interest.
- Number of other POIs that have distance less than 10 kilometers from point of interest.

For frequency and duration of POI, we collected data from survey and score it, more often of visit and take more time will get higher score.

Number of other POIs that less than 10 kilometers far from focused POI show us if the focused POI has more nearby other POIs, it can cover more demand.

The location score (LS) of each point of interest was calculated by equation as in (1),

$$LS_i = W_{FD}FS_i + W_{NP}NS_i \quad (1)$$

With LS_i as location score of point of interest i,, W_{FD}, W_{NP} as the weight of frequency & duration score and weight of number of nearby place score respectively. FS_i as the frequency and Duration score of point of interest i and NS_i as number of nearby POIs of point of interest i.

The scenario of simulation was setup as following

- Scenario 1 100% weight of frequency and duration score
- Scenario 2 100% weight of number of nearby place score
- Scenario 3 50% on both criteria

As results from 3 scenario, locations where have highest location score was

- Phuket Old Town
- Patong Beach
- Saphan Hin
- Promthep Cape

All optimal locations can cover area in Phuket as shown in Fig.3

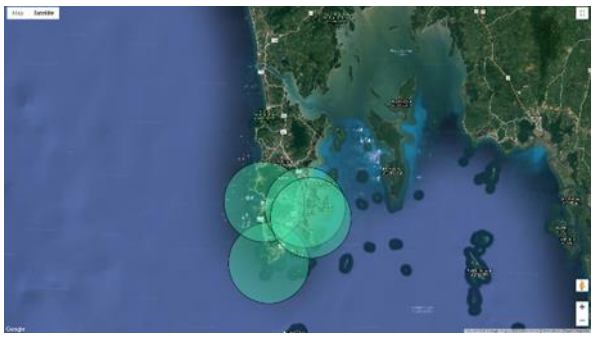

Fig. 2. Area cover of 4 optimal locations with circle radius 10 kilometers.

VI. DEMAND PREDICTION

A. *Number of van in phuket*

Regarding transportation in Phuket, van is the key role for travel in Phuket. According to statistics from the Land Transport Department report, the number of public vans has risen around 500 units every year since 2012 and from the 2017 report, the total registered van in Phuket was around 7,000 unit.

In order to forecast energy demand for electric van, we must forecast the number of vans. There is a research studied about vehicle ownership and use in low income countries that connect number of vehicle and gross domestic product [14] and

Thailand's Land Transport Department predicted total number of cars in Bangkok by using gross domestic product [13].

The main income of Phuket is from tourism and main customer of public van in Phuket is tourist so in our study we assume that the number of vans in Phuket depends on gross domestic product as in (2).

$$NV = -14381 + 0.84GDP_{\tau} + 3.6GDP_{\tau-1} \quad (2)$$

With NV as number of vans in Phuket, GPD as gross domestic product in year τ and τ as year that we consider.

In our study, we use GDP forecast from The Energy Policy and Planning Office report [15]. The result of number of vans prediction shown as table 3.

TABLE III. NUMBER OF VAN FORECASTING

Year	Number of vans
2019	9547
2020	10545
2021	11601
2022	12684
2023	13780
2024	14914
2025	16105
2026	17333
2027	18597
2028	19899
2029	21226
2030	22587
2031	23991
2032	25467

B. Electric van in Phuket

As result of forecast equation, we analysis under assumption that the growth of electric vehicle is linear, and we analyze 3 possible cases as following

- Case 1 the number of electric vans is 1% of total number of vans.
- Case 2 the number of electric vans is 5% of total number of vans.
- Case 3 the number of electric vans is 10% of total number of vans.

The result of all cases were shown as table 4.

TABLE IV. NUMBER OF ELECTRIC VAN

Year	Case 1	Case 2	Case 3
2019	127	634	1268
2020	138	689	1378
2021	149	746	1491
2022	161	805	1610
2023	173	867	1733
2024	186	930	1860
2025	199	995	1990
2026	212	1061	2123
2027	226	1129	2259
2028	240	1200	2399
2029	255	1273	2547
2030	127	634	1268
2031	138	689	1378
2032	149	746	1491

C. Vehicle Kilometer of Traveled

The vehicle kilometer of traveled (VKT) is the average kilometer travel of van in Phuket. The data of VKT in this paper was create by 1000 replication of computer simulation by using 33 points of interests as node and survey data as probability of travel and run under conditions of actual operation hour of each POI. The average vehicle kilometer of traveled from computer simulation was 172.20 kilometers per day.

D. Electric van model

In this study, we use Mercedes-Benz eSprinter model to replace Toyota Hiace Commuter model that mostly use as public van in Phuket. The eSprinter and Commuter has similar specification as shown as Table 5.

TABLE V. COMPARISON OF ELECTRIC VAN AND ICE VAN

Specification	Mercedes-Benz eSprinter	Toyota Hiace Commuter
Power	112hp	107 hp
Torque	300 NM	300 NM
Payload	900 kg	850 kg
Fuel Capacity	Battery 55kWh	Diesel 70 liters
Fuel Consumption	2.72 km/ kWh	12.50 km/liter

E. Energy Demand Prediction

The energy demand prediction was calculated by equation as in (3)

$$ED = NV \times FC \times VKT \quad (3)$$

With ED as energy demand, NV as number of vehicles, FC as Fuel consumption and VKT as vehicle kilometer of traveled

The result of energy demand prediction of 3 cases shown as Table 6.

TABLE VI. ELECTRICITY DEMAND PREDICTION IN GIGAWATT HOURS

Year	Case 1	Case 2	Case 3
2022	2.92	14.62	29.23
2023	3.18	15.88	31.76
2024	3.44	17.19	34.37
2025	3.71	18.56	37.12
2026	3.99	19.97	39.94
2027	4.29	21.43	42.86
2028	4.59	22.93	45.86
2029	4.89	24.46	48.92
2030	5.21	26.03	52.05
2031	5.53	27.64	55.29
2032	5.87	29.35	58.69

The peak load demand for charging electric van was calculated under assumption as all electric vehicle recharge simultaneously and the result shown as Table 7.

TABLE VII. PEAK ELECTRICITY DEMAND IN MEGAWATT

Year	Case 1	Case 2	Case 3
2022	6.34	31.71	63.42
2023	6.89	34.45	68.90
2024	7.46	37.29	74.57
2025	8.05	40.26	80.52
2026	8.67	43.33	86.66
2027	9.30	46.49	92.98
2028	9.95	49.75	99.50
2029	10.61	53.07	106.13
2030	11.29	56.47	112.93
2031	12.00	59.98	119.96
2032	12.73	63.67	127.33

F. Electricity capacity in Thailand

Since Thai government has established policy to support electric vehicle in Thailand and motivated private and public sector to develop and planning resource to support the policy. The Energy Policy and Planning Office and Electricity Generating Authority of Thailand has planned capacity of electricity in Thailand as shown in power development plan report [16].

The report shows that in 2032 Provincial Electricity Authority, organization who responsible to distribute electricity to household outside Bangkok, will has electricity capacity 256,452 GWh and has peak load capacity 37,756 MW that can support all electric van demand we forecast.

VII. CONCLUSION

In this paper we have presented optimal locations to built charging station in Phuket by focus on electric van and forecast electricity demand that will occur from electric van.

All optimal locations were analyzed by considered the potential travel trip of public van in Phuket, moreover, the number of charging locations we analyze was target by policy from Thai government.

The electricity demand was calculated by using GDP to forecast number of vehicles that will registered in the future and using Mercedes Benz eSprinter as a reference of electric van. As the result, The Provincial Electricity Authority can provide electricity to support all electric van in Phuket.

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Factor Influencing the Participation of People in Water Management in Muang District Community, Nakhon Ratchasima Province

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***Abstract*—This article aims at studying the factors influencing the cooperation of people in water management in Muang district community, Nakhon Ratchasima province. The data collection was made by collecting 364 sets of data. The data analysis was made using mean and standard deviation. Pearson Correlation Coefficient was used for analyzing the data focusing on internal factors and external factors affecting the cooperation of people water management in the community. Stepwise Multiple Regression Analysis was used to analyze the influence of independent variable. The result revealed that the factors influencing the cooperation of people in water management in Muang district community, Nakhon Ratchasima province including personal factor influencing the cooperation of people in the community in water management which were 1) people expectation to the benefit of community resources management, 2) leader's public awareness, and 3) social organization and staff acceptance towards the community leader. The community factor influencing the cooperation of people in community water management were 1) the leader and community feeling as the owners of the resources, 2) the trust to the organization or staff who administrate the community resources, 3) the public awareness of the community, and 4) the benefit to the society and the concrete management. The organizational factors influencing the cooperation of people in community water management were 1) the development of creative organization culture in resources management for the leader and the community, 2) the development of the cooperation in community resources management, 3) the attitude towards the resources management, and 4) opportunities or chances leading to the resource's conservation, respectively.**

Keywords—community leader; community resources; cooperation; public awareness

I. INTRODUCTION

The correlation of economic value of the natural resource and environment includes 1) the direct use value which referred to the value due to the actual usage, and 2) indirect use-value which referred to the value that did not directly to the actual usage [1]. The conditions for sustainable development were the effective usage of resources, the measure to solve any flaw of the market in resource management, and the effective ownership system [2]. Therefore, the sustainable community development needed to be able to manage resources that

respond to the current and future needs appropriately and much enough to pass to the next generation [3].

The participation of people was a composition that could cause sustainable community development because it allows people to get their rights joining the public policy process in terms of information accessing and sharing, opinion sharing, giving suggestion, and decision participation in the steps of policymaking, project planning that may affect the quality of life and environment. This included the implementation, following up, and project result evaluation [4]. The participation of stakeholders led to effective and sustainable wetland management which reflected its importance through various values [5]. The cooperation between communities and governmental organizations provided the opportunity to co-use the resource and information and learning supports. This relationship helped people to survive in this rapidly changing world [6]. The level of effectiveness in people learning development was up to the people in the community as the priority. The important points of community management were the participation of people in the community, community self-assisting, community resource usage, community creative thinking, and the cooperation of people and government. [7]. Factors promoting participation in community development included personal factors, community factors, and organization factors [8]. Besides, the appropriate network structure management could connect to the specific policy result and passed to the format of changing in methodology that created the result as planned [9].

The use of water from natural resources continuously resulted in an insufficient amount of water to use in activities that affected humans and ecosystems in terms of economy and society [10]. Therefore, the water resource or wetlands management was needed to be done concretely to conserve and use of resource sustainably [11] the results of previous community development caused both positive and negative consequences. The community and ones who may concern need to understand, evaluate the effect, be aware, and find ways to support the positive consequences and prevent the negative consequences. Therefore, the community and ones who concern need to find ways to encourage the community to change their thoughts and roles to be ones who encourage and enhance people's potential to participate in the development which could increase the community potential.

A. Research Objective

To explore the factors influencing the participation of people in water management in Muang district community, Nakhon Ratchasima province.

II. Conceptual Framework

A. Conceptual Framework

According to the review of the concepts, theories, papers and related researches focusing on the meaning and the characteristic of people participation in community resources management as well as the review of literature on factors influencing the people participation in water management in Muang district community, Nakhon Ratchasima province found that there were 20 independent variables as shown in the conceptual framework in figure 1.

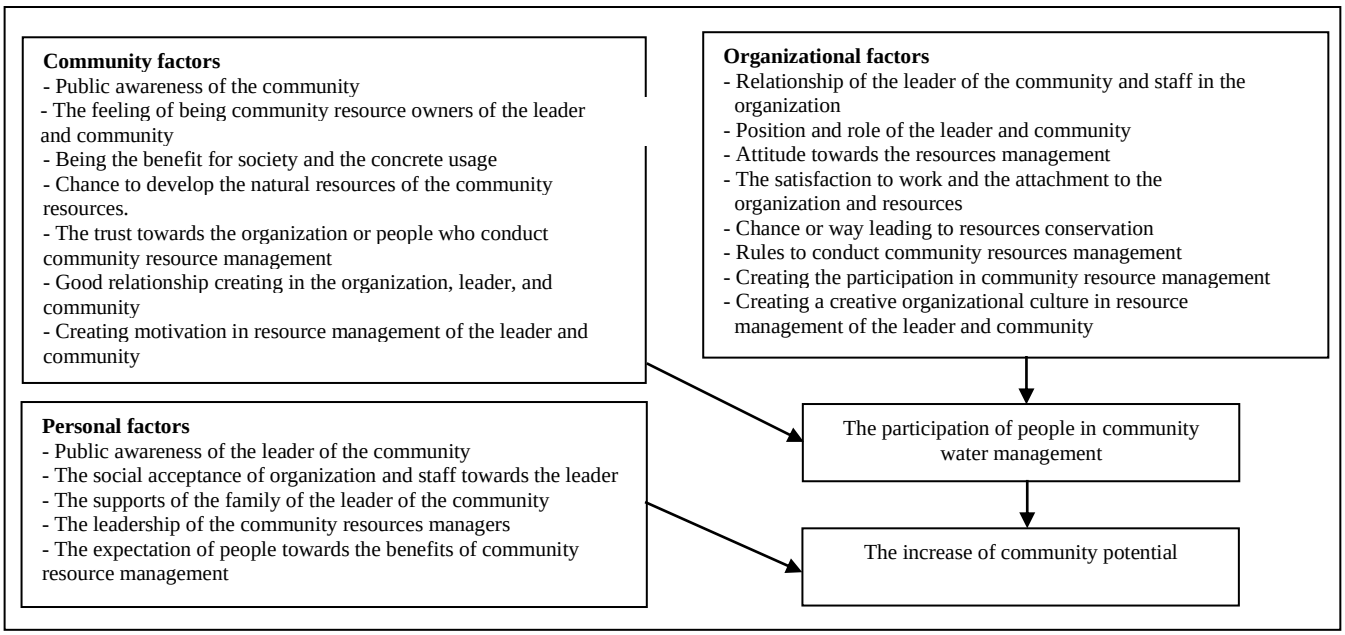

Fig. 1. Conceptual framework

III. METHODOLOGY

This research is quantitative research which was conducted as follows.

A. Population and samples

The population in this study was a total of 6,985 people from 15 villages listed in Muang district, Nakhon Ratchasima province. The sample size determination was made using Krejcie and Morgan Table [12] the result was 364 samples. The random was made in many steps. The first step was setting the area of samples by the village, the second step was the calculation for the proportion of the sample in each village, and the third step was simple random using a computer.

B. Instruments

The instrument used in this study was a set of questionnaires. The development of the instrument was made by considering the concepts, theories, and related researches. The instrument was developed in four parts as follows.

Part 1; questions were about general information including gender, ages and length of time living in the village, the position in the village, and occupation. The questions were made as a tick box to give the information.

Part 2; the questions were asking about the personal factors influencing the participation of people in community water management.

Part 3; the questions were asking about the community factors influencing the participation of people in community water management.

Part 4; the questions were asking about the organizational factors influencing the participation of people in community water management.

Part 2 and 3 questionnaires were the rating scale questionnaires providing five levels of agreement. They were 1) the least agree, 2) less agree, 3) somewhat agree, 4) more agree, and 4) the most agree. The questionnaires were evaluated for the Item-Objective Congruence (IOC) by 3 experts and revised with the suggestions given by experts. The result of the evaluation was between 0.71 and 0.92 which was considered as applicable.

C. Data Analysis

The calculation and analysis of data were made using statistical software finding mean and standard deviation. The data analysis was made on the personal factors, community factors, and organizational factors influencing the participation of people in resource management with Pearson Product Moment Correlation. The analysis of the independent variables was made using Stepwise Multiple Regression Analysis.

IV. RESULTS OF THE STUDY

The result revealed that 68.41% of the samples were male and 31.91% were female. Most of them or 25.55% were between 40-49 years old, some of them or 24.73% were between 50-59 years old, and some of them were 23.08% of 30-39 years old, respectively.

A. Personal factors influencing the participation of people in community water management

The result of the analysis on the level of the opinion of people focusing on personal factors influencing the participation in community water management found that the expectation of people towards benefits of community resource management was at the highest level ($\overline{X}$ = 4.92). The second high was the leadership of the community resources managers which was the highest level at ($\overline{X}$ = 4.83), and public awareness of the leader of the community was at the highest level ($\overline{X}$ = 4.75) respectively. The least high personal factor influencing the participation in community resource management was the supports of the family of the leader of the community which was at a high level ($\overline{X}$ = 4.02) as shown in Table 1.

The correlation analysis made with 5 independent variables gave the result at 0.105 to 0.472 which was considered positive relation significantly at 0.05. After consideration on the internal factors influencing the participation in community resource management, it revealed that 1) Public awareness of the leader of the community (X_1) and the leadership of the community resources managers (X_4) had the highest correlation rate, 2) The leadership of the community resources managers (X_4) and the expectation of people towards benefits of community resource management (X_5) had the second high correlation rate as shown in Table 1.

TABLE I. The correlation between variables used in the analysis

Variables	(X_1)	(X_2)	(X_3)	(X_4)	(X_5)
Public awareness of the leader of the community (X_1)	1	0.472	0.339	0.306**	0.261
The social acceptance of organization and staff towards the leader (X_2)		1	0.429	0.105	0.183
The supports of the family of the leader of the community (X_3)			1	0.226	0.197
The leadership of the community resources managers (X_4)				1	0.188*
The expectation of people towards the benefits of community resource management (X_5)					1
Mean	4.75	4.28	4.02	4.83	4.92

Variables	(X_1)	(X_2)	(X_3)	(X_4)	(X_5)
Standard Deviation	1.04	1.66	0.53	0.48	1.02

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

Stepwise Multiple Regression Analysis was used to analyze the correlation between people and independent variables. The result found that 3 out of 5 independent variables showed affection towards the dependent variables significantly (Sig < 0.05). They were 1) public awareness of the leader of the community, 2) the social acceptance of organization and staff towards the leader, and 3) the expectation of people towards benefits of community resource management which affected positive results to the people participation at rate 0.261, 0.118 and 0.294 respectively. The factor of the expectation of people towards benefits of community resource management affected the participation in community water management the most, and the social acceptance of organization and staff towards the leader affected the participation in community water management the least. The 3 independent variables could predict the participation of people at 80.10% as shown in Table 2.

TABLE II. The result of the regressive analysis on factors influencing the participation of people in community water management

Variables	Unstandardized Coefficients (B)	Standardized Coefficients (Beta)	t	Sig.
Public awareness of the leader of the community	0.261	0.104	0.561	0.012
The social acceptance of organization and staff towards the leader	0.118	0.094	1.783	0.041
The supports of the family of the leader of the community	0.158	0.098	0.448	0.452
The leadership of the community resources managers	0.143	0.103	1.184	0.472
The expectation of people towards the benefits of community resource management	0.294	0.101	1.382	0.014

$R = 0.821$, $R^2 = 0.801$

B. Community factors influencing the participation of people in community water management

The result of the analysis on the level of the opinion of people focusing the community factors influencing the participation in community water management found that being the benefit for society and the concrete usage was the highest level ($\overline{X}$ = 4.56). The second high was the trust towards the organization or people who conduct community resource management which was at a high level ($\overline{X}$ = 4.41), and public awareness of the community which was at a high level ($\overline{X}$ = 4.37), respectively.

The correlation analysis made with variables gave the result at 0.118 to 0.812 which was considered positive relation significantly at 0.05. correlation of the community factors influencing the participation of people in community water management found that 1) being the benefit for society and the concrete usage (X_3), and the trust towards the organization or people who conduct community resource management (X_5) had the highest correlation rate, 2) good relationship creating in the organization, leader and community (X_6), and creating motivation in resource management of the leader and community (X_7) had the second high correlation rate, and 3) public awareness of the community (X_1) and The feeling of being community resource owners of the leader and community (X_2) had the third high correlation rate as shown in Table 3.

TABLE III. The correlation between variables used in the analysis

Variables	(X_1)	(X_2)	(X_3)	(X_4)	(X_5)	(X_6)	(X_7)
Public awareness of the community (X_1)	1	0.341**	0.594	0.448	0.326	0.336	0.271
The feeling of being community resource owners of the leader and community (X_2)		1	0.335	0.419	0.395	0.812	0.557
Being the benefit for society and the concrete usage (X_3)			1	0.478	0.554**	0.381	0.432
Chance to develop the natural resources of the community resources. (X_4)				1	0.432	0.337	0.573
The trust towards the organization or people who conduct community resource management (X_5)					1	0.739	0.118*
Good relationship creating in the organization, leader, and community (X_6)						1	0.438**

Variables	(X_1)	(X_2)	(X_3)	(X_4)	(X_5)	(X_6)	(X_7)
Creating motivation in resource management of the leader and community (X_7)							1
Mean	4.37	4.01	4.56	4.24	4.41	4.15	4.08
Standard Deviation	0.36	0.95	0.68	0.77	0.81	1.02	0.93

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

Stepwise Multiple Regression Analysis was used to analyze the correlation between people and independent variables. The result found that 4 out of 7 independent variables showed affection towards the dependent variables significantly (Sig < 0.05). They were 1) Public awareness of the community, 2) The feeling of being community resource owners of the leader and community, 3) Being the benefit for society and the concrete usage, and 4) The trust towards the organization or people who conduct community resource management. All 4 factors affected the positive results at 0.156, 0.316, 0.135, and 0.171, respectively. The factor about the feeling of being community resource owners of the leader and community affected the positive result of the participation of people in community water management the most. The 4 independent variables could predict the participation of people at 81.90% as shown in Table 4.

TABLE IV. The result of the regressive analysis of external factors influencing the participation of people in community water management

Variables	Unstandardized Coefficients (B)	Standardized Coefficients (Beta)	t	Sig.
Public awareness of the community	0.156	0.087	0.433	0.044
The feeling of being community resource owners of the leader and community	0.316	0.142	1.103	0.039
Being the benefit for society and the concrete usage	0.135	0.193	1.251	0.024
Chance to develop the natural resources of the community resources.	0.113	0.099	0.109	0.431
The trust towards the organization or people who conduct community resource management	0.171	0.144	1.104	0.028
Good relationship creating in the organization, leader, and community	0.061	0.023	0.537	0.378
Creating motivation in resource management of the leader and community	0.077	0.029	0.435	0.184

$R = 0.852$, $R^2 = 0.819$

C. Organization factors influencing the participation of people in community water management

The result of the analysis on the level of the opinion of people focusing on external factors influencing the participation in community water management found that the community and the leader Creating the participation in community resource management the most at the highest level ($\bar{X}$ = 4.87). The second high was Creating a creative organizational culture in resource management of the leader and community at the highest level ($\bar{X}$ = 4.63), and The satisfaction to work and the attachment to the organization and resources at the highest level ($\bar{X}$ = 4.54) respectively.

The correlation analysis made with 8 variables gave the result at 0.306 to 0.681 which was considered positive relation significantly at 0.05. The correlation of the organization factors influencing the participation of people in community water management was 1) creating the participation in community resource management (X_7) and creating a creative organizational culture in resource management of the leader and community (X_8) had the highest correlation rate, 2) Chance or way leading to resources conservation (X_5) and creating a creative organizational culture in resource management of the leader and community (X_8) had the second high correlation rate, and 3) chance or way leading to resources conservation (X_5) and rules to conduct community resources management (X_6) had the third high correlation rate as shown in Table 5.

TABLE V. Organization factors influencing the participation of people in community water management

Variables	(X_1)	(X_2)	(X_3)	(X_4)	(X_5)	(X_6)	(X_7)	(X_8)
Relationship of the leader of the community and staff in the organization (X_1)	1	0.493	0.172*	0.224	0.472	0.335	0.261	0.306
Position and role of the leader and community (X_2)		1	0.446	0.501	0.702	0.109	0.470	0.429
Attitude towards resources management (X_3)			1	0.562	0.097	0.445	0.387	0.204
The satisfaction to work and the attachment to the organization and resources (X_4)				1	0.359	0.681	0.539	0.334
Chance or way leading to resources conservation (X_5)					1	0.185*	0.506	0.308**
Rules to conduct community resources management (X_6)						1	0.459	0.226
Creating the participation in community resource management (X_7)							1	0.348**
Creating a creative organizational culture in resource management of the leader and community (X_8)								1
Mean	4.19	4.01	4.44	4.54	4.32	4.52	4.87	4.63
Standard Deviation	1.06	1.05	0.51	0.64	0.69	0.85	0.77	0.43

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

Stepwise Multiple Regression Analysis was used to analyze the correlation between people and independent variables. The result found that 4 out of 8 independent variables showed affection towards the dependent variables significantly (Sig < 0.05). They were 1) Attitude towards the resources management, 2) Chance or way leading to resources conservation, 3) creating the participation in community resource management, and 4) Creating a creative organizational culture in resource management of the leader and community. All four factors affected the positive results of the people participation at 0.209, 0.125, 0.328, and 0.371, respectively. The factor of Creating a creative organizational culture in resource management of the leader and community affected the people participation the most, and the factor of chance or way leading to resources conservation affected the people participation the least. The 4 independent variables could predict the participation of people at 82.60% as shown in Table 6.

TABLE VI. The result of the regressive analysis of external factors influencing the participation of people in community water management

Variables	Unstandardized Coefficients (B)	Standardized Coefficients (Beta)	t	Sig.
Relationship of the leader of the community and staff in the organization	0.124	0.099	-0.431	0.381
Position and role of the leader and community	0.048	0.012	0.228	0.774
Attitude towards the resources management	0.209	0.193	0.093	0.010
The satisfaction to work and the attachment to the organization and resources	0.125	0.082	0.649	0.206
The satisfaction to work and the attachment to the organization and resources	0.125	0.202	-0.292	0.017
Rules to conduct community resources management	0.094	0.038	2.013	0.482
Creating the participation in community resource management	0.328	0.032	4.664	0.023
Creating a creative organizational culture in resource management of the leader and community	0.371	0.128	-0.329	0.005

$R = 0.882$, $R^2 = 0.826$

V. DISCUSSION

The participation included 1) co-giving information, 2) co-making decision, 3) co- implementation, 4) co-responsible, 5) co-follow up and evaluation and 6) co-taking the result of the development. The participation was the actual participation in every step. Without any step, it may lead to the failure of participation [13]. The important factors of community development were the community and the leader of the community. Without these two factors, it may lead to unsuccessful community development. Therefore, to develop the community, there should be the leader with potential and being accepted by people in the community in all aspects [14] as well as the people in the community, facilitators who assist developing activities and reduce any conflicts inside the community and the conflict with other communities [15]. The public awareness of the community leader was an important factor in assisting creating a good and strong society where people share, participate in the responsibilities among society [16]. To accomplish the natural resource management, it was needed to begin with the community. This was because the community loves and attaches closely to the resource [17]. The

community should play an important role in water management because they were stakeholders and know the condition of their area better than other sectors [18] The achievement of the management began with the local community leader with strength who could create participation of people and fair distribute the benefit to the local with consideration of natural resource management keeping the stability of the ecosystem [19]. Allowing all sectors and all level of people to participate the administration within their scopes of responsibilities, participate decision, using creative thinking and their expert in solving the problem which would lead to the community development as planned [20] and lead to the sustainable achievement [21].

The effective decision based on the policy should be made on the information base, the opinion, and the needs of people and stakeholders [22]. According to the complicated condition of water management, a large number of people and stakeholders gathered to join the making decision process. If there was no well-prepared unity management, there would be no cooperation, no information sharing. Therefore, the policymakers needed to facilitate the formal and informal learning process for stakeholders. That helped to make the policy in the right way [23]. One thing would obtain the achievement of the network in the water management network were 1) sufficient fund, 2) leadership, 3) cooperation with public awareness, and 4) readiness in good relation among people, trust to each other and participate with enthusiasm [24].

Water management was needed to be done as co-working between the governmental organization, private organization, and people in society. For instance, the government rule and maintain the water resource and community organization [24] providing promotion and supports the participation of people in policy level. This helps communities learn the actual work and could be able to solve the problem appropriately and up to date. Governmental sectors should provide promotion and supports informal and formal learning to communities to let them handle the environmental problem together [23]. There may be an effect in terms of economy, society, culture, and environment. If the effect causes trouble to all sectors continuously, it would also bring an impact on the quality of life of farmers and the community directly. This may also cause conflicts of the farmers and people trying to seize water and cause community separation. The water management with the participation focusing on understanding their roles and responsibilities as well as the use of law by the government organization integrating with the co-use of the information among organizations [25]. If the community could be enhanced the most, the more community would be developed in terms of it potential [26].

VI. Conclusion

The study of factors influencing the people participating in community water management in Muang district community, Nakhon Ratchasima province included the study on personal factors influencing the people participating in community water management which were 1) the expectation of people towards benefits of community resource management, 2) public awareness of the leader of the community, and 3) the social acceptance of organization and staff towards the leader.

The community factors influencing the people participating in community water management were 1) the feeling of being community resource owners of the leader and community, 2) the trust towards the organization or people who conduct community resource management, 3) public awareness of the community, and 4) being the benefit for society and the concrete usage.

The organization factors influencing the people participating in community water management were 1) creating a creative organizational culture in resource management of the leader and community, 2) creating the participation in community resource management, 3) attitude towards the resources management, and 4) chance or way leading to resources conservation, respectively.

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SOCIETY 5.0

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Abstract

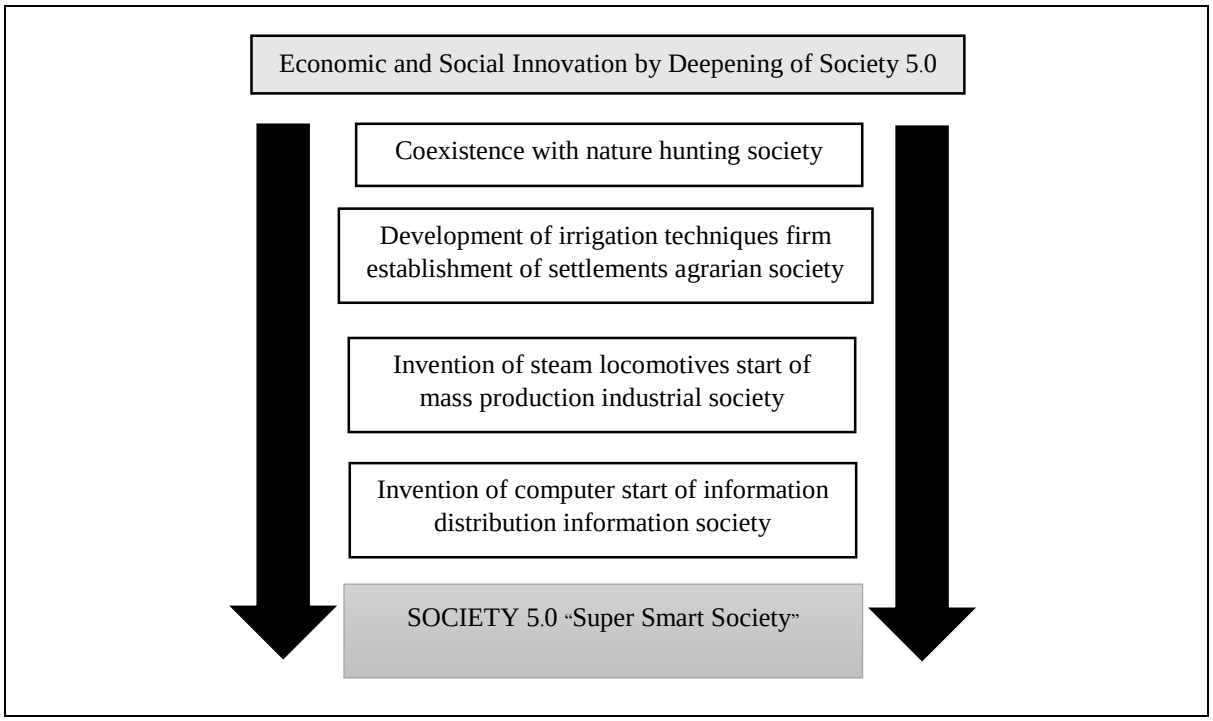
The technology of the industrial revolution 4.0 has evolved more and more towards society 5.0 (S5.0). In this new era, the S5.0 has given the quality of life a more happy, motivated and visionary life. The value of society can improve the productivity of work quickly and efficiently. Experienced workforce can save time and cost on a product production that guarantees a decent income as a result of technology and innovation. The purpose of this study is to determine the satisfaction, goals and direction of S5.0. Systematic literature review has been conducted to more accurately analyse the success of S5.0. Many of previous studies that have been carried out have similar themes and are identified from the findings. The findings show that the people in this S5.0 group have the privilege and the courage to make changes and innovations. S5.0 leveraging technology wisely to improve the quality of life more securely in improving economics. In addition, S5.0 has succeeded in changing the way of life, with high skills, competitiveness and innovation in the technology world. This clearly demonstrates that the industry revolution 4.0 is heading into the S5.0 era which is extra challenging.

1.0 Introduction

Rapid advances in the field of information and technology (ICT) have brought drastic changes to communities and industries [1]. Digital transformation creates new values that are the cornerstone of the industry in most countries. At the same time, the world today is facing global changes such as the scarcity of natural resources, global warming, conflicts between parties, political instability and economic growth [2]. Therefore, we must make full use of ICT to gain new knowledge and inculcate new values. This can be done by applying human-things, human-real-world and cyber-realities to effectively solve and manage things and efficiently creating a better life for the community and maintaining healthy economic growth [2b]. The Government of Japan's Society 5.0 has taken the initiative. Society 5.0 (S5.0) where its people can use new technologies and create a human-centered (super smart) physical cyber community [3].

Generally, S5.0, or otherwise known as 'smart society', is a community that solves a wide range of social issues and problems by leveraging the many innovations born in the era of industrial revolution 4.0 (IR4.0). Those innovations such as the Internet of Things, Big Data, automation robots and a variety of advanced machines shapes the values of the human body so that it facilitates the day-to-day work of the human being while they efficiently and proficiently handle the technologies found in IR4.0 [4].

History shows proof of the existence of Society 1.0 to Society 5.0. According to [1b, 9], Society 1.0 or Hunting Society was when humans lived in primitive times through hunting activities and they lived in groups and coexisted with nature. Meanwhile, Society 2.0 or Agrarian Society lived in specific groups where their main source was cultivation and agriculture. In addition, they also enhance the organization and construction of their own nation. In Society 3.0, or the Industrial Society, the formation of the Industrial Revolution led the mass production of products while Society 4.0, or the Information Society, was a community that realized value creation by adapting it by connecting intangible assets such as social relations through use internet and secure wellbeing in it and at the same time Society 5.0. Figure 1.0 below shows the age ranges from Society 1.0 to Society 5.0.



Source: Prepared based on materials form the Japan Business Federation (Keidanren)

Figure 1.0 The new era of Society 1.0 to 5.0

The technologies inherent in IR4.0 have led to new areas of application that requires human talent, knowledge and skills at the same time leading to new job opportunities [5]. Therefore, the aim of S5.0 is to create a human-centered community where economic development and the challenges faced by the community can now being solved and achieved in which they can enjoy high quality, active and comfortable living [6]. Therefore, this study aimed to list the goals and direction of S5.0 based on the reading sources by the researchers.

2.0 Methodology

This study uses a meta-analysis design, where the purpose of this study is related to the goals and objectives of achieving S5.0. In summary, meta-analysis is an analysis of the analysis from other sources involving the merging of the corresponding study results and is considered for inclusion in the research study to find the main effect [7]. This method has been used by [8] and has been adapted by researchers in selecting suitable articles for analysis. In the process of finding data, search engines such as Google Scholar and Google Search are used to ensure broader and more relevant search results. Most articles related to S5.0 published around 2017 through 2020 are used for analysis purposes. Keywords used in the search for articles are 'Community 5.0', ‹Society 5.0 ', ' Strategy Society 5.0 ', ' Aim to Society 5.0 ', ' Society 5.0 Development ', ' Constructing a Platform for Society 5.0 ' and ' On The Way To Society 5.0 '. Some of the criteria for selecting articles for analysis are:

1. Studies that define the S5.0 definition and history from Society 1.0 to Society 5.0.

2. Studies describing the goals and direction of S5.0.

After the selection of articles, a total of 14 articles that were identified, met the criteria. Table 1 shows a list of review articles related to the goals and direction of S5.0. The articles were systematically analysed to answer the research questions set.

3.0 Findings

Industry and S5.0 are the most effective collaboration between humans and technology systems for faster work. The use and operation of high-tech machines for work can help to speed up the work process. Meanwhile, working people help to control the machine, assume responsibility and control of the system to improve the quality of production. As many as 85% shows that the collaboration between robot and human labor help to speed up the work done. The European Economic and Social Committee (EESC) explained that the industry and the S5.0 have successfully combined human creativity and skills with the speed and productivity of technology-enabled machines such as robots.

In this era of globalization, new technologies including the Internet of Things (IoT), Artifical Intelligence (AI) and robotics, bring changes to society in everyday life. The goal of S5.0 is to create a highly skilled society, with extensive experience in developing economies and smart in solving complex problems. The concept was introduced as the "intermediary reality", combining the physical and virtual worlds to get accurate data analysis. Each and every data that Artifical Intelligence (AI) predicts is accurate. This proves that the human workforce is important in carrying out technology-related activities. Communities present in S5.0 will facilitate public affairs according to their needs, regardless of area, age and gender. Table 1.0 shows the changing needs and priorities of industries 4.0 and S5.0 to help the local community better.

Table 1.0 Key aspects of Industry 4.0 and S5.0 requirements

INDUSTRY 4.0	**SOCIETY 5.0**
End of 20th century	21st Century
Information Society	Super Smart Society
Automation, Information (Computer, Internet)	Digital Transformation
Cloud	Big Data

Table 1.0 above explains 5.0 prioritize human position to assist in the renovation of technology and innovation for the benefit of man himself. The main purpose of S5.0 was introduced after the industrial revolution 4.0 to improve the quality of life of the people by utilizing the potential of industry 4.0. Japan is one of the countries that have implemented S5.0 with new methodology such as drone delivery. The S5.0 will create a community that enjoys comfortable living, technological development and advanced economic growth. Table 2.0 shows the findings of the study conducted to determine the level of industrial revolution and development of S5.0

Table 2.0 The findings of the industrial revolution and 5.0

No	Author	title	Aim Society 5.0
1	Toru Fujii, Tian Bao Guo, and Akira Kamoshida (2018)	A Consideration of Service Strategy of Japanese Electric Manufacturers to Realize Super Smart Society (SOCIETY 5.0)	**Goal to S5.0** 1. Addressing economic and social challenges. 2. Reinforcing the "fundamentals" 3. Building a systemic virtuous cycle of human resource, knowledge, and funding for innovation.
2	Őzgür Őnday (2019)	Japan's Society 5.0: Going Beyond Industry 4.0	**Objective to S5.0:** Understand a general public where individuals can appreciate life minus all potential limitations: 1. Digital PC: Cyber-Proof-of-Concept 2. KPI: Key Performance Indicators Simulate transportation frameworks.
3	Dimitrios Serpanos (2018)	Society 5.0: For Human Security and Well-Being	**Goal to achieve S5.0** 1. Smart agriculture & Smart Food 2. Early warning alert system 3. e-Learning system 4. Empowerment of women 5. Smart grid system 6. i-Construction 7. Global innovation ecosystem 8. Smart cities 9. Utilization of meteorological and other observation data 10. Utilization of remote sensing and oceanographic data
4	Darmaji, ustiningsih, Imron Arifin (2019)	Quality Management Education in the Industrial Revolution Era 4.0 and Society 5.0	**Competencies of Society Era 5.0** 1. Writing skills 2. Leadership skills 3. Language Skills 4. IT literacy
5	Yuko Harayama (2017)	Society 5.0: Aiming for a New Human-centered Society	**Constructing a Platform for Society 5.0** 1. New manufacturing systems 2. Regional inclusive care systems 3. Infrastructure maintenance and updates 4. A society resilient against natural disasters 5. New business and services 6. Hospitality systems 7. Global environment information platform 8. Integrated material development system 9. Smart manufacturing systems 10. Smart food-chain systems 11. Intelligent transportation systems 12. Energy 13. Value chains
6	Carlos Miguel Ferreira, Sandro Serpa (2018)	Society 5.0 and Social Development	**Aims S5.0:** 1. Create new values by collaborating and cooperating with several different systems, and plans standardization of data formats, models, system architecture, and development of necessary human resources. 2. Improvement of productivity through digitization and reform of business models are promoted, and at the same time, the

<table>
<tr><td></td><td></td><td></td><td>new economy and society will be realized by promoting innovation and globalization.
3. Every individual including elderly people and women can live in safe, secured, comfortable and healthy life and each and every individual can realize his/her desired lifestyle.
4. Efforts are made to solve a pile of issues in our country such as falling population, super aging society and natural disasters so that rich and vigorous future can be realized.</td></tr>
<tr><td>7</td><td>Umar Al Faruqi (2019)</td><td>Survey Paper: Future Service in Industry 5.0</td><td>Aims S5.0<table><tr><td>Problem Solving & Value Creation</td><td>A society where value is created.</td></tr><tr><td>Diversity</td><td>A society where anyone can enjoy diverse abilities.</td></tr><tr><td>Decentralization</td><td>A society that anyone can get opportunities, anytime, anywhere.</td></tr><tr><td>Resilience</td><td>A society where people can live and pursue challenges securely.</td></tr><tr><td>Sustainability & environmental harmony</td><td>A society where humankind lives harmony with nature.</td></tr></table></td></tr>
<tr><td>8</td><td>Dr.Sc. P.O. Skobelev, Dr.Sc. S.Yu. Borovik (2017)</td><td>On the way from Industry 4.0 to Industry 5.0: from digital manufacturing to digital society</td><td>On the way to Society 5.0
1. Swarms of robots (self-organized groups of robots)
2. Internet of Things and People
3. Multi-Agent systems and technologies
4. Ontology and Knowledge Bases
5. Theory of Complex Adaptive Systems
6. Emergent Intelligence
7. Energetics</td></tr>
<tr><td>9</td><td>Carin Holroyd (2020)</td><td>Technological innovation and building a 'super smart' society: Japan's vision of society 5.0</td><td>1. Super Smart Society
2. Focused on support for the development of certain technologies.
3. Government's role to do 'game changing' innovation, to push beyond the status quo.
4. Create new value and establish an advanced cyber-physical system that links digital and real spaces in real time.</td></tr>
<tr><td>10</td><td>Matthew E. Gladden (2019)</td><td>Who Will Be the Members of Society 5.0? Towards an Anthropology of Technologically Posthumanized Future Societies</td><td>Aims to S5.0
1. Creation of equal opportunities for all and also providing the environment for realization.
2. Every individual including elderly people and women can live in safe, secured, comfortable and healthy life and each and every individual can realize his/her desired lifestyle.
3. Provide a sustainable, vibrant, liveable people-centric world.
4. Providing necessary goods and services to the people who need them at the required time and in just the right amount.
5. Facilitate human prosperity</td></tr>
<tr><td>11</td><td>Andreia G. Pereira, Tânia M. Lima, Fernando Charrua-Santos (2020)</td><td>Industry 4.0 and Society 5.0: Opportunities and Threats</td><td>1. Smart Factories stimulated by Industry 4.0
2. The challenges set by Industry 4.0 for companies
3. Computer technologies adapted to this new Society
4. The Future and Society 5.0</td></tr>
</table>

12	Daniel Paschek, Anca Mocan And Anca Draghici (2019)	Industry 5.0 – The Expected Impact Of Next Industrial Revolution	Characterization of Industry 5.0: 5.0 will increased collaboration between humans and smart systems like robots especially in the manufactory. With this step, machines take over all monotonous, repetitive tasks while humans take creative side to take on more responsibility and increased supervision of systems to elevate the quality of production across the board.
13	Mayumi Fukuyama	Society 5.0: Aiming for a New Human-Centered Society	S5.0 In Japan: Challenges Facing Japan, Digital Transformation, Society 5.0, Enhancement of Society 5.0 and Industry Initiatives.

4.0 Discussion

The S5.0 concept came after the industrial revolution 4.0 to aid and enhance human creativity. Society is now known as the centre of innovation for easier technological innovation [10]. The changes in S5.0 also provide the advantage of leveraging technology as a result of industry 4.0. S5.0 emphasizes human responsibility and responsibility for the software systems used. Human monitoring of machinery and technology help to increase production of a product rapidly [11]. Vision S5.0 represents a large-scale new technology and is the focus of the technology of the industrial revolution 4.0. Human-made work with the help of advanced machines and can facilitate easier integration, best automation and the use of man-made machines or robots according to creativity [12].

S5.0 has successfully integrated the physical world and cyber space with the benefit of information technology. The facility used by humans for the future is known as the "Super Smart Society". Science, Technology and Innovation (STI), brought changes in S5.0 to empower humanity by including the needs of digitalization technologies. In S5.0, the transformation is made to reach a society of intelligent people who take the opportunity to change their way of life and dare to change their way of work through an ecosystem of ideas, academics and the environment. The relationship between real-world human activities and the cyber world can help effectively and efficiently solve critical problems and maintain healthy economic growth [13].

The key techniques in S5.0 are based on sound ideas on technological developments and general structures in managing systems management and control. S5.0 also emphasizes that the workforce has the skills applied from the industry revolution 4.0 such as entrepreneurial skills, entrepreneurial spirit to succeed in business and has a remarkable innovation base [14]. The advancements in S5.0 will succeed in changing the standard of living of the people despite the decline in labor demand [15]. The technologies available in S5.0 such as IT, IoT, robotics, artificial intelligence and augmented reality in people's lives, health and other spheres of activity, while industry 4.0 still limit the technological advances in the industrial sector.

5.0 Conclusion

New technologies in the industry to enable people to work easily and quickly. Machine learning and the creation of robots for work can save human time and labor and provide better quality of life for people with technology. The use of technology has successfully benefited the community in S5.0. The people in this group are able to prioritize and use the entire technology in the development stream and innovate a product for the better. Thus, it is clear that the integration of technology and society is very important in today's needs. S5.0 outlined the benefits gained from the skills of the people who dared to invent new technologies as the industrial revolution 4.0 grew. People undergoing S5.0 need to be ready to face the coming globalization era with great challenges

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MFU SHOT : Photographer Supporting System for Education

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***Abstract*— This study aims at creating photographer supporting system application on the android platform can access thought website. It can show a good spot for taking a good picture around the user area, the example of pictures taken around the place also the camera setting, and the suitable time. The author also designs this application for education use to apply the use of application thought photography subjects that teach at Mae Fah Luang University. While students use the application, the application itself also collects information on the user's behavior as the type of picture, location, time, camera setting, camera, and lens model. Then the data can be used for designing the course, improving assignments as well as collect information for further research.**

Keywords—photographer; application; education

I. INTRODUCTION

One of the problems that photographers especially the beginner faces all the time is they do not know what and where to shoot. Imagine you go to a famous place, but you do not know where to start. Maybe you can use the google map, but it does not show the exact location, or you will use the old fashion way as a scout that cause you a lot of time. If you lucky to find a good spot then you will need the time to prepare some equipment and setting the camera for the best result, also cause you more time. It will be better if you can find what kind of picture you want to shoot, the location of the scene, for example, a picture with a camera setting, and equipment. Then you do not have to waste time for scout or bring the excessive gears.

The same problem also hit the students in the photography class that the author teaches at Mae Fah Luang University. Plus, they do not have the motivation to shoot the picture except the assignment that handed to them. So, the author uses PBL Project-Based learning to influences students' behavior in learning and improving their skills for increase the efficiency of knowledge exchange [1] and integrate with the application for creating a relationship between student and multimedia system as the use of E-learning for better concentration of the student [2]. However, for the best result of the classroom, the lecturer needs to participate as the one who teaches the course and giving advice [3]. The partner's ship for 21st-century learning also shows a good learning process is based on focusing on learning skills and use the skill in daily life with the support system [4]. The lecturer also participates and giving suitable assignments to encourage students while integrating the multimedia application in the classroom as the learning support system [5,6,7]. And support the student until they can freely use the application and share with each other.

II. METHODOLOGY

A. Application design

The application design to fit photography needs on a mobile device by divide into 4 search groups as found by the most top viewed picture, find by the last update, find by map, and find by category. The category also has an alternate menu as landscape, portrait, macro, food, and still picture. The name MFU SHOT is coming from the name of the University and relates to the area that application can be used. The author set the limit or pinpoint location within 60km. around the campus for students' safety but the application can access worldwide thought the android application platforms and websites.

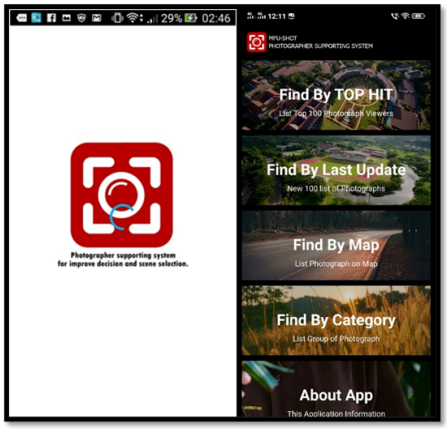

Fig. 1. Application design

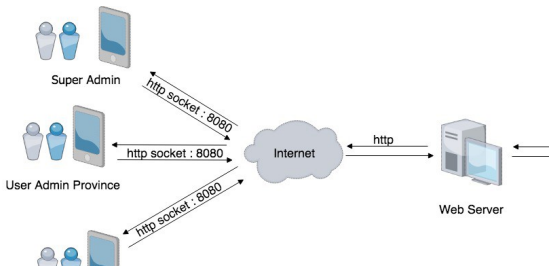

Fig. 2. Web server system

B. *Data gathering*

There are 2 ways for users to send the picture and information to the application. First, use the mobile phone to send the picture. If the picture was taken by the smartphone with GPS on, the location will be embedded into the picture but if the user takes a picture with a camera without GPS on or turn the GPS function off, The user needs to pinpoint the location by manual process. Another way to submit the picture is thought the website.

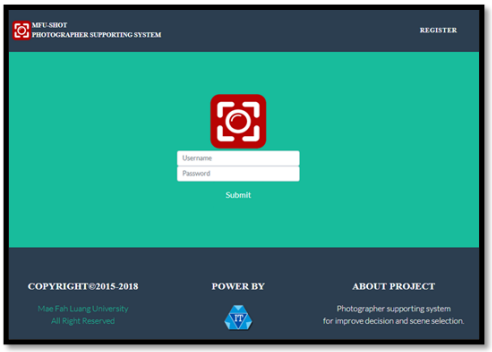

Fig. 3. MFU SHOT website

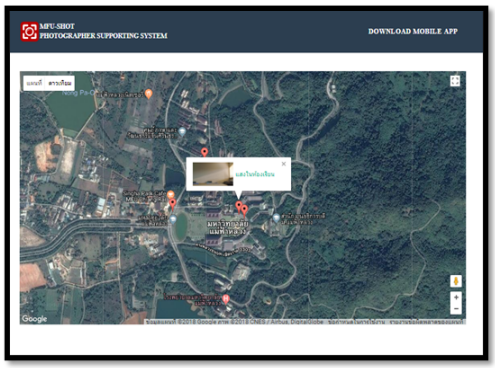

Fig.4. Pinpoint location on website

C. *Data processing*

The user submits the picture with information to the server in the web application system. Then The administration can access the data for check, analysis, and export the information via the web server.

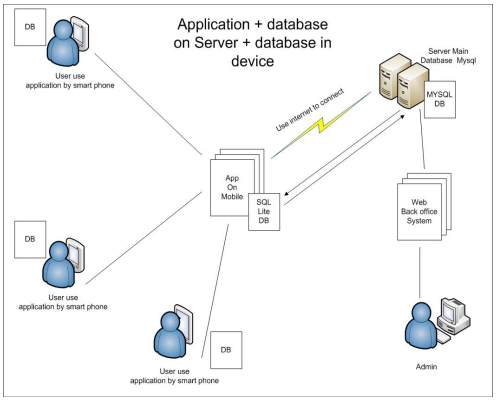

Fig.5. Web application system

D. *Learning process*

The author teaches the knowledge of photography to the student while given assignment that requested to submit vie the application. When the students use the application, they also share the picture and interest via the program to classmates. And they can analyze how other people work and what is the setting behind the camera for improving their own work.

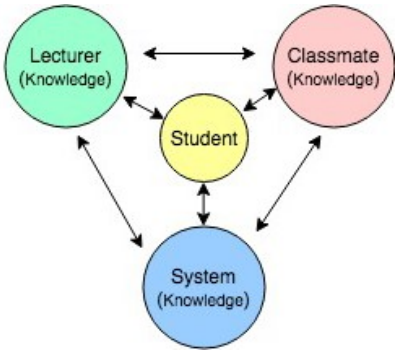

Fig. 6. Learning process

III. RESULT

The application can perform data gathering and analysis processes well. Not only the student in photography class use the application but also the photographer who comes who visits the university to share their picture and best location around the area while helping the system by contributing the information thought the

This research was funded by Mae Fah Luang university.

picture.

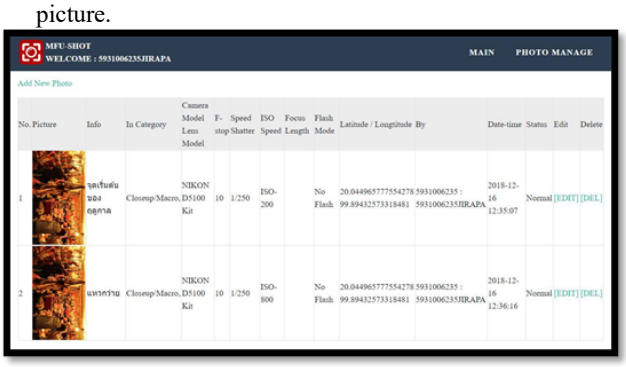

Fig. 7. MFU SHOT website

The information that processes in the server can be useful in many ways. The author has divided the information into these categories: type of photography, camera model, F-stop, ISO, focal length, time upload, time view, gender. The author can use this information to design the best course that suits the student or their gear, promoting the visiting place, guiding tourism to the university.

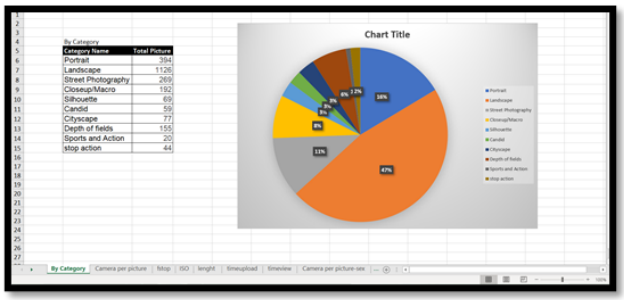

Fig. 8. Data collection

IV. CONCLUSION

The application can perform the duty well in helping the photographer find a suitable location for the shoot. The students who study in Mae Fah Luang university are using the application on their interest. Also, lead the visitor who came here for the first time to enjoy their visit. This application is also useful for promoting the place, especially in the travel industry because people nowadays tend to follow the place that good for photography. And the information from the analysis can be used in various ways including future research.

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Process of Cross-cultural Adaptation of Cambodian Students in Rajamangala Univeristy of Technology Isan, Surin Campus

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***Abstract*—The present study aims to investigate process of intercultural adaptation and strategies of first-year Cambodian students in adapting themselves while staying in Rajamangala University of Technology Isan (RMUTI), Surin Campus. Participants of the study were sixteen undergraduate Cambodian students, who were studying in their first year in 10 different majors. The data were collected through a set of Cross-cultural Adaptation Questionnaire and a semi-structured interview. The questionnaire, translated into Khmer Language, asked about three dimensions of adaptation: cognitive, affective, and operation dimension, respectively. The results suggested that, of the three dimensions, the affective and operational dimensions had high impact on the cross-cultural adaptation process, while the degree of influence of cognitive dimension on participants' adaptation process was moderate. The findings also demonstrated problems, challenges, and adaptation strategies the participants employed to overcome those problems.**

***Keywords*—cross-cultural adaptation, Cambodian students, adaptation strategies**

I. INTRODUCTION

A dramatic expansion of regions in Asia, including South East Asian regions, have started push their institutions to build international education networks of higher education owing to the global mobilisation of economy,technology and information [1]. As a result, the past decade has seen a growing number of ASEAN students coming to study in universities in Thailand, and this may result in challenges to administrators of those institutes. Some of the challenges include issues related to academic problems, financial difficulty, social acceptance, homesickness, loneliness and health problems, which may have metal and physical impacts on international students [2][3], and may consequentially lead to a stressful condition known as culture shock. Moreover, cultural adaptation has been proved to be a significant factor affecting international students'temporary stay in the host culture [4].

Located in Surin Province, approximately 80 kilometers away from the Thai-Cambodian Border, Rajamagala University of Technology Isan, Surin

Campus (RMUTI, Surin Campus henceforth) is a university in which Cambodian students choose to come to study due to the joint academic collaboration between the university and university institutions in Cambodia and the signed of MoU (Memorandum of Understanding) agreements. Most of them are students under the Royal Scholarship of Her Royal Highness Princess Maha Chakri Sirindhorn Education Project to the Kingdom of Cambodia. These international students come to study at RMUTI, Surin in various fields of study e.g. fisheries, plant sciences, multimedia technology, and accounting.

However, there has been no previous studies addressing the issues regarding cultural adaptation and ways to overcome these problems of Cambodian students. Therefore, the present study was conducted to examine the cross-cultural adaptation of Cambodian students studying in Thailand at RMUTI Surin Campus. The objectives of this study were twofold:

1) to study the cross-cultural adaptation of the first years Cambodian students at RMUTI, Surin Campus; and

2) to investigate factors contributing to the adaptation of the first years Cambodian students.

II. Literature Review

A. Cross-cultural Adaptation

Cross-cultural adaptation is the modification of personal behavior and social behavior which is adapted to suit the new environment or some changes to suit their needs. Which is a comparison with the host because the society and the host's way of life influence the need for cultural adjustment, which is in line with the concept about adaption of Searle and Ward [5] as follows:

1) adaptation from the inside is a mental adjustment which is an adaptation that affects mental health that new cultural satisfaction; and

2) external adjustment are personal adjustment in the area of family life, work and school. "Shock" is caused by the change in the tense life of people who face cross-cultural issues, it is necessary to have flexibility, adaptation and methods in the face of problems. Adaptation is therefore a process that eliminates stress at different levels in both individuals and situations for depending on the level of change of life.

B. Communication theory

The fact that people from one culture go into a society with a different culture and tend to have various problems Kim [6] views that entering a new culture and facing different and unfamiliar things will cause stress. This stress will encourage new entrants to try to find a way to adapt. New entrants must adapt to new learning, adjust their thinking and behavior. This adaptation will allow new entrants to better understand the host culture and be able to express what they want.

In the context of cross-cultural adaptation, a person's communication can be described in the manner of host communication competence, which is the communication ability of strangers. In encryption and decryption of information related to real-life communication in having interaction with the host. The communication under the culture of the host is divided into three categories: cognitive competence, affective competence and operational competence.

1. Cognitive competence

Cognitive competent is the inner ability of an individual to understand the meaning of things under the culture of the host such as knowledge related to the culture and language of the host country, beliefs norms and rules for interpersonal communication, which the ability of this idea will reflect the ability to expresstion and understanding of interactions under the host culture. This ability is related to the level of complexity within an individual's mind.

2. Affective competence

Affective competent is the ability to express feelings under the host culture is the ability to recognize and express appropriate emotions in the host culture. Including needs Mind to learn new cultures and change oneself from the old culture that hold on to being able to understand, absorb, participate in culture charecheristice. The host and the emotions that are reflected when feeling joyful, sad, angry in the manner of the host culture.

3. Operational competent

Operational competent is the ability to act under the culture of the host is the ability to choose to display both verbal and nonverbal behaviors like Suitable to feel the unity with the host culture speaking skills operation according to the rules of interaction, the skills of managing the interaction of the host, which is the result from the ability, thought and ability to express feelings.

According on Kim's concept adapted from Wirayawirot [7], it can be seen that the factors that need to be considered, in adaptation of foreigners is the communication ability under the culture of the host. Communication behavior of foreigners in that new culture there is an important part in helping to adapt

strangers into a new culture, able to adapt, have knowledge and understanding. The appropriate communication behavior can be seen in the concept of communication under the culture of the house in 3 dimensions mentioned above. It will be used as a conceptual framework in this research study.

III. METHODOLOGY

A. Participants

The participants in this study were a group of 16 Cambodian students who were in the second semester of their first year at RMUTI Surin Campus selected through purposive sampling method to serve the objective of the study from 10 majors of study including plant science, tourism and hotel management, animal science, agro-industry, accounting, business computer, fisheries, mechanical engineering, computer technology and English for international communication. The students were about 18-21 years old. The reason that the researcher has chosen the first year students group because in other years, they have could adapted, but the first year students who have not yet been able to adapt to study may therefore be able to receive knowledge and opinions from students who have faced events which will receive more detailed information.

B. Instruments

The instrument used in this study were a questionnaire and interview that aimed to study cross-cultural adaptation of Cambodian students an semi-structured and interviews comprised two passages the factors contributing to the adaptation and new cultural adaptation guidelines.

Questionnaire

The questionnaire, translated in Khmer Language—the native language of the participants, was divided into 2 parts: demographic information information and communications competence questionnaire adapted from Wittayavirot's version [7] which asks about the three dimensions of cultural adaptation, namely, cognitive dimension, affective dimension, and operational dimension.

Semi-structured Interview

The semi-structured interview is a collection of verbatim information (Birmingham & Wilkinson, 2003) and adapted from Simapan and Puangsuk (2016) [8]. The interview were conducted in Khmer language, the native language of the participants to ensure complete understanding of the questions, which asked about the following topics:

1. reasons to study at RMUTI Surin Campus;
2. problems that Cambodian students have to face while studying at RMUTI, Surin Campus; and
3. factors affecting adjustment and adaptation themselves.

C. Data collection

The data collection for the study was performed in the following steps. First, the participants were explained of the purpose of the research to the sample group was to understand the samples prior to questionnaire. Second, they were explained about the process in doing the questionnaire. Then, the questionnaire was distributed to the participants, in which they were given an hour to complete. Finally, the interview was administered to five out of the sixteen participants, a day after the completion of the questionnaire.

IV. RESULTS

This section presents the data of participants' demographic information, fields of study, and their perceptions regarding cultural adaptation in three aspects.

A. Participants' demographic information

As shown in Table I and Table II, the majority of first-year students were male and aged between 18 – 19 years old. Five of them were majoring in plant science, three in tourism and hotel program, while two participants were studying in agro-industry major. Moreover, each of the other six students was majoring in accounting, fisheries, computer technology, business computer, mechanical engineering, and English major.

TABLE I. DEMOGRAHIC INFORMATION OF THE PARTICIPANTS

General information	***Number***	***Percentage (%)***
1. Gender		
1.1 Male	10	62.50
1.2 Female	6	37.50
2. Age		
18-19 years old	13	81.25
20-21 years old	3	18.75

TABLE II. PARTICIPANTS' FIELD OF STUDY

Major	*Number*	*Percentage (%)*
Plant science	5	32%
Accounting	1	6%
Fisheries	1	6%
Computer technology	1	6%
Tourism and Hotel	3	19%
Agro-industry	2	13%
Business computer	1	6%
Mechanical Eng.	1	6%
English	1	6%

B. Participants' perceptions on 3 dimensions of communicative competence

This section presents the findings concerning participants' perception on three dimensions of cross-cultural adaptation: the cognitive, affective, and operational dimensions as illustrated in Table III, IV, and V respectively.

Participants' perceptions on cognitive dimension of cross-cultural adaptation

TABLE III. PARTICIPANTS' PERCEPTIONS ON COGNITIVE DIMENSION OF CROSS-CULTURAL ADAPTATION

Cognitive Dimension	$\bar{x}$	S.D.	Level of Agreement
1) I understand Thai cultural norms.	3.19	0.39	Moderate
2) I understand Thai cultural values.	3.38	0.70	Moderate
3) I understand the Thai rule of verbal communication and how most Thais express themselves verbally.	3.38	0.60	Moderate
4) I understand prevalent Thais ways of thinking.	3.31	0.68	Moderate

According to Table III, it presented the finding of cognitive dimension toward cross-cultural adaptation of the first years Cambodian students at RMUTI, Surin Campus. There were 4 cognitive dimension collected data from participants. All of these were 1) I understand Thai cultural norms; 2) I understand Thai cultural values; 3) I understand the Thai rule of verbal communication and how most Thais express themselves verbally; and 4) I understand prevalent Thais ways of thinking. The overall score of cognitive dimension toward cross-cultural adaptation preparation of Cambodian students was at a moderate level ($\bar{x}$=3.31).

Participants' perceptions on affective dimension of cross-cultural adaptation

TABLE IV. PARTICIPANTS' PERCEPTIONS ON AFFECTIVE DIMENSION OF CROSS-CULTURAL ADAPTATION

Affective Dimension	$\bar{x}$	S.D.	Level of Agreement
7) I am interested in making friends with Thai people.	4.06	0.75	High
9) I am interested in learning Thai Language.	4.06	0.90	High
12) I am interested in trying Thai food.	4.38	0.70	High
13) I am interested in joining the Thai culture ritual such as Songkran, Loykratong, wedding ceremonies, funerals etc;.	4.13	0.93	High

Table IV presents the findings of participants' perceptions on affective dimension towards cross-cultural adaptation. The findings showed the overall of participants' affective dimension towards cross-culture adaptation was at high level of agreement ($\bar{x}$=3.85). Four items with the highest scores are their interest in trying Thai food($\bar{x}$=4.38), their desire in joining the Thai culture rituals such as Songkran, Loykratong, wedding ceremonies, funerals etc;..($\bar{x}$=4.13), their interest in learning Thai Language (=4.06), and the interested in making friends with Thai people ($\bar{x}$=4.06), respectively.

Participants' perceptions on operational dimension of cross-cultural adaptation

TABLE V. PARTICIPANTS' PERCEPTIONS ON OPERATIONAL DIMENSION OF CROSS-CULTURAL ADAPTATION

Operational Dimension	$\bar{x}$	S.D.	Level of Agreement
14) Ability to speak Thai language with Thai people.	3.81	0.73	High
15) Ability to converse on the phone with Thai people in Thai language.	3.63	0.78	High
16) Ability to ask questions and solve problems with Thai people.	3.56	0.86	High

Table V shows the results of the questionnaire regarding operational dimension towards cross-cultural adaptation of the participants. The three items with the highest average scores in this category are: the ability to speak Thai language with Thai people ($\bar{x}$=3.81), the ability to converse on the phone with Thai people in Thai language ($\bar{x}$=3.63), and the ability to ask questions and solve problems with Thai people ($\bar{x}$=3.56) respectively.

Participants' Overall mean scores towards cross-cultural adaptation

TABLE VI. PARTICIPANTS' OVERALL PERCEPTIONS ON THE 3 DIMENSIONS OF CROSS-CULTURAL ADAPTATION

Overall mean score	**$\bar{x}$**	**S.D.**	**Level of Agreement**
Cognitive Dimension	3.31	0.59	Moderate
Affective Dimension	3.85	0.77	High
Operational Dimension	3.54	0.80	High
Total	3.57	0.72	High

Table VI shows the overall level of the perceptions towards the three dimensions of cross-cultural adaptation of first-year Cambodian students. The findings suggest that most of the participants agreed that affective and operational dimensions played important roles in adapting their lives in Thailand, while they slightly agreed that cognitive dimension was also important in cross-cultural adaptation.

C. Results from the interview

The in-depth interviews aimed to probe into more detailed information of how the participants adapted themselves while staying in Thailand. The questions for the interview include 1) reasons to study at RMUTI, Surin campus, 2) problems that Cambodian students have to face while studying in Thailand, and 3) how they to deal with problems and adaptation themselves. They used the question together, but the details of the answers vary depending on the individual's problems. Therefore, information collected from interviews to organize content in accordance with the objectives set.

1) Reasons to study at RMUTI, Surin campus

- They got Royal Scholarship under Her Royal Highness Princess Maha Chakri Sirindhorn Education Project to the Kingdom of Cambodia.
- The study programs respond to their needs.
- They were recommended by their senior friends who are also studying at RMUTI, Surin Campus.

2) Problems that Cambodian students have to face while studying

- Language (I cannot to communicate in Thai language)
- Too spicy food
- Different currency (Baht vs Rial)

3) Factors affecting adjustment and adaptation themselves

- Help offered by Thai friends;
- Use of Thai local media viewing such as watching Thai TV programs and movies, Thai dramas, listening to Thai music, news and other Thai media
- Improving Thai Language by speaking Thai even with their Cambodian classmates and friends

V. DISCUSSION

The results of the present study were consistent with those of [7] who found that communication under the host culture can help to fully adapt to the new environment and understand the host culture even more.

Moreover, the findings are in line with Bunart [9] about "Intercultural Adaptation Process of Laos and Cambodian Students in Ubon Ratchathani University", he pointed out that the exposure to Thai media such as newspapers, television, drama, music, movies and this new media, students use the media as a guideline for adjustment.

Finally, this study is related to the research of Chotirostiti [10] whose results suggest that language is the most contributing factor for cross-cultural adaptation, as it is an intermediary for interpersonal communication that creates understanding among each other exchange ideas make the best learning and adaptation across cultures.

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Development of Integrated Curricula for the Master of Engineering Programs using the CDIO Framework

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Abstract—**This research presents the revision of the current curriculum of the Master of Engineering program at Camarines Sur Polytechnic Colleges in the Philippines through series of consultations and focus group discussions with the faculty and students of the graduate program and industry practitioners, and the development of integrated curricula using the CDIO framework. Standards 1, 2, 3, 4 and 5 and syllabus v2.0 of the CDIO framework were used in the development of the integrated curricula. Graduate attributes were developed, and the result of the industry needs survey served as one of the bases in the integration of various skill sets in the integrated curricula for the master of engineering programs.**

Keywords—CDIO framework, integrated curriculum, Master of Engineering

I. INTRODUCTION

The outcomes of the student learning can be determined by how well an educational institution design and to implement the entire curriculum for a specific program. The development of curriculum for educational programs can be influenced by a number of sources. The goals of the program could be defined based on the funding source, the community, government departments of education (state and federal level), or by the educator who is designing the activity (1).

CDIO is an international initiative in reforming education. CDIO framework has been the current trend, and it influences the reformation of engineering education. It is an innovative educational framework for producing the next generation of engineers. The framework provides students with an education stressing engineering fundamental set in the context of Conceiving – Designing – Implementing – Operating (CDIO) real-world systems and products (2). The current educational setup must be aligned to the current needs of the industry and skills gap is a common problem between university products and industry needs (3). To cope in this competitive world, a well-designed curriculum must be designed to satisfy with the international standards of engineering education that focus on the attainment of the needs of the industry.

In the Philippines, CDIO was first to introduced with the partnership of Singapore Polytechnic and Temasek Foundation. One of the nine State Universities and Colleges in the Philippines is the Camarines Sur Polytechnic Colleges that undergone series of trainings and seminars both in the Philippines and Singapore on the CDIO Framework. Six faculty members of the College of Engineering were trained to become Master Trainers that has the role of cascading CDIO not just in the college but to all Colleges and Universities in the Philippines.

Camarines Sur Polytechnic Colleges popularly known as CSPC is a state college in the Philippines. It is mandated primarily to provide higher technological, professional and vocational instruction and training in fisheries, trade and technology, arts and sciences, as well as short term technical and vocational courses, as the Board of Trustees may deem necessary, and shall promote researches in the exploration and conservation of natural resources in the province (4). The vision of the college is to be the regional center of excellence in polytechnic education. Presently, CSPC has two campuses: the main campus in Nabua, Camarines Sur and Buhi Extension campus. In the main campus, the institution has 5 colleges, namely, College of Engineering, College of Health Care Technology, College of Management and Entrepreneurship, College of Information and Communications Technology, and College of Education, Arts and Sciences. The college offers 2 levels of educational programs in various disciplines: bachelor's degree and master's degree programs.

CSPC has been one of the leading engineering institutions in the Bicol Region. The
College of Engineering puts its goals in providing quality instruction and training in engineering through the ladderized curricula in civil, electrical, mechanical and electronics engineering which are responsive and relevant to the needs and development of the service area in particular and the country in general as well as develop total quality engineers and technology researchers for industry and society to maximally contribute to sustainable national development (5).

The first master's program offered by the college in the last 20 years was the Master of Arts in Teaching Engineering Technology (MATET) and then it was changed to Master of Arts in Engineering Technology (MAET) and Master in Engineering Technology (MET). Currently, the name of the program was change in 2014 to Master of Engineering (M.Eng'g). The program offers specializations in Civil Engineering, Mechanical Engineering, Electrical Engineering and Electronics Engineering. Based on the tracer study of Barandon conducted in 2016, the graduates of the program at CSPC from 2004 to 2015 is fifty-five (55). From 2016 to present, the enrollees of the program greatly increased and in 2018, the current number of students is eighty (80).

CSPC is one of the two higher education institutions in Bicol region to offer a master's program in engineering catering engineering professionals and practitioners in the six (6) provinces of Bicol.

The main objective of the study is to develop integrated curricula for the master of engineering programs using the CDIO framework guided by the current educational standards and requirements of the graduate program in engineering, and the results of industry needs survey.

II. LITERATURE REVIEW

The following are reviews on CDIO that served as the basis in the development of the integrated curricula for the master of engineering programs.

A. CDIO and the Educational Standards and Accreditation

The adoption of the CDIO Initiative at the School of Engineering, Nanyang Polytechnic, Singapore contributed to the ABET accreditation of the Diploma in Aerospace and Aeronautical Engineering. The CDIO played a key role in meeting the ABET criteria; the success of the accreditation within a short span of time is shaped by the strategic foundation for NY organizational excellence – Culture, Concept, Capability and Connection/Collaboration (6).

CDIO standards are accepted to be compliant with the Washington accord. With the CDIO process, the CDIO Standards and the CDIO Syllabus, many scholarly contributions have been made around cultural change, curriculum reform and learning environments. The CDIO Syllabus cast into the Australian context by mapping it to the Engineers Australia Graduate Attributes, the Washington Accord Graduate Attributes and the Queensland University of Technology Graduate Capabilities (7).

The Tomsk Polytechnic University carried out the analysis of the existing Academic Standard to understand whether it requires some changes and to identify the possibilities of its improvement. The analysis was aimed at the development of a basis for a new edition of the TPU Standard in the frame of CDIO context (8). With these literatures, it is to note that CDIO is a worldwide accepted framework for engineering education. It conforms to various educational standards such as the Washington Accord and incorporates outcomes-based education. It is compliant to the standards of engineering education and accreditations of programs

B. CDIO standards

The CDIO framework is consists of 12 CDIO Standards (9). Standard 1 focused on program philosophy. Standards 2, 3 and 4 is on the curriculum development. Standards 5 and 6 are on design-build experiences and workspaces. Standards 7 and 8 are on new methods of teaching and learning. Standards 9 and 10 is on faculty development. And standards 11 and 12 is on assessment and evaluation.

C. CDIO syllabus

The syllabus is the cornerstone of CDIO. It offers rational, complete, universal and generalizable goals for undergraduate engineering education (10). The CDIO syllabus was developed through discussions with focus groups comprised of various stakeholders, and by reference to other documentation of the time (11). The CDIO syllabus is composed of learning outcomes that are classified into four high-level categories, namely, technical knowledge, personal and professional attributes, interpersonal skills, and the skills specific to the engineering profession. Table 1 shows the CDIO Syllabus v2.0 (12).

TABLE 1. CDIO SKILL SETS

CDIO Syllabus v2.0
1. Disciplinary Knowledge and Reasoning 1.1 Knowledge of Underlying Mathematics and Science 1.2 Core Engineering Fundamental Knowledge 1.3 Advanced Engineering Fundamental Knowledge, Methods and Tools
2. Personal and Professional Skills and Attributes 2.1 Analytical Reasoning and Problem Solving 2.2 Experimentation, Investigation and Knowledge Discovery 2.3 System Thinking 2.4 Attitudes, Thought and Learning 2.5 Ethics, Equity and other Responsibilities
3. Interpersonal Skills: Teamwork and Communication 3.1 Multidisciplinary Teamwork 3.2 Communications 3.3 Communications in Foreign Languages
4. Conceiving, Designing, Implementing, and Operating Systems in the Enterprise and Societal Contexts 4.1 External, Societal and Environmental Context 4.2 Enterprise and Business Context 4.3 Conceiving, Systems Engineering and Management 4.4 Designing 4.5 Implementing 4.6 Operating

III. METHODOLOGY

This study was focused on the development of integrated curricula for the master of engineering programs using the CDIO framework. The Master of Engineering Programs at Camarines Sur Polytechnic Colleges, a higher education institution in the Philippines was the subject of the study. Revisions of the curricula were done through a series of consultations and FGDs with the faculty and students of the graduate program, and industry practitioners in order to obtain the most important courses and descriptions to be developed. Review of the CDIO standards and syllabus formed part in the whole processes of the development of the integrated curricula. Graduate attributes were developed, and industry needs survey on the expected proficiency of graduate students were gathered that served as inputs in the integration of the CDIO skill sets in the developed curricula. The questionnaire survey was obtained using the CDIO Syllabus v2.0. Respondents were asked to assess the expected level of proficiency, using a set of descriptors as shown in Table 2, in the range of skill sets of the CDIO syllabus (13).

TABLE 2. EXPECTED LEVEL OF PROFICIENCY DESCRIPTORS

1	To have experienced or been exposed to
2	To be able to participate in and contribute to
3	To be able to understand and explain
4	To be skilled in the practice or implementation
5	To be able to lead or innovate in

The participants of the study were classified into two groups. The first group is the composition of the faculty and students of the graduate program, and industry practitioners. They served as the informants to the series of consultations and FGDs in the revision of the curricula which include the course contents and descriptions. The second group of respondents is the primary engineering industries in the Bicol region, Philippines where the majority of graduate students are employed. They served as the respondents of the industry needs survey in determining the expected levels of proficiency of graduate students. Arithmetic mean and standard deviation were the statistical tools used in the analysis of data. Cronbach's Alpha was used to determine the reliability of the survey. Microsoft Excel was used in the analysis of the data.

IV. RESULTS AND DISCUSSIONS

A. Graduate Attributes

On the curriculum development process, five CDIO standards were involved. These are standards 1, 2, 3, 4 and 5 (14). To meet standard 1, it is understood to indicate that the curriculum has adopted CDIO as a context for the master of engineering education. To meet standard 2, graduate attributes are necessary. Graduate attributes are essential factors in planning the curriculum of any university. The five themes generated represent the main areas of engineering attributes regulated by national bodies (15). These are knowledge base, professionalism, problem solving, diverse work settings and design. These attributes were derived from the data of countries under the Washington Accord. Currently, the college doesn't have clear statements on the graduate attributes. The proposed attributes were developed and meet the global graduate attribute themes and categories as shown in Table 3.

TABLE 3. PROPOSED CSPC GRADUATE ATTRIBUTES

No.	Global Themes	Proposed Graduate Attributes	
1	Knowledge Base	Deep Discipline Knowledge	Graduates who have the knowledge and mastery of the fundamental and advanced concepts required for effective practice of their respective fields of disciplines.
2	Professionalism Problem Solving Design	Professional Skills and Competence	Graduates who have basic and advanced practice in their fields, able to think, design, build and solve problems to respond to the needs of the industry and community.
3	Diverse Work Settings	Personal and Interpersonal Skills	Graduates apply effective communication skills both orally and in writing, give importance to life-long learning, and work effectively in multi-disciplinary and multicultural teams.
4	Diverse Work Settings	Socially Responsible and Ethical	Graduates give importance to moral values and beliefs, and understand social and ethical responsibilities.
5	Design	Productivity	Graduates contribute to nation-building and development, and industrial innovation through creative generation of technologies.

The graduate attributes conformed to the CDIO knowledge and skill sets from CDIO syllabus as shown in Table 4.

TABLE 4. CDIO SKILLSETS-FUTURE GRADUATE ATTRIBUTES MAPPING

CDIO Skill Sets based on CDIO Syllabus v.20	Desired Graduate Attributes				
	1	2	3	4	5
1. Disciplinary Knowledge and Reasoning					
1.1 Knowledge of Underlying Mathematics and Science					
1.2 Core Engineering Fundamental Knowledge					
1.3 Advanced Eng'g. Fundamental Knowledge, Methods & Tools					
2. Personal and Professional Skills and Attributes					
2.1 Analytical Reasoning and Problem Solving					
2.2 Experimentation, Investigation and Knowledge Discovery					
2.3 System Thinking					
2.4 Attitudes, Thought and Learning					
2.5 Ethics, Equity and other Responsibilities					
3. Interpersonal Skills: Teamwork and Communication					

3.1 Multidisciplinary Teamwork					
3.2 Communications					
3.3 Communications in Foreign Languages					
4. Conceiving, Designing, Implementing, and Operating Systems in the Enterprise and Societal Contexts					
4.1 External, Societal and Environmental Context					
4.2 Enterprise and Business Context					
4.3 Conceiving, Systems Engineering and Management					
4.4 Designing					
4.5 Implementing					
4.6 Operating					

B. Industry Needs Survey Results

Twenty (20) questionnaires were returned. The computed Cronbach's Alpha was 0.855 which is higher than 0.700, thus, the survey was reliable. Table 5 shows the result of the survey of the proficiency expectation from the industry. It is found that multidisciplinary teamwork, advanced engineering fundamental knowledge, methods and tools, attitudes, thought and learning, ethics, equity and other responsibilities, and communications were the top expectations. The lowest expectations are communications in foreign languages and enterprise and business context. Results show similarities of the findings of Kuptasthien (16) in 2014. Also, in the results of the study of Ercan, et al., (17), they observed that engineering as well as communication and teamwork skills of students participated in their program developed significantly, which proves that these skills must be integrated in the curriculum.

TABLE 5. RESULT OF INDUSTRY NEEDS SURVEY

No.	Skill Sets	Mean	Std. Dev.
3.1	Multidisciplinary Teamwork	4.500	0.671
1.3	Advanced Eng'g. Fundamental Knowledge, Methods and Tools	4.250	0.829
2.4	Attitudes, Thought and Learning	4.250	0.622
2.5	Ethics, Equity and other Responsibilities	4.200	0.600
3.2	Communications	4.200	0.600
1.2	Core Engineering Fundamental Knowledge	4.150	0.572
4.4	Designing	4.150	0.654
2.1	Analytical Reasoning and Problem Solving	4.050	0.669
2.3	System Thinking	4.050	0.497
4.3	Conceiving, Systems Engineering and Management	4.000	0.548
1.1	Knowledge of Underlying Mathematics and Science	3.950	0.589
4.5	Implementing	3.850	0.853
2.2	Experimentation, Investigation and Knowledge Discovery	3.750	0.698
4.1	External, Societal and Environmental Context	3.700	0.900
4.6	Operating	3.700	0.843
3.3	Communications in Foreign Languages	3.550	0.669
4.2	Enterprise and Business Context	3.500	0.806

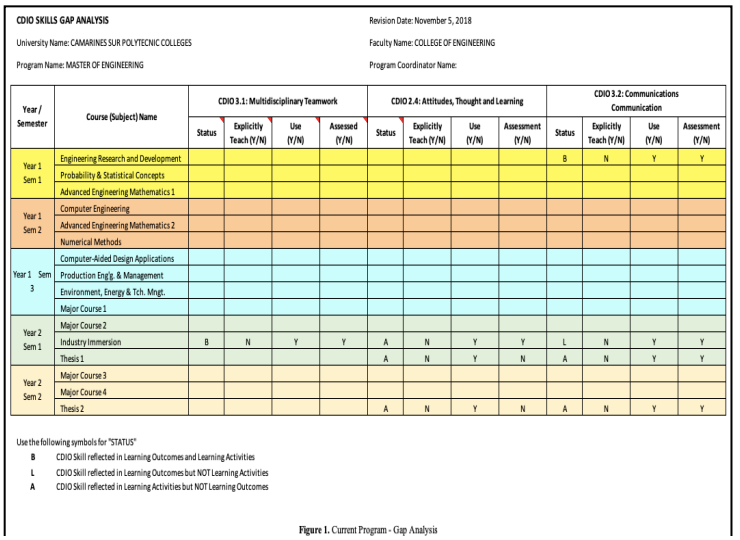
C. Revisions of the curriculum

The revision of the curriculum was done through a series of consultations and FGDs with the faculty and students of the graduate program, and industry practitioners. The contents of the curriculum were based on the needs of the industry and the capability of the faculty members to handle specialized courses. The faculty suggested that the major courses should only focus on one specialization in each program since the previous curriculum focuses on various specializations. In this revision, four major courses were designed in each program as shown in Table 6.

TABLE 6. PROPOSED CURRICULUM: MASTER OF ENGINEERING

Foundation Courses (12 units)			
Course Code	**Pre-Requisite /Co-Requisite**	**Course Title**	**Units**
ET 200	None	Engineering Research and Development	3
ET 201	None	Probability and Statistical Concepts in Engineering Planning and Design	3
ET 202	None	Computer Engineering	3
ET 203	None	Advanced Engineering Mathematics I	3
Core Courses (15 units)			
ET 204	ET 203	Advanced Engineering Mathematics II	3
ET 205	/ET 203 /ET 202	Numerical Methods with Computer Applications	3
ET 206	None	Production Engineering and Management	3
ET 207	ET 202	Computer-Aided Design Applications	3
ET 208	None	Environment, Energy & Technology Management	3
M.Eng'g. in Civil Engineering: Structural Engineering (12 units)			
CE 200	ET 204, ET 205	Advanced Structural Analysis	3
CE 201	ET 204, ET 205	Advanced Reinforced Concrete Design	3
CE 202	ET 204, ET 205	Prestressed Concrete Design	3
CE 203	ET 204, ET 205	Structural Dynamics and Earthquake Engineering	3
M.Eng'g. in Mechanical Engineering: Heat Transfer, Thermodynamics and Energy Systems (12 units)			
ME 200	ET 204, ET 205	Combustion Engineering	3
ME 201	ET 204, ET 205	Thermal Engineering	3
ME 202	ET 204, ET 205	Two-Phase Flow and Heat Transfer	3
ME 203	ET 204, ET 205	Thermal Science Application in Power Engineering	3
M.Eng'g. in Electrical Engineering Major Courses: Power Engineering (12 units)			
EE 200	ET 204, ET 205	Power System Operation & Controls	3

EE 201	ET 204, ET 205	Power Transmission and Distribution	3
EE 202	ET 204, ET 205	Computer Applications in Power Systems	3
EE 204	ET 204, ET 205	Renewable Energy Resources Design	3
M.Eng'g. in Electronics Engineering: Robotics and Control Engineering (12 units)			
ECE200	ET 204, ET 205	Electronic Systems and Instrumentation	3
ECE201	ET 204, ET 205	Robotics and Mechatronics Engineering	3
ECE202	ET 204, ET 205	Modern Control Systems	3
ECE203	ET 204, ET 205	Digital Control Systems	3
ET 210		140 HOURS Industry Immersion	3
		Comprehensive Exam	
ET 211		Thesis Writing	6
		Total Units	**48**



CDIO SKILLS GAP ANALYSIS

Revision Date: November 5, 2018

University Name: CAMARINES SUR POLYTECNIC COLLEGES

Faculty Name: COLLEGE OF ENGINEERING

Program Name: MASTER OF ENGINEERING

Program Coordinator Name:

Year / Semester	Course (Subject) Name	CDIO 3.1: Multidisciplinary Teamwork				CDIO 2.4: Attitudes, Thought and Learning				CDIO 3.2: Communications Communication			
		Status	Explicitly Teach (Y/N)	Use (Y/N)	Assessed (Y/N)	Status	Explicitly Teach (Y/N)	Use (Y/N)	Assessment (Y/N)	Status	Explicitly Teach (Y/N)	Use (Y/N)	Assessment (Y/N)
Year 1 Sem 1	Engineering Research and Development									B	N	Y	Y
	Probability & Statistical Concepts												
	Advanced Engineering Mathematics 1												
Year 1 Sem 2	Computer Engineering												
	Advanced Engineering Mathematics 2												
	Numerical Methods												
Year 1 Sem 3	Computer-Aided Design Applications												
	Production Eng'g. & Management												
	Environment, Energy & Tch. Mngt.												
	Major Course 1												
Year 2 Sem 1	Major Course 2												
	Industry Immersion	B	N	Y	Y	A	N	Y	Y	L	N	Y	Y
	Thesis 1					A	N	Y	N	A	N	Y	Y
Year 2 Sem 2	Major Course 3												
	Major Course 4												
	Thesis 2					A	N	Y	N	A	N	Y	Y

Use the following symbols for "STATUS"

B CDIO Skill reflected in Learning Outcomes and Learning Activities

L CDIO Skill reflected in Learning Outcomes but NOT Learning Activities

A CDIO Skill reflected in Learning Activities but NOT Learning Outcomes

Figure 1. Current Program - Gap Analysis

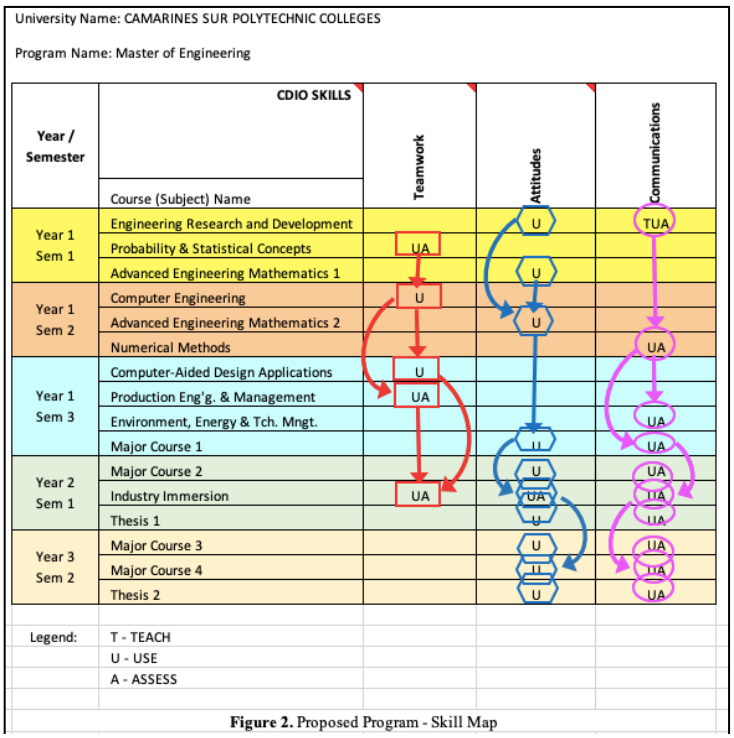
Fig. 1. Current Gap Analysis

D. Integrated curricula using the CDIO framework

From the results of the survey, the top five industry expectations are multidisciplinary teamwork, advanced engineering fundamental knowledge, methods and tools, attitudes, thought and learning, ethics, equity and other responsibilities, and communications. Multidisciplinary teamwork, attitudes, thought and learning, and communications were integrated into the developed curricula. Communications will be taught (T) in the course engineering research and development.

While the multidisciplinary teamwork, and attitudes, thought and learning will be used (U) and be assessed (A) in the various courses of the program as shown in the integrated curriculum. Course syllabi on these courses should be designed and incorporated the various skill-sets as presented in the curriculum.

The foundation courses serve as the fundamentals of engineering as stated in standard 4. Four major courses were incorporated in the curriculum to enhance the implementing skills along with Design & Build experience (standard 5). Figures 1 to 3 shows the gap analysis, skill map and full integrated curriculum.



University Name: CAMARINES SUR POLYTECHNIC COLLEGES

Program Name: Master of Engineering

Year / Semester	CDIO SKILLS / Course (Subject) Name	Teamwork	Attitudes	Communications
Year 1 Sem 1	Engineering Research and Development		U	TUA
	Probability & Statistical Concepts	UA		
	Advanced Engineering Mathematics 1		U	
Year 1 Sem 2	Computer Engineering	U		
	Advanced Engineering Mathematics 2		U	
	Numerical Methods			UA
Year 1 Sem 3	Computer-Aided Design Applications	U		
	Production Eng'g. & Management	UA		
	Environment, Energy & Tch. Mngt.		U	UA
	Major Course 1		U	UA
Year 2 Sem 1	Major Course 2		U	UA
	Industry Immersion	UA	UA	UA
	Thesis 1		U	UA
Year 3 Sem 2	Major Course 3		U	UA
	Major Course 4		U	UA
	Thesis 2		U	UA

Legend:

T - TEACH

U - USE

A - ASSESS

Figure 2. Proposed Program - Skill Map

Fig. 2. Skill Map

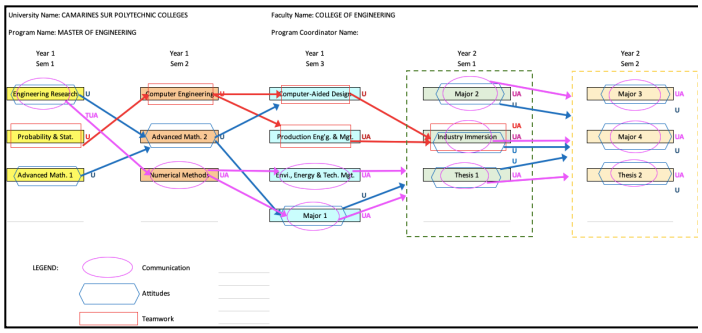


Fig.3. Integrated Curriculum (Same for the Four Programs)

V. CONCLUSION AND RECOMMENDATIONS

The developed integrated curricula for the master of engineering programs using CDIO framework conforms with the current educational standards in engineering education. The contents of the curricula were revised. Graduate attributes were developed, and the industry needs survey was conducted as bases in the integration of various skill-sets and attributes of graduate students. Multidisciplinary teamwork, attitudes, thought and learning, and communications were integrated into the curricula. Policies regarding admission, industry immersion, comprehensive examination, thesis/research, and other academic-related policies on the master's degree in engineering which are not part of this study can be developed based on the approaches of the CDIO framework. The developed curricula can now be in the process for approval with the academic council for implementation. Stakeholder's validation will be essential to determine the effectiveness of the developed curricula. Faculty professional and teaching enhancement will lead to a successful implementation of the developed curricula.

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Korean Education Policy and Parents Expectation: Case Study of Korean School in Thailand

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***Abstract*— Korean education policy had established Korean School or KS in different local cultures with the Korean curriculum base for expatriated Korean in many countries. This study tries to understand the characteristic of Korean schools in terms of schools established in Thailand and define the purpose and expectations of parents that have on the Korean School and see if those expectations are met. The study shows that not only Korean Government creates KS that uses the National Competency Standard or NCS learning module as a core curriculum to provide the same standard education as the private school in The Republic of Korea to the expatriates Korean but also help students maintain their identity as Korean despite being residing in other countries. This paper will show the characteristic of the related parties of KS which is a result from quantitative research and the expectation of parents on KS will also be discussed.**

Keywords—Korean education policy; school for expatriate Korean; Korean parents' expectation on school; cultural identity

I. INTRODUCTION

Korean people have confidence in equal education opportunities and believe that their own success depends on their own effort and that "you will succeed if you study hard" made the meritocracy a reality and led the way to social integration.(Diem, Levy, & VanSickle, 2003) [1] and education was the force behind the citizenship that achieved political democracy. Expanded education opportunities boosted the education standard and thus heightened people's political awareness. Even though some Korean has to expatriates living abroad whatever the reason is to work or to asylum but their keep strong characteristic as Korean and cherish their culture wherever they go. For Korean parent living abroad does not burden their will to teach their children Korean culture, so Korean overseas community start to have Korean Language school for Korean children and interested person.

Korean Government then came up with the policy to support educational institutions which is providing education to the children of Korean expatriates living abroad and to make sure those children can grow into global talent with a firm self-identity as Koreans with the same standard as the school established in Korean. By supporting the school, not only the Government can control the standard and quality of education that Korean children are going to received but also, they can guarantee the quality of the person who might future to be their workforce to develop Korea.

II. LITERATURE REVIEW

A. Korean Government's Policy on Education

After the Forth Industrial Revolution Korea's technology and society in general has been rapid changed which pushed the education and training systems to reform. (Asiasociety, 2010; MOE, 2016) [2][3] According to Ministry of Education (2017), the first Korean compulsory primary education has started in 1950 then middle school in 1985. The development starts from outbound then moving into the city, until 2004 all primary and middle school education have been compulsory across the country. This shows that the Korean government has always focused on upgrading education since the liberation from Japan. Their goal was to satisfy the country modernization and industrial revolution, so they used many policies to fulfil a diverse society and the demand of various learners to produce best quality human resource. (Diem et al., 2003)

Can't deny that secondary students in Korea are among the strongest performers in foundation skill, as measured by the Program for International Student Assessment or PISA (OECD, 2015) [4] Therefore nowadays the goal of education policies still focus on producing human resources to go along with the fourth industrial revolution and the future society. However, slightly shift in the education paradigm to Happiness Education. The following are the key assignments that Korean education is focusing on: Producing creative and converged talents, expanding convergence character education, expanding education welfare, global education cooperation, and building a lifelong learning society. (MOE, 2017) [5]

Furthermore, to ensure the success of various future-oriented education policies, Korean teacher training institutes

are being reformed with a focus on practicality to enhance teachers' ability. The teacher certification exams are also being changed to test for practical proficiency. After the teachers are employed, both pre-service and in-service teachers are given training according to their needs to continuously boost up their skill and performance. (Joo, 2020) [6]

B. Korean Education Policy on Korean School

The Korean government seeks to provide everyone with equal educational opportunities from the early days of one's life, and to assist even those students with learning difficulties such as underachievers and dropouts, even Korean who are residing abord, so that everyone can learn and grow together, and be given hope and opportunities. In developing overseas Korean societies, they build the foundation of educating human resources who can make contributions to the development of overseas Korean societies the same as for in the motherland by building an Act on education for Korean Residing Aboard. (Act on Educational support for Korean residing abroad [Enforcement Date 29. May 2018.] [Act No.15042, 28. Nov 2017. Partial Amendment]) (MOE, 2020a) [7]

According to the Act, it is made for KS that has established in foreign countries to support the school education and lifelong education for Korean expatriates. It shows that Korean government not only provide necessary support to education services to Korean expats' family but also to ensure that they can lead a life, taking great pride in being nationals of the Republic of Korea. The Act has determined the relevant topics to establish and operate KS. This Act has effected to any KS that fall under the Act on Educational support for Korean residing aboard necessary to use Korean Curriculums that designed by the Ministry of Education which developed in accordance with Article 23 of the Elementary and Secondary Education Act, but the school might change some part of curriculum or content to match with the characteristics of the host country where it locates. Korean Government will consider funding support for KS depends on budget they have each year. And for the student who graduated from these schools will be considered as the same level in academic degree as the student who graduated the same level in the Republic of Korea.

C. Korean School worldwide and in SEA

There are around 7.5 million overseas Korean all around the world mostly staying in the US and China (around 2.5 million in each country) followed by Japan, Canada, Uzbekistan and so on. The number of overseas Korean in Thailand are around 20,200 (MOFA, 2019) [8] which ranked 20th of the nation that have overseas Korean. Other than the US and China Korean people tend to stay in Europe and South East Asia countries. Among those countries Vietnam ranked 6th and counted as 1st among South East Asia countries followed by Philippines 10th, Indonesia 17th, Singapore 18th, Malaysia 19th, Thailand 20th and Cambodia 24th. Despite the number there are no Korean school (in term of school that controlled by the government) in the US and European countries, it turns out that there are more Korean schools in China and South East Asia countries. And The expatriate student population tends to decrease in China, while increasing in the South East Asian region. (MOE, 2020b) [9]

D. Advantage of entering university from residing abord

The Korean College Scholastic Ability Test (hereafter CSAT), or Suneung (수능) is designed to measure the students' scholastic ability required for college education. Annually, approximately 600,000–650,000 students take the CSAT and 20% of them are re-takers. This high rate of re-takers implies that demand for a higher CSAT score is very crucial for having a better chance to enter a more reputable university. (Kwon, Lee, & Shin, 2015) [10]

Nevertheless, Korean universities have special pathways of college entrance available for the children of expatriates. Such as Invitation Program for overseas Koreans, Overseas Koreans Foundation or MOFA has scholarships for Overseas Koreans to be invited to Korea, however, the qualification of student who can get special quota as overseas Korean must have stayed in other country for at least 3 years. Especially for Korean student who stay more than 12 years will get more advantages to enter university in Korea. (Bae, 2020) [11]

III. METHODOLOGY

This research focuses on background information of Korean school and the characteristic of students in the Korean School that are established in Thailand and to see trend of parents' intention and expectation in relation to Korean government policy through collecting of data from the survey questionnaire circulated among students, parents and teacher of KS. Other background knowledge retrieved from Korean government organization's documents. Three ideas are considered as below:

A. Hypothesis

1) The educational aim in Korean curriculum and trend impact to educational value in Korean student at Korean school in Thailand.

2) There are two rationale for choosing KS from parents' side (1) for younger students to learn Korean Culture, and (2) for older students to prepare and get advantage for enter university in Korea.

3) Korean policy is responding to parents' expectation in terms of provide basic education but not related to high school

students' parents who are seeking opportunity for their children in higher education in Korea than academic result.

B. Research Design

This study is a descriptive research which studies and describes the background of Korean school and the characteristic of related parties of the KS which consist of students, teachers, and parents. To see if trend of parents' expectation on school have a connection with Korean government policy. In order to be able to understand the perspective and opinions about the school and support the findings, questionnaire survey was designed in three set for each group separately. The questionnaire is consisting of general information part containing questions with multiple choices and some open-end question, and the opinion part which used the Likert scale questions. To achieve the objectives of this study, all of data were collected from many reliable sources will review, analyze and discuss in the form of descriptive research by explain the result from questionnaire using percentage and calculate to find mean score.

C. Participants

There are three group of samples which are students, teachers, and parents. The samplings were chosen among middle and high school students, teachers, and parents from Korean International school in Bangkok, in total of 69 respondents. The number of samples are depending on the number of students and teacher who are active on year 2020.

IV. RESULT

A. KS in Thailand

KS in Thailand has opened since 2001 and located in Ram-Intra and is the only KS that exists in Thailand in the present time. The school is relatively smaller in number when compared with other KS in South-East Asia. In 2020 the school has 88 students in total and 27 Staffs works in school. KS school system and educational activities is conducted by the Korean curriculum, so most of the main subject are taught in Korean language but they also provided foreign language education such as English and Thai, and the program to experience the excellence of Korean culture and the culture of other countries in the world. To cultivate students as global talents that suitable with the 21st century, the school not only provides the academic education to students but also a variety of after-school club activities that consider to serve students' needs.

Nevertheless, KS in Bangkok has somewhat differences with the school in Korea due its location and the surrounding culture which can be seen in the lacking of competitive spirit from students but still has some commons with the school in Korea due to the school system and the community.

B. Characteristic of the participants in each group.

1) The age of the KS students ranges between 7-20 years old divided in elementary level (41 persons), middle school level (21 persons) and high school (26 persons). Their ethnicity majority is Korean, and some half Korean-Thai. Most of the student stay with parents, only a few live with only mother or relatives. More than half of the students in middle and high school levels have lived in Thailand for more than 3 years and around 40% of the students have lived more than 12 years already.

Despite living in Thailand for many years, most of them seem to have gone back to Korea to visit relatives quite often which shows how much they have connected with their roots. Despite that some of them spent their whole life in Thailand, they all shown attachment to Korea. From the result, majority of the student shows to have very positive attitude and comfortable around Korean culture. They are familiar to Korean food, language, community and even more than half of the respondent prefer to live in Korea more than Thailand.

2) Korean teacher of KS. The Korean teachers who works here are required to have the equivalent qualifications to the domestic Korean teachers in accordance with the Elementary and Secondary Education Act. And teachers for local and foreign language are hired by the schools themselves locally. The number of active working staff in 2020 is 47 in total. Among these number, 12 of them are teachers of Korean nationals. The Korean teacher who is active in year 2020, accounted for 75%, just starting their first year this year. KS teachers' responsibility are scatter to every level and take responsible for different subject. All KS teachers plan to work in Thailand only for a short-term, mostly said for two years. When looking at KS teachers' methods of teaching, it shows that KS teachers are confident with their own way in managing students'b ehavior in class. They also shared some similarity on using positive methods to manage students' general behaviors in the classroom and avoiding negative methods such as use physical restraint.

3) The age of KS parents in Thailand are in the range of 25 – 55 years and all have Korean Ethnicity, the samples are randomly pick those who has child from elementary level to high school level of KS. KS parents mostly are from middle-class to upper middle-class family. Around 55% of the respondents stayed in Thailand for 1-3 years while others spend their time here more than 3 year. The reason of stay mostly came from their work (around 68%), while around 22% choose to come to Thailand for their child's education.

TABLE I. KS PARENTS' REASON OF RESIDING TO THAILAND

Reason of residing to Thailand	***Qty.***	***%***
Work/Business	15	68.18
For child's education	5	22.73
Own Study	1	4.55
Migration by Marriage	1	4.55

Note: The result from survey with KS parents of academic year 2020 in total of 22 persons

KS parents believe that EQ, SQ, CQ and IQ are important. While MQ and PQ are less important relatively. These also shown when asking the parents about After-School Activities, they prefer their child to spend more time on languages or creativities activities more than stress academic class and also prefer their child to have 1 or 2 hours of extra study instead of put all the effort on study. This shows that KS parents try to keep their children more balancing between academic and other learning aspects in the education.

C. Student's cultural identity value

TABLE II. KS STUDENTS' KOREAN IDENTITY VALUE

Statement	**Level of agreement**			***Meaning***
	total	$\bar{X}$	***S.D.***	
I feel like I am in Korea more than in Thailand	35	2.80	1.390	Moderate
I always would like to know about what happening in Korea	35	3.66	1.068	High Korean Identity
I feel comfortable with the Korean community more than Thai.	35	3.86	1.175	High Korean Identity
I get used to Korean food more than Thai food.	35	4.00	1.171	High Korean Identity
I get used to Korean culture more than Thai culture.	35	4.29	1.084	High Korean Identity
I know most of Korean's special days such as Seollal, Chuseok, Independent day, Hangeul day, etc.	35	3.74	1.250	High Korean Identity
I feel comfortable with Korean culture more than Thai culture.	35	4.23	1.123	High Korean Identity
total		3.84	1.284	High Korean Identity

Note: The result from survey with KS secondary student of academic year 2020 in total of 35 persons

Koreans are very proud of their nationality because they value their rich achievements. It was a valuable result of their hard work. This pride gives Koreans a powerful and positive identity. According to table II, despite being in different local culture environments KS students are familiar with Korean culture and are more comfortable with their homeland culture.

Furthermore, even though KS students are living with their parents they tend to visit Korea quite often, 95% visited Korea at least once a year, some even said around 3-5 times in a year. The main reason of their revisiting Korea is mostly to meet their families, friends, or relatives. In addition, 97 % of the participants said they use Korean language in their daily life, among them around 64% used only Korean while the rest are using either Korean, Thai and English. This is also showing their strong Korean identity which is the result of the strong tie with Korean community surrounding KS.

D. Parents' expectation on KS

TABLE III. KS PARENTS' REASON OF CHOOSING KS

Reasons of choosing KS	***Qty.***	***%***
Korean community	11	50.00
Korean curriculum	8	36.36
Tuition fee is acceptable	2	9.09
Has tuition fee support program	1	4.55
location	0	0.00

Note: The result from survey with KS parents of academic year 2020 in total of 22 persons

From table III, more than half of the parents of KS choose KS for their children because they want their children to live in Korean community. When looking closely in details, those who has this idea are parents of children in the elementary level. Parents whose children are in the upper levels mostly choose KS because they believe in Korean curriculum.

TABLE IV. KS PARENTS' EXPECTATION ON KS

Expectation on school	***Elementary level parents***		***Middle school level Parents***		***High school level Parents***	
	Qty.	***%***	***Qty.***	***%***	***Qty.***	***%***
Gets to study in good school	7	31.82	4	18.18	2	9.09
Gets advantage from residing in Thailand to enter good University in Korea	0	0.00	1	4.55	4	18.18
Opportunity to learn and get used to Korean culture	3	13.63	0	0.00	0	0.00
Opportunity to meet Korean friends	1	4.55	0	0.00	0	0.00
total	11	50.00	5	22.73	6	27.27

Note: The result from survey with KS parents of academic year 2020 in total of 22 persons

However, if paying a close look in Table IV, there is different expectation on KS between lower level class parents and upper level class parents. The majority of KS parents from lower level class has put their expectation on good school system for their children. Then again parents of the upper level class expect that their children will get advantage from residing overseas to benefit the quota in entering good university back in The Republic of Korea.

In addition, participants show their positive attitude towards KS. Both parents and students show that they have good relationship with friends and community surrounding KS both in Korean and locally environment. They also trust and believe that they are being well prepared as the same level as the students in The Republic of Korea to get ready for further education.

V. Summary and Discussion

Nowadays Korean education system has its strong focus on academic studies, but it must be balanced with greater attention to fostering creative and entrepreneurial skills. Cannot deny that one of the reasons that make The Republic of Korea develops as far as they become is because they put priority on human resources development especially education for youth. Even for the Korean expatriates living abroad, the Korean Government comes up with the policy to support educational institutions which is providing education to the children of Korean expatriates living abroad and to make sure those children can grow into global talent with a firm self-identity as Koreans with the same standard as the school established in Korean. By supporting the school, not only the Government can control the standard and quality of education that Korean children are going to received but also, they can guarantee the quality of the person who might be their future workforce to develop Korea. This research can prove that KS student do have a firm self-identity as Korean but cannot conclude that it is because of the curriculum. To do so this research needs to get more different aspect information from other Korean expatriates in Thailand who send their children to other kind of school than KS to be able to find true variables that related to.

Even though, Korean government goals are to educate overseas Korean about their homeland culture and maintain Korean identities culture, KS parents in Thailand's intention are slightly different. It is true that Korean parents want to let their children know and learn about Korean culture but they also want their children to get privilege advantages to get in University in Korea, which is a special quota for overseas Korean who must have stayed in other country for at least 3 years and the privilege becomes better if they stay longer. And the best scenario is to reside abroad for over 12 years. As the result, there are some parents that really decide to come to Thailand for their children's better opportunity for education, however, that is not necessary the significant reason for residing abroad. It should be noted that the majority of the respondents (around 68%) came to Thailand for reason of work.

Despite the belief that EQ, SQ, CQ and IQ are important, KS parents would like their children to balance between their academic and other aspects in education and skills, however, not to lose sight of the academic aspect which is the path to enter to University in Korea. That leaves the question as to whether these children will eventually be able to acquire enough to keep up with the competitive education system in Korea.

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