DIGITAL STORYTELLING PROJECTS COMBINED WITH SOCIAL AND ECOLOGICAL FRAMEWORK APPLICATIONS TO EXAMINE HEALTH DISPARITIES AMONG VULNERABLE GROUPS

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ABSTRACT

Abstract—Purpose: The results of this study illustrate how digital storytelling (DS) projects incorporating social and ecological framework applications can be used to effectively communicate major risk factors on social determinants of health contributing to health disparities, especially among vulnerable groups. Methods: Doctoral students in a "Human Ecology of Health and Illness" course worked on semester-long projects applying social-ecological frameworks to address health disparities among underserved groups. In addition to traditional paper reports, each student learned to develop a 3-minute DS project as a new and effective communication strategy to convey evidence-based research on major risk factors and suggested strategies to potential policy makers and the general public. A 7-item DS scale along with an overall effectiveness item was used to assess the quality of students' DS projects. Results: As an integral part of the learning experience, students synthesized existing data and literature, used the seven element guidelines described in a DS cookbook and other resources, and incorporated ecological frameworks in their analyses. Students were also encouraged to talk with key community stakeholders to gain first-hand experience and perspectives on the issues and underserved groups. A total of six projects developed by 6 pairs of students were used to pilot the DS scale, with each student rating the other 5 projects plus the instructor rating all the projects (valid n=65). Students commended deepened understanding of the contextual factors impacting health disparities and deepened passions and commitment towards the underserved groups. Example(s) on how an ecological framework can be incorporated in DS to convey important public health messages and actions are provided. Conclusions: The study provides an innovative way of translating evidence-based and framework-guided knowledge to real-life applications, which was effective to deepen engagement and critical thinking, and an innovative way of measuring and translating this knowledge to public health practice.

Keywords: digital storytelling, health disparity, social-ecological framework, public health.

INTRODUCTION

1.1. Health Disparity

Health disparity refers to different health outcomes among populations. While there have been national initiatives to address health disparities, such as HealthyPeople2020, health disparities in the United States are ever increasing [8]. Powerful, complex relationships exist between five determinant areas (i.e. economic stability, education, social and community context, health and health services, and neighborhood and built environment) incorporating several key issues that heavily influence quality of life and subsequently, population health outcomes [18]. These determinant factors are also known as social determinants of health [18].

1.2. Digital Storytelling

Storytelling is one of the most basic and universal forms of communication and education, having been used to transmit ideas, values, identity and culture [15]. Digital storytelling (DS) is used to bring awareness to identities, cultures, and experiences, by evoking emotion through leveraged use of images, text, videos and voice to add a sense of realism to the story being told. Goodwin proposes that storytelling is a subjective process; a shared experience between a teller and an audience that cannot be extricated from the larger context in which it takes place [1]. If we move the concept a bit further, and apply it to today's technologically-advanced landscape, we may infer that DS utilizes a variety of modern outreach platforms including web-based and digital media to broaden the spectrum of outreach of the story [6]. What differentiates DS from

traditional storytelling, however, is that it is a promising tool to reach and effectively communicate narratives of disadvantaged and minority populations [7]. Thus, a tool such as DS could prove essential to addressing health disparities, especially among disadvantaged and minority populations.

LITERATURE & THEORY

2.1. Existing Studies on Digital Storytelling

Past research efforts geared towards targeting health disparities have been primarily focused on decreasing and/or eliminating diseases, and on health services; however, it is important to recognize that the absence of disease alone does not constitute good health. In addition, social determinants of health are critical to population health. From a preventive approach, addressing social determinants of health has the potential to not only foster awareness on these major risk factors, but to advocate on social-economic environment contribution to health disparities.

Most health disparities occur at the intersection of racial, ethnic, geographic, socioeconomic and other social characteristics [10]. DS, as earlier stated, provides these population groups with a voice and associates a face with the voice, issue, disease, or experience, drawing connections between viewers and participants. In the case of health disparity, DS can be a powerful and culturally relevant health promotion tool to address health disparity by combining technology with the voices of members of vulnerable and often underserved populations [17]. DS also enables members of communities of color or low socioeconomic status (SES) to share their individual stories, which may often go unnoticed by mainstream media [11]. Not only could this increase outreach opportunity promoting awareness in a wide scale fashion, DS can also identify shared experiences among members, possibly stimulating action and moving towards changes on the social-ecological environment.

In addition to promoting awareness, DS is also a powerful educational and teaching tool. In these capacities, DS takes a constructivist approach to learning, in that, it emphasizes learning through use of authentic contexts, and a focus on the importance of the social dimension of learning [13]. For example, the e-Learning Digital Storytelling (eLDiSt) framework provides tools, protocols and rubrics designed to help story creators in producing engaging digital stories, and considers the needs and abilities of learners at different stages of learning and can be used as an efficient and effective learning tool at various levels of education [13].

2.2. Theoretical Framework

Besides the use of DS, behavior change can be further explained by the Narrative Communication theory and the Social-ecological framework.

2.2.1. Narrative Communication Theory

Fisher asserts that narrative theory is based on the assumptions that humans are natural storytellers who understand and interpret their life experiences as ongoing narratives [2]. These narratives add personality and/or context to an issue or experience, which aids listeners and viewers in constructing meaning from a narrative through transportation, identification, or realism [2]. These three concepts intertwine to form the framework for understanding how meaning is drawn from a story, and how the paradigm moves toward change in, or motivations to change, attitudes and/or behavior. These concepts are interrelated and operate on a spectrum where transportation may impact the likelihood of identification; identification has great potential to determine whether one's perspective is perceived as real; and realism impacts one's overall consideration of the narrator's experience in informing their own attitudes toward, and behaviors associated with, a story or narrative.

2.2.2. Social-Ecological Model

In health promotion, the social-ecological model is a four-level framework used to better understand the interplay between individual, relationship, community and societal factors that affect or determine attitudes and behaviors [12]. Whether it is one's personal knowledge or demographics; family-or-friend influence on one's attitudes and behaviors; social relationships, neighborhoods, and their impact on behavior adoption; or social norms that might support a behavior, leading to poor outcomes, in health disparity research, we wish to

understand how these factors affect one's behaviors, and how they may lead to poor health outcomes and health disparities.

2.3. Elements of Digital Storytelling

The *DS Cookbook* developed by the Center for Digital Storytelling provides a basis for evaluating DS projects by understanding the main components of DS [4]. These seven elements are means by which viewers connect with the digital story being told: point of view, dramatic question, emotional content, gift of your voice, power of the soundtrack, economy, and pacing. Understanding and leveraging these elements could make for a much more impactful story, yielding a stronger connection to the narrative being discussed, and an overall improved consideration of the main idea being conveyed.

2.4. Gaps and Purpose

While this eLDiSt framework offers a comprehensive means for evaluating DS projects, the tool may also be viewed as a bit too involved, resulting in too much time and effort needed to complete the evaluation (in addition to the scoring rubric). The framework tool involves a pre-observation form, timed observation form, field notes form, and simplifying or condensing the tool may help with adaption and time-saving. In addition, the eLDiSt framework was crafted specifically for use in education, whereas, DS can be a versatile tool able to be applied to various arenas and industries, supported by a published and tested framework of elements.

In this study, we wish to bolster notions made by the identified theoretical framework by testing an assessment tool for DS, to illustrate and measure ways which DS can be used to convey important public health messages and actions. This paper describes and illustrates how DS projects incorporating social and ecological framework applications can be used to effectively communicate major risk factors on social determinants of health contributing to health disparities, especially among vulnerable groups.

METHODS

3.1. Project Background

The DS projects discussed in this paper were outcomes of a core required course on "Human Ecology of Health and Illness" in a college-wide interdisciplinary doctoral program in public health at one of the major public research university in the Southeast United States. This course aims for students to gain in-depth understanding of social and ecological determinants of health and illness; in particular, addressing those determinants affecting minority, underserved, vulnerable, and hard-to-reach populations. Topics discussed include: general framework of studying these populations, community determinants and mechanisms of vulnerability, disparities in health care access and health status, current strategies to reach or provide services / health promotion interventions among these groups. Students choose a specific underserved group, provide in-depth review, analysis, and discussions on major risk factors from individual, cultural, social perspectives, and explore effective & culturally relevant strategies to reach them.

Doctoral students enrolled in this core course on "Human Ecology of Health and Illness" worked on semester-long projects to understand major risk factors, and culturally relevant strategies to address health disparities, for underserved groups on priority health issues. Students learn to apply social-ecological frameworks to address health disparities among underserved groups. In addition to traditional paper report, each student learned to develop a 3-min. DS project accompanying their reports as a new and effective communication strategy to convey evidence-based research on major risk factors and suggested strategies to potential policy makers and the general public. As an integral part of the learning experience, students synthesized existing data and literature, used the seven key element guidelines described in a DS cookbook and other resources, and incorporated ecological frameworks in their analyses to better communicate lessons learned from research. Students were also encouraged to talk with key community stakeholders to gain first-hand experience and perspectives on the issues and underserved groups.

3.2. Digital Storytelling Project Description

In this assignment, based upon the analyses & synthesis of existing data and literature, students developed a story to help the general public understand a major health issue among an underserved group identified. Students were instructed to use the DS cookbook and other resources as a general guide to construct and create

the story, expected to describe the ecological framework used to analyze the issue, and used at least 30 images or photos to describe and construct the "story". Particularly, highlighting major risk factors contributing to the disparities, and illustrating how the culturally relevant strategies recommended might help close the gap.

Students identified a major public health issue among a specific vulnerable / underserved / hard-to-reach group, conducted in-depth review, syntheses, analytical thinking, and discussed major risk factors for the health of the underserved / hard-to-reach group or community, from individual, cultural, social perspectives. In addition, students explored effective, evidence-based, and culturally relevant strategies to reach these groups.

3.3. Measures

A scale was developed to assess the seven key DS elements suggested by the Center for Digital Storytelling: point of view, dramatic question, emotional content, voice, soundtrack, economy, and pacing. The 7-item 5-point Likert DS scale along with an overall effectiveness item was used to assess the quality of their DS projects. A total of six projects developed by 6 pairs of students were used to pilot the DS scale, with each student rated the other 5 projects plus the instructor rating all the projects (n=66; valid n=65).

3.4. Analyses

To assess the reliability of the 7-item DS scale, Cronbach's alpha was calculated to measure its internal consistency. In addition, mean plots of the 7 key elements were produced by each of the six projects. The one overall effectiveness items were compared with the average of the 7-item DS scale to exam the consistency of these two comparable yet different measures among these six projects. In addition to the utilization of the 7 DS guidelines, these projects were also evaluated based on how well students synthesized existing data and literature on major social determinants and risk factors contributing to health disparities, incorporate the social-ecological frameworks in their issue analyzes and application, as well as proposed what culturally relevant strategies might be and explain how they might help close the disparity gaps. Student reflections and learning on the semester-long DS projects were also analyzed and summarized in this paper.

RESULTS

4.1. The 7-item Digital Storytelling Assessment Scale (DS Scale)

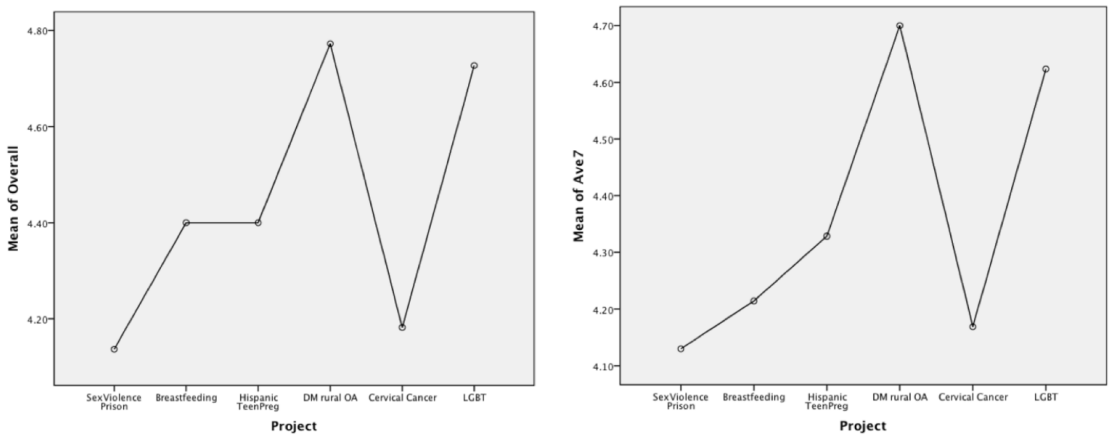
A total of six projects developed by 6 pairs of students were used to pilot the DS scale, with each student rated the other 5 projects plus the instructor rating all the projects (valid n=65). Data showed satisfactory internal consistencies (Cronbach's alpha=.78; CITC ranged .34~.68). Item means ranged between 3.94~4.62 (SD ranged .55~1.07) (Table 1). The scores of the overall effectiveness item and the average of the 7-item scale showed no statistical difference, although students tended to rate higher on the overall item than the average of individual items combined (Fig. 1).

Table 1 - Reliabilities of the 7-item Digital Story Telling Scale (DS Scale) (n=65).

Item Description	Mean (SD)	CITC	Alpha if deleted
(DS-1) Point of View	4.58 (.659)	.512	.748
(DS-2) Dramatic Question	4.29 (.879)	.675	.708
(DS-3) Emotion	4.46 (.772)	.619	.724
(DS-4) Voice	3.94 (1.074)	.341	.795
(DS-5) Soundtrack	4.14 (.827)	.556	.736
(DS-6) Economy	4.62 (.550)	.513	.752
(DS-7) Pacing	4.45 (.830)	.405	.766
DS Scale (7-item)	**Item mean = 4.35**	**Cronbach's Alpha = .776**	

- CITC = Corrected Item-Total Correlation

Fig. 2: Mean-plots of the one-item overall effectiveness vs. mean of the average 7-item DS scale by DS telling projects



Notes: Means of the one-item overall effectiveness vs. the 7-item DS cale item mean were 4.43 vs. 4.35 (p>.05), statistically not significant.

4.2. Example of the Digital Storytelling Projects

A couple of projects were briefed below to showcase what major social determinants and risk factors contributing to health disparities were identified guided by social-ecological framework, and what culturally relevant strategies were recommended to help close the disparity gap.

The Diabetics prevention among older adults in rural Georgia project examined older age, rural setting, and lower education as major risk factors influencing the DM disparities using an adapted social-ecological framework in the analyses. To illustrate the health issue and risk factors, this project featured "Betsy", a 71 years old low health literacy women who recently lost her husband and living in a rural county in Georgia. This project proposed recruiting and training community health workers (CHWs), especially older and with diabetes CHWs, as peer educators. In addition, it proposed a tailored alternative exercise program which was fun, social, and educational – The "Dance for Life" low-impact aerobic dance program for DM prevention. The use of "Betsy" in the story to represent many others in the target group proved to be an effective strategy for audience to related to.

The LGBT Youth project targeted this "invisible" population on substance use disorder issues. This project discussed the non-acceptance and shame among this group, lack of access to support and treatment, and frequent use substance in socialization as major cultural-environmental-social factors. This project successfully used vivid images and voice to illustrate the significant life issues faced by LGBT youths. Strategies proposed include student life advisors' initiatives with counselor training and promoting system-wide change via screening, brief intervention, and referral to treatment, as well as provide a safe space to support LGBT youths.

4.3. Student Reflections on Own Learning

Students commended on deepened understanding of the contextual factors impacting health disparities and deepened passions and commitment towards the underserved groups. Below are sample excerpts highlighting student reflections and learning on the course project.

4.3.1. Deepened Critical Thinking

- Of all the classes I took this semester, this class pushed my thinking the most. I've really enjoyed the doctoral learning process: exploration, clarification, & synthesis.

- As an educator myself, I love how the project directed the content learned and yet the various project contents informed the process of understanding mechanisms of vulnerability and understanding social determinants of increased risk in population.
- The activities and assignments in class captured and pushed me to understand the influences on vulnerable population from an ecological perspective.
- Learning and understanding the frameworks became the catalyst for my thinking process throughout the semester in attempting to find the best approach for resolving the health disparity.

4.3.2. DS Telling Project Assignment Stimulated Learning Environment and Thinking

- I really enjoyed my peer's presentations, videos, and journal article presentations. I found the experiential aspects of the course to be an excellent way to pursue understanding of the issue.
- I was introduced to a body of research that is extremely relevant to not only my personal life but my academic life as well. I'm considering extending this topic potentially into dissertation material.
- The project as well as the class enhanced my understanding of the health disparities that exist as well as the mechanisms that expand them.

DISCUSSION

The most salient components of the DS approach are that viewers build on their own interpretations of a phenomenon through experience and interactions, and can generate a new or transformed understanding through the collection of knowledge from various sources [9]. Understanding this, we also understand the notion that DS can serve to educate viewers about the plights of disadvantaged populations, and alongside promotion/awareness, can evoke the appropriate emotions, stimulate action and propel us toward changes in social determinants of health that influence behaviors or decisions. This study illustrates how DS can be used and assessed as a new and effective communication strategy to convey evidence-based research findings and epidemiological data to the public. Essentially, the tool can be used as an agent of social change. As supported by the students' commendations, the tool supports a deepened passion and commitment towards understanding the contextual factors impacting health disparities and the underserved groups in general.

The DS tool supports the transportation and identification of attitudes/beliefs and experiences, leading to greater recognition of the importance and effect of social determinants of health, and their effects on overall population health. Using DS to impact individual thought-processes as they relate to decision-making regarding health and health behaviors has the potential to have a webbed effect vis-à-vis the acceptance of new attitudes and a subsequent change in relational, community and societal behaviors, affecting the overall health of a population. Additionally, promoting awareness of social determinants of health and their impact on population health could have major policy and practice implications, providing a focus for national health strategy on targeting specific and/or overall health disparities.

Slater & Rouner assert that production quality is critical to affect change in attitudes or beliefs as information must be credible and substantive [3]. The tool provides a succinct and effective evaluative means to ensure digital stories are of acceptable quality to ensure their efficaciousness. The DS format could serve as a promising strategy to better communicate lessons learned from research. Current data shows that the 7-item DS scale along with the overall effective measure was valid and reliable, and can be easily administered to measure the quality of DS projects.

DS can be used as an educational tool in health disparity research, and our DS tool aids this by providing a basis for producing high quality and effective DS projects. From this, listeners and viewers accept a sense of responsibility for changing social-ecological environments and experiences for the underserved. By doing this, there is a shared experience and an identification between the narrator and viewer/listener, and an overall motivation to change the health condition for both parties. Changing the social-ecological landscape could bring forth significant changes in health behaviors and an improvement in the overall population health.

CONCLUSION

This study provides an innovative way of translating evidence-based and framework-guided knowledge to real-life applications, which was effective in deepening student engagement and critical thinking, as well as their connection to the story. In addition, the study provides an innovative way of measuring and translating

evidence-based and framework-guided knowledge to public health practice in addressing health disparities. Using DS as a tool for health promotion and communicating health disparity, with this underpinned framework, can prove to be a powerful intervention technique for improving health behaviors in a culturally and linguistically sensitive manner [14].

The study also provided students with the opportunity to connect to a vulnerable group and expressed positive feelings associated with being able to tell the stories and understand the plight of a given population a bit more. This may be especially salient for marginalized or vulnerable populations who impacted by race discrimination, class discrimination, and blatant disregard from mainstream media outlets and mediums of mass communication. Digitalizing these stories and making them publicly available over the internet could have a wide-scale positive impact in communicating health disparity and telling the stories of those who are impacted by it. This validates that the 7-item DS scale can serve as an easy to be adapted, useful tool for assessing the effectiveness of DS projects.

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DEHYDRATION OF ETHANOL OVER PHOSPHORUS MODIFIED ALUMINA-SILICA CATALYSTS

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ABSTRACT

Abstract - The characteristics and catalytic activity of 5 wt% and 10 wt% of phosphorus modified alumina-silica catalysts were investigated. Alumina-silica was reacted with the desired amount of phosphoric acid for 0.5 h at room temperature. The prepared catalysts were characterized by N_2-physysorption, scanning electron microscope (SEM) and energy X-ray spectroscopy (EDX), and temperature programmed desorption (NH_3-TPD). The catalytic activity of all catalysts was represented through ethanol conversion and selectivity of products in ethanol dehydration. Dehydration reaction was carried out in fixed-bed reactor at atmospheric pressure with temperatures from 200 to 400 ºC. Ratio of ethanol/water was varied from 50 and 95 v/v%. The effluent products were collected at interval time, and then analyzed by gas chromatography with flame ionization detector. The results showed that the phosphorus modified alumina-silica catalysts had surface area, pore size, and pore volume of catalysts higher than the alumina-silica. From NH_3-TPD results, the phosphorus modification decreased amount of medium to strong acid sites but it increased quantity of weak acid sites. Increasing amount of weak acid sites led to higher catalytic activity of the ethanol dehydration to diethyl ether. The 5 wt% of phosphorus modified alumina silica catalyst exhibited the catalytic activity higher than the 10 wt% of phosphorus modified alumina silica catalyst. The alumina silica catalyst with 5 wt% phosphorus modification presented the highest diethyl ether selectivity of 92.51% at the 95 v/v% of ethanol concentration, while 10 wt% of phosphorus modified alumina silica catalyst showed the highest diethyl ether selectivity of 70.73% at the same concentration of ethanol. The enhancement of water content in ethanol solution resulted in the reduction of diethyl ether selectivity but it increased ethylene selectivity.

Keywords - Alumina-silica, Ethanol dehydration, Modification, Phosphorus

INTRODUCTION

Ethanol dehydration can convert ethanol to important starting chemicals such as ethylene, propylene, and diethyl ether [1,2]. This reaction is green manufacturing process because ethanol can be produced from fermentation of biomass e.g. sugar cane and molasses, starch (corn and wheat), and cellulose. Fermentation of ethanol process produces the broth containing ethanol having purity lower than 20%, water, other alcohols, aldehyde, and ester [3,4]. Purification of ethanol from the fermentation broth is required in fermentation-based industries which consume much energy. Hence, it affects the cost of chemicals production from ethanol feedstock. The use of a low purity of ethanol purified by simple flash distillation process or crude bioethanol may reduce the chemicals production cost from ethanol dehydration.

Ethanol dehydration is preferable performed over acid catalyst such as zeolite [5,6], alumina [6-8] and metal oxides [9]. Suitable catalyst can enhance yield and selectivity of the desired product. Alumina-silica catalyst is one of important catalyst for several chemical reactions since the silica has high surface area, excellent mechanical strength, uniform pore size and high thermal stability, and alumina has high acidity, high surface area, good thermal stability, and excellent degree of metal dispersion [6,8,10]. However, the dehydration of low concentration of ethanol is different from that of the pure ethanol because water and impurities may cause some effect on the catalyst performances. In this research, the catalysts properties and

catalytic activity on ethanol dehydration reaction of phosphorous modified alumina-silica catalysts were studied. The alumina-silica catalyst was synthesized by modified sol gel method. Moreover, the effect of ethanol concentration on the catalytic activity for ethanol dehydration was also investigated.

METHOD

1.1 Synthesis of alumina-silica support

The desired amount of ammonia solution was mixed with 3.3 g of cetyltrimethylammonium bromide, and then stirred for 30 min. After that 6.3 g of tetraethyl orthosilicate was added into the mixture and stirred for 1 h. Then, 16.89 g of aluminium nitrate was filled into the mixture, and then stirred for 1 h. The resulting product was filtrated, dried at room temperature for 12 h. After that it was dried in an oven at 120 ºC for 24 h., and finally calcined in air at 700 ºC for 6 h.

1.2 Acid activation

0.5 g of alumina-silica was added into 50 ml of 5% or 10% of H_2PO_4 solution. The suspension was mixed at room temperature for 30 min, and filtrated the solid by vacuum pump. The obtained solid was dried at 110 ºC overnight, and then it was calcined at 600 ºC for 6 h.

1.3 Catalysts characterizations

The specific surface area, average pore volume, and pore size diameter of the catalysts were determined by N_2-physisorption using Micromeritics ChemiSorb 2750 Pulse instrument. Morphology of the catalysts and elemental distribution of a catalyst were investigated by scanning electron microscope (SEM) and energy X-ray spectroscopy (EDX), respectively using Hitashi mode S-3400N.

1.4 Reaction test

Gas-phase ethanol dehydration was performed to determine the catalytic activity and product selectivity of the phosphorous modified alumina-silica catalysts. The reaction was determined using a fixed-bed continuous flow reactor. For the reaction test, quartz wool and the desired amount of catalyst was packed into the middle of a glass tube reactor. The catalyst was pretreated in nitrogen flow (50 ml/min) at 200 ºC for 1 h. The ethanol was vaporized at 120 ºC, and then it was injected into the reactor by a single syringe pump. The dehydration reaction was carried out at 1 atm of total pressure and the temperature ranging between 200-400 ºC. The light hydrocarbon products were analyzed by gas chromatography technique (Shimadzu GC-14B) with flame ionization detector (FID) using capillary column (DB-5).

RESULTS AND DISCUSSION

2.1 Characterization of catalysts

2.1.1 N_2 physisorption

The N_2 physisorption technique was used to determine the surface area, pore size and porosity volume of each studied catalysts shown in Table 1. It can be seen that phosphorus addition over alumina-silica catalysts increased surface area, pore size and pore volume of the catalysts. Alumina-silica catalysts with 5%wt of phosphorus modification (5%P/ Al_2O_3-SiO_2) have the highest surface (1378 m^2/g) area and pore volume (0.63 cm^3/g).

Table 1

Surface area, pore size and porosity volume of each studied catalysts

catalysts	surface area [a] (m^2/g)	Pore size[b] (nm)	Pore volume[b] (cm^3/g)
Al_2O_3-SiO_2	276	5.61	0.41
5%P/ Al_2O_3-SiO_2	1378	4.15	0.63
10%P/ Al_2O_3-SiO_2	1088	6.06	0.57

[a] Determined from BET method

[b] Determined from BJH desorption method

2.1.2 Temperature programmed desorption of ammonia (NH_3-TPD)

The surface acidity and the acid strength of various amounts of phosphorous loading over alumina-silica catalysts was analyzed by NH_3-TPD as shown in Table 2. It was found that an increasing amount of phosphorous increased the amount of weak and medium to strong acid sites on the catalyst surface. Moreover, it can be noticed that the desorption temperature of each catalyst was the higher temperature when increasing the phosphorus content. Catalyst which contained higher amount of phosphorus would have a lower coke formation.

Table 2

The amount of acidity of the phosphorus over alumina-silica catalysts with various phosphorus loading

Catalysts	Amount of acid site (µmol NH_3 /g cat.)		
	Week acid site	Medium-strong acid site	Total
5%P/Al_2O_3-SiO_2	1882	596	2478
10%P/Al_2O_3-SiO_2	3447	432	3879

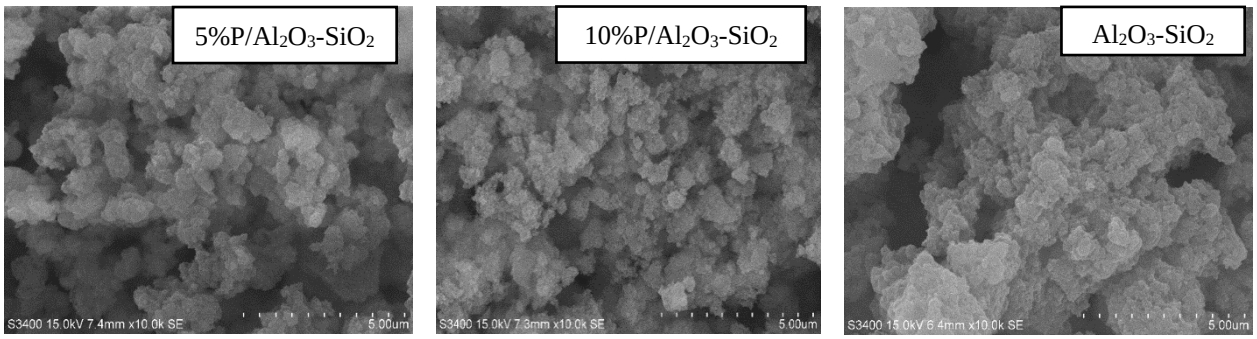
From Table 2 can be seen that the 10%P/Al_2O_3-SiO_2 catalyst showed the highest amount of total acid site reaching to 3879 µmol NH_3/g cat. It can be predicted that higher amount of phosphorus over alumina-silica catalyst tended to increase weak acid sites.

4.1.3 Scanning electron microscopy (SEM) and Energy dispersive X-ray spectroscopy (EDX)

SEM technique was used to investigate morphology of the catalysts as shown in Figure 1. It was found that the morphologies of all studied catalysts were sphere and bunched together. The amount of phosphorus doping into the catalysts did not affect the catalyst morphologies.

Figure 1

SEM images of Al_2O_3-SiO_2 and phosphorus modified Al_2O_3-SiO_2 catalysts



EDX technique was used to investigate the amount of elemental distribution on the surface of catalysts. The elemental distribution of each catalysts is shown in Table 3. All elemental distribution on the surface of the catalysts were well dispersed. The amount of elemental distribution (Al, Si, O, P) in weight percent and atom percent over each catalyst surface are shown in Table 3.

Table 3 The amount of elemental distribution on the catalysts surface

Catalysts	**Amount of element on surface (wt%)**				**Amount of element on surface (at%)**			
	Al	**Si**	**O**	**P**	**Al**	**Si**	**O**	**P**
Al_2O_3-SiO_2	19.15	38.93	41.92	-	15.05	29.39	55.56	-
5%P/Al_2O_3-SiO_2	9.96	48.20	36.77	5.08	8.11	37.74	50.54	3.60
10%P/Al_2O_3-SiO_2	2.92	44.04	43.94	9.10	2.29	33.25	58.23	6.23

4.2 Reaction study

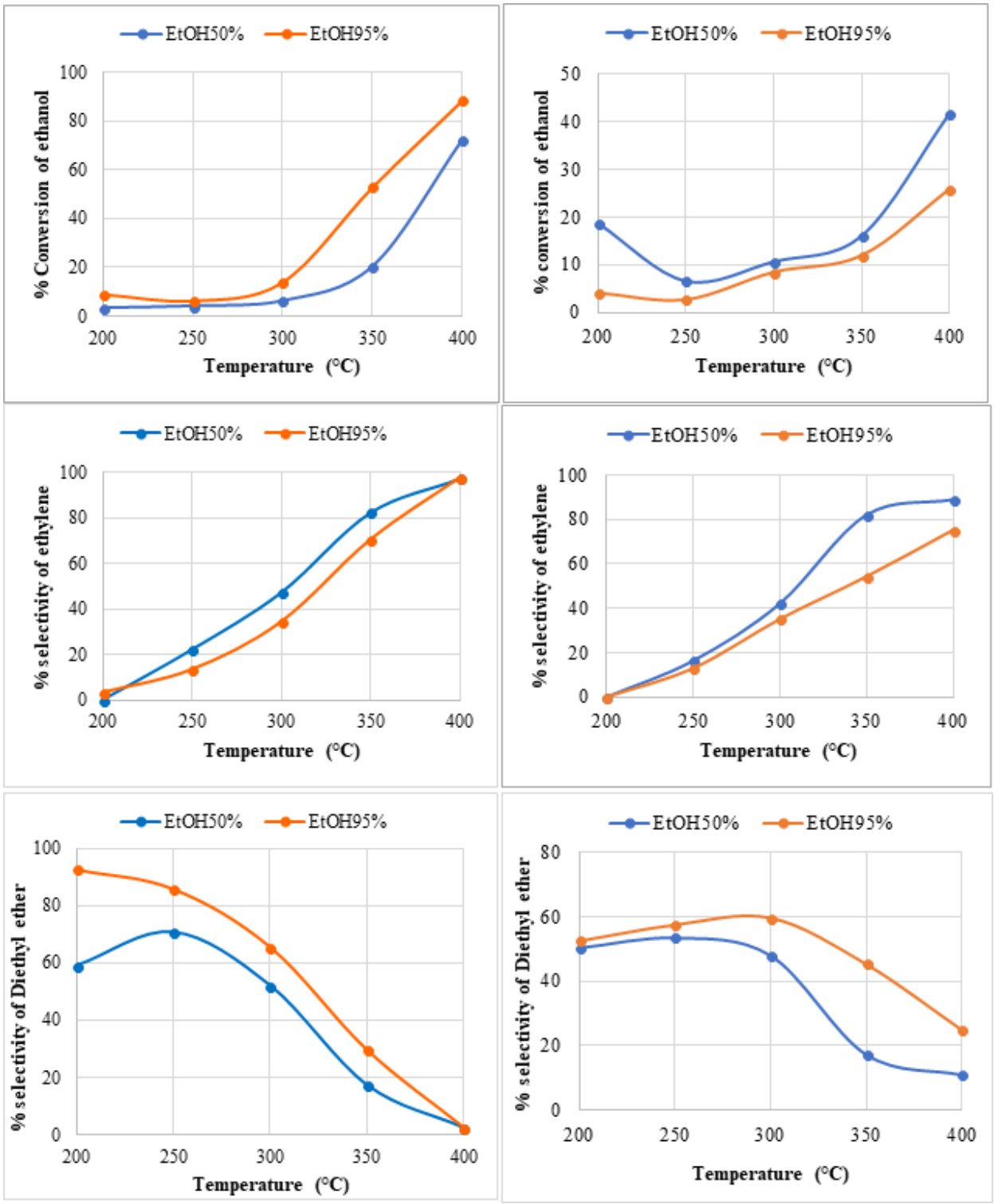
Ethanol dehydration at reaction temperatures from 200 to 400 ºC with various concentration of ethanol including 50 and 95 v/v% were performed. The 5%P/Al_2O_3-SiO_2 and the 10%P/Al_2O_3-SiO_2 were used as a catalyst. The catalytic activity in term of ethanol conversion, desired product selectivity, and product yield were examined through these reaction conditions.

The comparative catalytic activity of 5%P/Al_2O_3-SiO_2 and 10%P/Al_2O_3-SiO_2 catalysts using 50 and 95 v/v% of ethanol is presented in Figure 2. The 5%P/Al_2O_3-SiO_2 had ethanol conversion of 88.78% which was more than that of the 10%P/Al_2O_3-SiO_2. It can be said that increasing phosphorous content resulted in lower ethanol conversion. Moreover, ethanol with higher water content presented higher ethylene selectivity for both catalysts because steam could convert Brønsted acid to Lewis acid site [5]. Lewis acid site suited for ethanol dehydration to ethylene. While increasing water content caused low diethyl ether selectivity. The result was found that ethylene selectivity and diethyl ether selectivity of 5%P/Al_2O_3-SiO_2 catalyst had the highest at 97.48% and 92.51% at 50 v/v% of ethanol, respectively.

Figure 2

Comparative effect of ethanol concentration on the catalytic activity.

The results of 5%P/Al_2O_3-SiO_2 catalyst are on the left, and the results of 10% P/Al_2O_3-SiO_2 catalyst are on the right.



From Figure 3-4, the catalytic activity over ethanol dehydration between the 5%P/Al_2O_3-SiO_2 and the 10%P/Al_2O_3-SiO_2 catalysts at 50 v/v% of ethanol were compared. The ethylene selectivity was slightly enhanced when reducing phosphorous content since the 5%P/Al_2O_3-SiO_2 catalyst had surface area and volume more than the 10%P/Al_2O_3-SiO_2 catalyst so, the reactant might easily react on the catalyst. Moreover, the result was found that the highest ethylene selectivity of the 5%P/Al_2O_3-SiO_2 catalyst was 97.41% at 400 ºC. Whereas

the maximum diethyl ether selectivity of the 5%P/Al_2O_3-SiO_2 catalyst was 70.73% at 250 ºC. This is because dehydration of ethanol to ethylene is endothermic reaction, while dehydration of ethanol to diethyl ether is exothermic reaction [11].

Figure 3

Comparative ethylene selectivity of 5%P/Al_2O_3-SiO_2 and 10%P/Al_2O_3-SiO_2 catalysts at 50 v/v% of ethanol

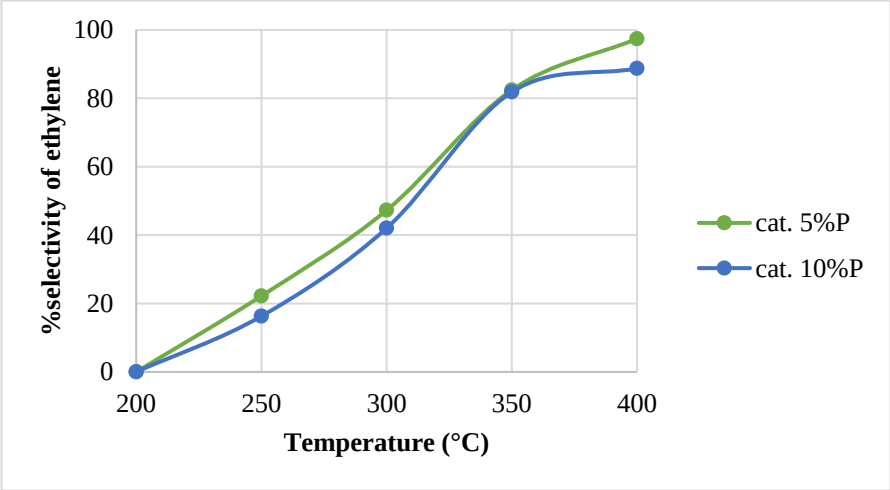
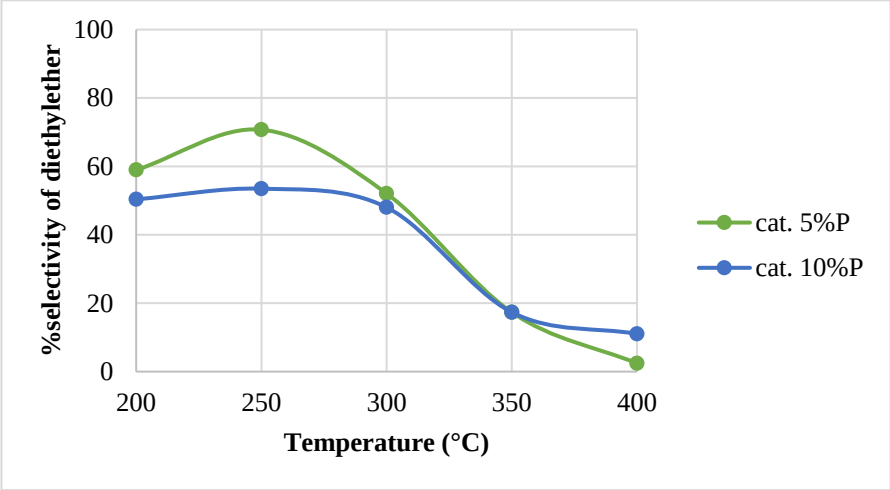


Figure 4

Comparative diethyl ether selectivity of 5%P/Al_2O_3-SiO_2 and 10%P/Al_2O_3-SiO_2 catalysts at 50 v/v% of ethanol



CONCLUSIONS

The influence of ethanol concentration on the catalytic performances of the phosphorous modified alumina-silica catalysts over dehydration of ethanol were investigated. The 5%P/Al_2O_3-SiO_2 showed higher ethanol conversion than the 10%P/Al_2O_3-SiO_2. Moreover, the catalyst with lower amount of phosphorous presented highest diethyl ether and ethylene selectivity at 200 °C and 400 °C, respectively. Enhancing water content in the reactant caused an increasing in ethylene selectivity.

ACKNOWLEDGEMENTS

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THE EDUCATIONAL DIFFICULTİES FOR THE SEASONAL NOMADIC/ SEMI-NOMADİC CHİLDREN IN TURKEY: WORK AT FARM SUFFER IN THE SCHOOL A WORLD FAR BEYOND REALITY AND DREAMS

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ABSTRACT

The right to education is one of the main social rights which should be strictly maintained and supported by the state. In Turkey although the goverments coming in charge paying attention for each social group/ subculture are taking advantage of basic education system lasting 12 years, it seems some subcultures such as LGBT groups, gypsy communities, children whose parents are inprisonment and seasonal nomadic/ semi-nomadic children workers. Mostly seasonal nomadic/ semi- nomadic children workers move with theri parents in order to increase their family incomes, have to work both in the field and their schools. The nomadic/ semi-nomadic parents who seems unsure about if the psychological value or the economic value of their children is more important are sticking in between low conditions their families have to face with and necessity of their children to be educated. The irrevelance of teachers and education administration in their schools results as nomadic/ semi- nomadic children to suffer wiyhin the national educational system.

The research focusing on 23 nomad children and their parents/ sisters & brothers as well as the teachers and school administrators totaly 68 participants tries to explain the difficulties nomadic children struggling against in their daily lives to finish conpulsury education. The research is arguing the the line between the reality and the dreams are much more different in rural education.

Keywords: Nomadic/ semi- nomadic children, rural education, compulsory schooling, child labour, nomadic communities.

Turkey located on historical migration routes is one of the states that has a wealth of experience in welcoming and evaluating domestic and foreign migrations. [1] Therefore, all the research carried out in the form of the application of research from developed Western societies without making any distinction between developed and underdeveloped countries is doomed to remain unqualified and meaningless.

INTRODUCTION INTERNAL MIGRATION MOBILITY IN TURKEY

While it is observed that domestic migration mobility to work in the country aims to close the periodical workers' deficits especially in the agriculture and animal husbandry sectors, temporary agricultural labor is evaluated under the headings of *"working for an employer"* and *"animal husbandry"*, "feeding and evaluating the animals owned by the family. " Seasonal labor, which has been widespread in Turkey, since the early Republican period in order to pay off the debts of the peasants, has become an important part of the current labour force by combining with the ongoing nomadic mobility in the country for centuries.

Although seasonal agricultural labor is located in different regions during certain seasons of the year and includes production- collection activities that are performed in short periods, this does not reduce the weight of seasonal agricultural labor. When the data of the Ministry of Labor and Social Security are examined, seasonal agricultural labor is generally defined as labor- intensive jobs, and the population working in these jobs is found to be working fast and heavy by joining all family members in production. Seasonal migrant/ semi - migrant agricultural workers, who are not considered legally under Labor Law despite heavy work conditions and intense pace, benefit from the provisions of the Law of Obligations. [2]

1. EXPLOITATION OF CHILD LABOUR

Officials of the Ministry of Social Security, like many researchers, agree that seasonal agricultural workers have difficulty in achieving the most basic human rights because the workforce in agriculture is largely unorganized. Kaya-Özgülnar draw attention to the children who drift into the city from the city together with

the seasonal migratory/ semi-immigrant families defined through *"mobility"* and *"transitivity"*, are used as cheap labor force in times exceeding normal working hours. It shows that this sector is exposed to all forms of abuse. [3] Although there is no obstacle to establish the union, it is remained that seasonal migrant/semi - migrant agricultural workers are not organized among themselves due to the fact that they are mostly employed in small jobs and are in a disconnected state from one another. [4] Lordoğlu-Etiler examine the position of child labour in the agricultural sector in Turkey by considering Turkish Statistical Institute datas and compare the state's findings between 1994 and 2012 with the fieldwork which were conducted in the Black Sea region. Lordoğlu-Etiler record that the children working in the hazelnut collection are 6-14 years of age group. And Lordoğlu-Etiler argues that famili es who leave their younger children in the village are almost forced to *"migrate"* their children of 6-14 years of age group. According to the research which focused on the western Black Sea region, the difficulties of 6-14 years old child workers in seasonal ağriculturel sector can be briefly summarized as follows:

"The education of seasonal migrant child workers is an important problem. Therefore, it is understood that these children can not continue to study in May and November, and can not attend high school after primary school because of migrant agricultural worker. ... As a matter of fact, 11.5 percent of children never went to school or dropped out of school. The working hours of 102 observed children are all similar. While they work between 07:00 a.m.-19:00 p.m. and it means 12 hours work, lunch break is only 1 hour 30 minutes. The duration of study is 10 hours and 30 minutes per day for children at that rate. ... It has been observed that children do not use personal protective equipment during work, none of them have gloves and hats, they all wear long pants and one child also works without shoes." [5]

Koruk-Şimşek and their colleagues mention that these children do not have a health unit to get protected from diseases in working areas. They also note that about 65 percent of the child workers in the seasonal migrant/ semi- migrant agriculture sector are exposed to insect and 17 percent of them are exposed to scorpion sting. Researchers emphasize that health problems such as parasites and strong diarrhoea are conditions that push all agricultural workers, especially children. [6] The experts point out that child workers lose calories because of 10 hours a day and over the burden of work and they have not food supplement because of malnutrition conditions. In comparison with their peers, these children have physical development disorders in mid-long term. [7]

It would be appropriate to quote the advises of Lordoğlu-Etiler who see the most important problem of seasonal migrant/ semi - migrant child workers is the education:

1.1 Access To Education Right Goes Through Domestic Competiton

" It is known that one of the main problems of young and child workers in seasonal agriculture sector is the interruption of their education. For this reason, the lack of supervision in compulsory education should be eliminated. First of all, a pilot practice may be initiated to ensure that children who are educated in the family do not participate in seasonal agricultural work, especially 6 - 14 years of age group. " [8]

On the other hand, it is not possible to say that the public power is completely irrelevant for seasonal migrant/ semi - migrant workers. Although the state intended to bring only two-term permanent solutions to the problems of the migrant/ semi-migrant population throughout the history of the Republic, serious arrangements have been made to ensure that migrant workers live in healthier conditions and to eliminate health- shelter - education problems since the appointment of the II. Justice and Development Party's government. With the Prime Minister's Circular 2010/6, working economists point out that the infrastructure of future legislation is being prepared and they point out that the coordination of public power, municipalities and mukhtars aim to raise the living standards of immigrants. Retired labor inspector Keskin evaluates the Circular:

"As it can be seen, the administration wants to solve the problems of the mobile agricultural workers who are on the agenda in every year due to fatal accidents or social problems in the region. It is important that the issue has been handled extensively for the first time. It is seen that the state has been put into action with its own possibilities. Some services have been left in good faith. " [9]

At this point, it is necessary to pay more attention to the problem of education of migrant/ semi-migrant child workers. Balcı who views the right of access to education as a positive right said *"Firstly, the social structure of people and society is dependent on education. It is impossible to think the education as a seperate activity from the society or an independent facility of human fundamentals rights and freedoms. Education is a part of the human since the creation. This is why fundamental rights and duties are related to education and all national and international legal arrangements and documents about it are the most important study areas for human rights defenders."* [10] [11]

1.2 Nomadic Children are Disadvanteged Groups' Settled

At this point, it would be appropriate to stop theoretically examining the economic - social - legal problems of seasonal migrant/ semi - migrant agricultural workers and to focus on the data and field research on the access to education of their children. Article 26 of the Universal Declaration of Human Rights and Article 29 of the United Nations Convention on the Rights of the Child underline that the individual has the right to access of information and education from the early ages. [12]

In line with the principle of the social state, one of the most important of rights the individual demands from the state is the right of access to education. Despite the meticulousness of the legislator to fulfill the bureaucratic regulations and to comply with the requirements of the contract, the loss of rights can not be eliminated. Firstly disabled people, the Gypsies and children of poor families and the other many children are forced to survive with the lack of the right of access to education. A group of seasonal agricultural workers - migrants with their animals who face difficulties to access to education are the subject of this article.

Murat Aşıcı says that the right of access to education has changed its content rapidly over the past 30 years and this right has become one of the basic human qualities of social status indicator. He also draws attention to the fact that personal value is a “special” situation that shows an individual's interest with society. [13] However, Aşıcı is not the only one who argues that individual value is based on the concept of literacy. Just like Aşıcı, Altun believes that the concept of literacy which consists of the words "reading" and "writing" is an expression for solving the communication skill by figuring out the meanings of writing symbols and by using mental skill and for determining the meaning sequence. [14] Aşıcı explains the phenomenon of literacy which is evaluated under three different headings as *"basic literacy - functional literacy - multi-functional literacy"* :

1.3 Development Of Concept Of Literacy

"The first level is the level of reading and writing skills such as speaking words and understanding sentences. The second level describes the use of the person's knowledge and skills related to reading, writing and arithmetic in individual, social and cultural contexts. The third level aims to improve the capacity of the individual as much as possible, not only by reading and writing itself but also by striving for the progressive of society." [15]

Aşıcı who reminds that the society is shaped entirely on the axis of literacy argues that the individual has received linguistic warnings about symbols in surroundings from childhood and has completed the pre - reading period by turning it into a voice expression within the family. Aşıcı underlines that formal education is the basic support for improving literacy skills and he refers to Öztunç:

"The book is read for rest and fun. Keeping a note is to remember. Events in the country are followed by the daily newspaper. The important part of religious activities is still dependent on literacy. Reports, business letters, meeting minutes in the business life are part of the literacy skills. Briefly, all activities to improve himself / herself, to spend the day enjoyable and meaningful and to continue his / her job are performed on the basis of literacy." [16] [17]

Kılıçgün- Oktay underlines the importance of parents' education levels in child education and says that the educated-high status parents care about that their children are at peace with themselves, capable of solving problems and more peaceful-cheerful individuals. Experts say that theparents with low educational levels

expect their children to accept their roles within the family, to be in harmony with society, not to contradict social norms. [18]

However, experts point out that these differences do not help to show the children what they really expect from life and what they pursue in their lives freely. Because, behaviours such as joyfulness - peace - quietness are only valid for individuals who are not opposed to society - even those who have accepted social norms one by one. In this context, the expectation of educated families is to socialize their children independently or to establish useful relationships in social lives and keep them out of potential trouble is quite problematic. Raising children free is meaningless when the society pulls the strings, so both high and low educated parents represent two different (solid-soft) dimensions of the same conservative child-rearing model. When we look at the problem in this view, Çiğdem Kağıtçıbaşı who conducts the research of " value of the child" on three generations in Turkey says in her thesis that the permissive- authoritarian- explanatory authoritarian family types differ by countries. Kağıtçıbaşı emphasizes that authoritarian and explanatory authoritarian approaches are widespread rather than permissive type. She also asserts that the authoritarian type which is described as "indifference" in the United States is perceived as the integration compassion and protectiveness in Turkey. [19]

2. EVALUATION OF METHODS AND FINDINGS IN FIELD RESEARCH

This study discusses the value of the child in Turkey in the sense of the right of access to education of seasonal migrant/ semi - migrant children and the opinions of 90 people - 24 of them are children from different regions of the country- are consulted in the study. Besides the migrant/semi-migrant child workers, their mothers, fathers, grandparents and uncles have participated in this field research. The impressions of the student child workers' teachers and school managers are in the research. The datas collected by using the qualitative research method has been opened to discussion. There is a serious difference in opinion among the migrant / semi-migrant families in the East-Southeast Anatolia region of the country and the other regions' families. In the study, it is observed that the Turkmen migrant families of Avşar origin are ready to face more difficulties for children's right of access to education. The Kurdish families with lower economic income on the other hand support their children's education if they do not hinder contribution to household income.

While the majority of the families who participated to research had 3- 4 children, the average number of children in Mardin, Adıyaman, Diyarbakır where the population of Kurdish origin is between 3-5. There are no families with 1-2 children in the participating families. All families which have 7-11 children are from the East – Southeast region. It shows the economic value of the child rather than the psychological value of the child. Another striking result of the field research is the lack of confirmation about that Western families in the country have higher expectations for their children and their children in the developed region have entered a merciless race with their peers to enter a good school. Actually, migrant/ semi- migrant families with many children permit to go to school for only high-grade ones. Children who can not achieve visible success-and also their grades are full of mediocre grades- are often taken from school to open the way for the family's *"future-proof"* individual. It is understood that these children are forced into the business life in which they will increase their income and migrant children can continue their education life after having a very cruel elimination in the family.

2.1 "Read For Stubbornness"

Nazar who is born after two great siblings who are forced to work because of their father's illness not to have financial difficulty is a typical example of the situation explained above. Nazar has refused to her brothers' obedience and has struggled with his family and brothers in order to go to school. *" I love reading. I am not like the other people who have many opportunities but do not want to go to school and leave. I want to study. Even if they do not, I am going to study. In other words, I am going to do everything I can, I am going to study and I am going to be successful."* Nazar's mother has confirmed her daughter and says that Nazar is so ambitious to study. She also adds that Nazar's determination has began to be shared with other children in the family. Nazar's two sisters who dropped out the school struggle to have a diploma through the open university and Nazar and his brother continue to attend formal education institutions. Nazar and his little brother, who

mentioned that studying is not a very difficult endeavor, explain that the secret of their success is "listening to the lesson". However, “good listening to the lesson” seems to be an accepted helplessness rather than preference for migrant family children. Nazar and his brothers have to prepare the turd, to help their father in the garden, to graze animals, to back up the food of animals, to help the household. These children, who do not their father alone in the meadow, have not enough time to study at home. The most important factor that motivates children is the points taken from the state exams. For example, Nazar, 454 points from the TEOG test, said that she has forgotten all the fatigue when she saw her point. Nazar's mother is proud of her daughter's point and she explaind the differences between other children with these words: *"Nazar likes reading. Sometimes I want to help for works but she stubbornly opposes and says: ' Mom stop! I am studying and I can not do anything right now."*

This field research informs that most of the women of Avsar - Turkish origin are primary and secondary school graduates and the fathers are usually high school graduates. While there are few university graduates among the participating parents of Avşar-Turkish origin, the education level of women in Kurdish families stay at primary-secondary graduates and the highest education level of males in Kurdish families are high school drop out. Only one of the male participants of Kurdish origin graduated from high school show the education level of the parents clearly. All parents believe literacy is a precondition for both their children and themselves to achieve a higher level of welfare. Especially, Turkmen-Avşar migrants tend to support daughters and boys to the highest level in their educational lives. In the other participant group which has lower income, it is seen that girls are enough to learn to read and write, to finish primary school while boys are encourage to study sincerely.

2.2 Differentiation Between Turkmen - Avsar Immigrants And Kurdish Originated Immigrants

Mardinian Murat who has 8 sisters argues that studying has become a necessity rather than a choice and says: *" I mean, some of my sisters are studying but I don't know how long they continue. When we lost our father, I will become the only man in the family. I have to study and save myself because I will be responsible for my family. I'm going to go to the big city and complete my education and then I'm going to start my business and invite to my mother, brothers and sisters. At least I will take care of them until they get married. Thus, I have to do all the job such as servant, dyeing, pedlar's trade. I can not be a burden to my family in my all life because I am not a girl."* Therefore, Murat's dreams are getting smaller because of his responsibilities. Many seasonal migrants/ semi-migrants' children want to become doctor or nurse because of their hard health conditions. Murat also wants to become a policeman. A mediocre level of education is sufficient in order to become police officer in Turkey standards so, it has caused to turn Murat's focus on the realities from the dreams.

"My courses are good but I get low in mathematics. Last year the math was high and at that time the English is very low. I had two bad marks in two courses in the first term of the year but there is only one fail course in the second term. If I succeed to pass the lesson, maybe I have certificate of achievement but all succeeses can not be at tha same time. In the first years, my Turkish is weak. My dream is to be a policeman. When the Special Operations Police intervened, I was exposed to tear gas. I do not want to be exposed that again."

Murat's father had to drop out after the high school education. He thinks he is lucky because he has a low level civil servant in the state. He also emphasized that he wants to send his daughters to school but his salary is insufficient. The Father argues that there is no distinction between having a girl or a boy and also emphasises that Murat's mother was not lucky like children. *"When I gave birth to eight daughters, my husband's mother came and said to me 'You did not have a boy. If you do not give birth to a baby boy, co-wife will come. Who have a boy, she will be the first woman in the family.' I was so afraid and then Murat was born."* Murat's mother added that the parents in the Kurdish family have insufficient education level and the grandparents who have lower education level put the pressure on the elemantary family.

Sümeyye and Fatma Bolulu are the youngest two daughters of the migrant family with four dauhters. Their father works in a private company for 8 months of the year. The family spends the remaining four months with seasonal migration. Mother is illiterate person. The mother encourages all her daughters to study as a woman

who has a little voice in the family and can not make a decision on her own due to her lack of education. The children hesitates between modern life and traditional expectations because of the traditional nature of the family. Damla and Sümeyye, who stayed in Qur'an course for 5 days a week in order to avoid excessive burden on their families, are obliged to be hafiz by nature of the traditional patterns of the family and to study in sciences to save the future. Fatma is moving forward confidently on her way to becoming a hafiz but Sümeyye has difficulties because she does not have the ability to memorize. She isalso struggling with burdens such as preparing dinner for the family and helping sisters with their lessons when she returned home at weekends. The father reminded that Fatma is able to get away with these duties because she is younger but he stressed that she will take responsibility for these duties no more than two years later. Fatma, who wants to be a doctor, is successful in both of being hafiz and numerical lessons. This situation does not make her life easier. They live in a small village of 15 dwellers, staying in course contributes to socialization because they have difficulty finding peers who can play in the village and have a good time. The biggest dream is opening a market in their village. An ordinary example of these type family children is Sümeyye, Fatma and their sisters. The following information given by one of the participants in Kırıkkale shows how migrant families' children face difficulties for their educaiton:

"Early in the morning, I take the goats to the grass and prevent to go damaging places. Then my father and I milk the animals. I go to the school in the afternoons and then I come home in the evenings. I finish my homeworks at school. It is my job to prepare the table for dinner - clean the dishes - make a salad and prepare the animal feed. I study on the weekends. If you do not study and do a test, you can not progress. I want to be a teacher. I help to my parents in the field to grow vegetables such as tomatos, peppers, aubergines. I do what my parents say and I force to myself to work as much as them. In resting times, I converse with my mother and fold laundry or cook the bread. "

It seems that there is no decrease in the responsibilities of migrant families' children as much as their difficulties. There are challenges they have to face whether younger or bigger child. For example, young doctor candidate Abidin, the eldest child of his family, takes his brothers to school and then he goes to own school. After having lunch time at home, he returns the school. When the school time finished, he still stays in there for extra courses. Hence, he has only two hours to rest, do homeworks and help to his brothers when he came to home. He said that he left home at 05:30 a.m. and continued with these words:

2.3 Blind-Lame Struggle Between Dreams And Realities

"My mother is old and maybe he would be sick in the late ages. I want to use every means available for her. I get up at 7: 00 in the mornings and prepare my brothers and take them to school. And then my school starts. I come back to home at around 04:00 p.m. I do my homeworks after I help to my brothers for their homeworks. I go to a job for daily wage. He works until I am gone and then I take over the job. First, I pick up the empty glasses and then keep the accounts, clean up. I take the orders and do the services. My work finishes at 11:00 p.m. but the weekend is so busy. Thus, I come home in the midnight. Monday is my leave day but I have to go to the school. I have no computer but there is in the tea house. I can use it. This is how life goes."

Fatma, her brothers, Hatice and Ekrem reside in the villages of Kırıkkale, right next to the capital Ankara. This city which is one of the well-situated cities in Anatolia has advanced infrastructure from the past. The city was also organized as the *"Silicon Valley"* of Turkey in the early period of the Republic. Kırıkkale, which has a nationalist - conservative population structure, has many higher education institutions-primary, secondary and high schools- in addition to a well - established University. Even if the children of the wealthy families attend the schools in the capital Ankara, approximately 1 hour away, educational institutions in Kırıkkale rank high in state examinations compared to the other institutions of Anatolia. Many academicians - teachers - public officials are employed even if their families live in Ankara and schools that have been ranked in the TEOG examinations and the students who have completed the examinations in the first 1000 are in this city. In Kırıkkale, where the Afşar- Turkmen migrant families' children live, it can be said that families have enough *"role models"* for their children.

Fatma, her brothers, Hatice and Ekrem have adapted to the personality of nationalist-conservative and loyal citizen which is dominant in the city at a young age because of their family norms. The children and their parents participated in this field research have a political consciousness, especially 10-13 years of the age group children. The coup attempt of a religious sect against the political structure of the country on July 15 is effective for this political consciousness. A participant from Kırıkkale said that he was so afraid of that coup attempt and added: *TThey killed our soldiers, opened fire on the Assembly, wanted to smash our state. However, the state brought into line and stopped them. Homeland means a feeling for me. That's where we live. We can not go anywhere. So, we must never leave the hand of our country. The flag is important for us because we find the peaace in its shadow. We are here as long as it is fluctuating and we would not be without the flag. "* Another participant from the same city asserted that anyone who accepts the good - bad conditions of the country is a citizen of the Republic of Turkey, but those who draw a gun on the state will lose their qualifications. These examples showed that the city's nationalistic attribute regardless of the economic - social status.

Medine's family who settled from the southeastern Anatolian city of Muş to Arnavutköy, the suburb of İstanbul, is left-oriented. Medine sees her father as a role model and she can not approve the ridicules of people with low income and low economic - social status. She wants all people to empathize with each other. Medine emphasized that there are lots of acquaintances in Muş from Syria-Iraq and people hold them in contempt. She is a conscient migrant family child who integrated general left - wing motifs such as respect for human-labor and brotherhood into their own language. Medine wants to be a music teacher and live in metropolis which has high life quality.

2.4 Public Employees Are Irrelevant, Children Are Absent

Unfortunately, the education of migrant families' children does not seem to be a problem that can be solved with respect to the family - child relationship, the economic situation of the families or the attitude to the right to access education. Moreover, the interest of political governments or the circular issued by senior bureucracy is insufficient for the permanent solution. In order for the children can benefit from the right of access to education and overcome their disadvantaged positions, a wide range of coordination needs to be provided from political power to senior bureaucracy, from public administration to parents ' attitudes, from families to migrant students. However, according to datas compiled from participatory families, it is proven that middle - lower level public officials and settled families are not very keen to coordinate this. The following findings in the study of Sadioğlu and his friends indicate that the issue is not only a problem in the minds of migrant families: *"... According to the research which included the attitudes of the primary school teachers to the mentally diabled students, the teachers have negative attitudesand comments to integrate these students to the class or the society. Primary school teachers do not consider themselves enough to integrate and meet the needs of their students and they have problems managing time and need to be informed about it."* [20]

The second problem arising from public personnel in improving the educational situations of the seasonal agricultural migrant/ semi-migrant families' children is the "nonchalence" and "reluctance" of school administrators to follow their educaitons, leaving students with their own destiny. The experts remind that agricultural mobility in Turkey can begin in March and continue until November and draw attention to the fact that some families send their children to school for a little time or never send their children to school because of their economic needs. They demand that compulsory education do not be "on the paper". For example, they advise that this education problem can solve with the school masters and the students: [21] [22]

CONCLUSION: *"CONDITIONAL SUPPORT"* FROM FAMILIES TO THE RIGHT OF ACCESS TO EDUCATION

When the household incomes of the Southeast and the East Anatolian origins are examined, a direct link between the right of access to education and the value of child in the Republic of Turkey citizens of Kurdish origin. As a matter of fact, almost all of the participants mentione that the boys have more responsibilities than the girls and argue that boys should be taught to the level at which they can be taken, but the girls should only have to read and write. While some Kurdish-origin parents mention that their children can only continue to attend school if the education costs are fully funded by the state, some participants say that the state payment for the education costs is not a solution. If the children do not contribute the production activities of the household, they will be taken from school. These situations are worrisome. Actually, Kurdish families engaged

in animal husbandry are more supportive than seasonal agriculturel migrant families for children's education. This is a sign of the difference in income between the two sectors. However, only one Kurdish child's family mentioned that they will be support for their children's education at every opportunity and they will not be afraid of sacrifice for them. This data shows that the problem can not be solved with the solutions produced by the state bureaucracy in good faith. [23]

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DEGRADATION OF WATER QUALITY IN LOWER MEA KLONG WATERSHED, THAILAND

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ABSTRACT

The objective of this research was to study the water quality and the degradation of water quality of lower Mea Klong watershed. Sixty samples were collected in 3 provinces: Kanchanaburi, Ratchaburi and Samut Song Khram province, during 2017 November to 2018 February. Five water qualities were studying, include DO, BOD, Ammonia, Total Coliform Bacteria and Fecal Coliform Bacteria, and study the degradation of water quality by Pollution Control Department of Thailand method. The result showed the value of DO was 3.74 – 6.65 mg/L, an average value of DO was 4.65 ± 0.56 mg/L. The value of BOD was 0.20 – 8.21 mg/L, The average value of BOD was 1.39 ± 1.23 mg/L. The value of ammonia was 0.20 – 5.80 mg/L, The average value of ammonia was 2.77 ± 1.42 mg/L. The value of Total Coliform Bacteria was 3.59 x 102 to 1.6 x 106 MPN/100 mL, the average value of Total Coliform Bacteria was 1.21 x 105 ± 3.89 x 105 mg/L. Finally, the value of Fecal Coliform Bacteria was 3.59 x 102 to 1.6 x 106 mg/L, The average value of Fecal Coliform Bacteria was 6.6 x 105 ± 2.8 x 105 MPN/100 mL. The Water Quality Index was 24 – 71, the average was 50.9 ± 8.89, it means the water quality is degradation.

Keyword: water quality, water quality index, Mea Klong

1. INTRODUCTION

Lower Mae Klong Watershed

Lower Mae Klong Watershed is a watershed in the west of Thailand. On the border with Thailand and Burma. The Thongchai mountain range divides the country and the water of the Mae Klong River. The total area is about 4,433.1 square kilometers (Figure 1). Covered areas of Kanchanaburi, Ratchaburi, Nakhon Pathom and Samut Songkhram province. The river flows from north to south. From Mae Klong Dam, A Tha Muang district, Kanchanaburi province, it flows through Kanchanaburi province, Ratchaburi province and flows into the Gulf of Thailand, Muang District, Samut Songkhram Province. The total length is about 130 kilometers.

The quality of the Mae Klong River has been monitored by Pollution Control Department Ministry of Natural Resources and Environment [2]. By using an automatic water quality monitoring station. Municipal District of Amphawa. Province of Samut Songkram during April to June 2007 showed that the average value of dissolved o xygen (DO) was 4.2 mg/L. The results of the measurements showed that water quality is fair. The results of the dissolved oxygen of 1.4 mg/L. The value of electrical conductivity (EC) was 357 micro cement per centimeter. The salinity value was 0.2 ppt. A summary of water quality monitoring has been found to be much degraded. The dissolved oxygen is less than 2.0 mg/L. It will be seen that water quality has degraded slowly

Water Quality Index

Water Quality Index (WQI) is defined as a technique of rating that provides the composite influence of individual water quality parameters on the overall quality of water [1]. The WQI takes the complex scientific information of these variables and synthesizes them into a single number. The Water Quality Index is used for assessment of water quality in the river or canal. A water quality index provides a single number that expresses

overall water quality at a certain location and it is time - based on several water quality parameters. The objective of an index is to turn complex water quality data into information that is understandable and useable by the public [2]. The WQI is a mathematical instrument used to transform the qualities of water characterization data into a single number, which represents the water quality level [3].

The 5 parameter WQI of the Pollution Control Department, Thailand (PCD) include Dissolved Oxygen (DO), Biological Oxygen Demand (BOD), Ammonia, Fecal Coliform Bacteria (FCB), and Total Coliform Bacteria (TCB). This WQI can be calculate by using the following website http://iwis.pcd.go.th/first_page/ wqi_online.php. This WQI was classified into 4 rating, good, poor, bad and very bad. When the values of the index are between71 – 100, 61 – 70, 31 – 60, and < 30, respectively [4].

Figure 1. The Mea Klong Watershed area.

Table 1. Rating of water quality.

WQI Score	Surface water quality classification.	PCD water quality standard class
71 – 100	Good	2
61 – 70	Poor	3
31 - 60	bad	4
< 30	Very bad	5

Source: [4]

2. OCJECTIVE

The objective of this research were study to the surface water quality and the degradation of surface water quality in the Lower Mae Klong watershed area, including in 3 provinces: Kanchanaburi, Ratchaburi and Samut Song Khram province.

3. METHODS

Research Area

The research area including in 3 provinces: Kanchanaburi, Ratchaburi and Samut Song Khram province

Research Equipment

1. Water sampler
2. GPS
3. pH meter
4. DO meter
5. Thermometer
6. WQI program online : http://iwis.pcd.go.th/first_page/wqi_online.php

Methodology

1. All samples (60 samples) were collected in in 3 provinces: Kanchanaburi, Ratchaburi and Samut Song Khram province during 2017 November to 2018 February. Dissolved Oxygen (DO) was measured in the field by using of a HORIBA DO meter. pH was measured in the field by using of a HORIBA pH meter

2. All samples were determined 4 parameter in Environmental Science laboratory, Faculty of Science and Technology, Suan Sunandha Rajabhat University, Bangkok, Thailand. Four parameters and Standard method include:

(1) Biological Oxygen Demand (BOD) was determined by using the Azide Modification method or DO meter at 5 days and 20 °C.

(2) Ammonia was determined by using the distillation and titration method.

(3) Fecal Coliform Bacteria (FCB) was determined by using the multiple tube fermentation technique.

(4) Total coliform Bacteria (TCB) was determined by using the multiple tube fermentation technique.

3. After analysis or measurement, the PCD water quality index (WQI) was calculated by using the website http://iwis.pcd.go.th/first_page/wqi_online.php and explanation of the water quality classification was made by using table 1.

4. RESULT

Five water Qualities were study, include DO, BOD, ammonia, Total Coliform Bacteria and Fecal Coliform Bacteria and study the degradation of water quality by Pollution Control Department of Thailand method. The result Show in table 2. Summarized as follows

Table 2. The water quality in the Mea Klong watershed.

Parameter	Water Quality Standard	Statistic	Water Quality		
			Kanchanaburi	**Ratchaburi**	**Samut Song Khram**
pH	6.5-8.5	Range	7.41 – 7.63	6.87 – 7.69	6.74 – 8.01
		Mean ± SD	7.53 ± 0.06	7.36 ± 0.25	7.50 ± 0.39
Water temp (°C)	natural	Range	29.10 – 31.10	29.50 – 31.70	28.60 – 32.60
		Mean ± SD	29.62 ± 0.26	30.41 ± 0.62	30.71 ± 1.35
DO (mg/L)	> 4.0	Range	3.74 – 5.39	3.90 – 5.35	3.85 – 6.20
		Mean ± SD	4.39 ± 0.50	4.70 ± 0.46	4.88 ± 0.62
BOD (mg/L)	< 2.0	Range	0.20 – 2.74	0.80 – 6.52	0.85 - 8.20
		Mean ± SD	0.77 ± 0.51	1.63 ± 1.20	1.77 ± 1.55
TCB (MPN/100 mL)	< 20,000	Range	$7.2x10^2$ –$1.5x10^5$	$9.5x10^2$ –$1.6x10^6$	$3.5x10^2$ –$1.6x10^6$
		Mean ± SD	$3.1x10^4$ ± $5.4x10^4$	$1.6x10^5$ ± $4.5x10^5$	$1.6x10^5$ ± $4.8x10^5$
FCB (MPN/100 mL)	< 4,000	Range	$7.2x10^2$ –$1.5x10^5$	$3.6x10^2$ –$1.5x10^6$	$3.5x10^2$ –$1.6x10^6$
		Mean ± SD	$3.1x10^4$ ± $5.4x10^4$	$8.3x10^4$ ± $3.5x10^4$	$8.5x10^4$ ± $3.5x10^5$
Ammonia (mg/L)	< 0.5	Range	0.20 – 5.80	2.62 – 5.71	1.24 – 5.80
		Mean ± SD	2.99 ± 1.45	2.62 ±1.35	2.71± 1.49
WQI	-	Range	36 – 71	25 – 61	24 - 71
		Mean ± SD	52 ± 8	50 ± 9	50 ± 10

The average value of pH in the Kanchanaburi, Ratchaburi and Samut Song Khram province is 7.53 ± 0.06, 7.36 ± 0.25 and 7.50 ± 0.39 respectively, all samples were met the pollution control department, Thailand standard. (The pH value must be range 6.5 – 8.5)

The average value of DO in the Kanchanaburi, Ratchaburi and Samut Song Khram province. is 4.39 ± 0.50 mg/L, 4.70 ± 0.46 mg/L and 4.88 ± 0.62 mg/L respectively, The average values of DO were met the pollution control department, Thailand standard (The DO value must be more than 4.0 mg/L.)

The average value of BOD in the Kanchanaburi, Ratchaburi and Samut Song Khram province. is 0.77 ± 0.51 mg/L, 1.63 ± 1.20 mg/L and 1.77 ± 1.55 /L respectively, The average values of BOD were met the pollution control department, Thailand standard (The BOD value must be less than 2.0 mg/L.)

The average value of ammonia in the Kanchanaburi, Ratchaburi and Samut Song Khram province. is 2.99 ± 1.45 mg/L, 2.62 ±1.35 mg/L and 2.71± 1.49 /L respectively, The average values of ammonia were higher than the pollution control department, Thailand standard (The BOD value must be less than 0.5 mg/L.)

The average value of Total Coliform Bacteria in the Kanchanaburi, Ratchaburi and Samut Song Khram province. is 3.1x104 ± 5.4x104 MPN/ 100 mL, 1.6x105 ± 4.5x105 MPN/ 100 mL and 1.6x105 ± 4.8x105 MPN/ 100 mL respectively, The average values of Total Coliform Bacteria were higher than the pollution control department, Thailand standard (The Total Coliform Bacteria value must be less than 2.0 x 104 MPN/ 100 mL

The average value of Fecal Coliform Bacteria in the Kanchanaburi, Ratchaburi and Samut Song Khram province. is 3.1x104 ± 5.4x104 MPN/ 100 mL, 8.3x104 ± 3.5x104 MPN/ 100 mL and 8.5x104 ± 3.5x105 MPN/ 100 mL respectively, The average values of Total Coliform Bacteria were higher than the pollution control department, Thailand standard (The Total Coliform Bacteria value must be less than 4.0 x 103 MPN/ 100 mL

The Water Quality Index was 24 – 71, the average was 50.9 ± 8.89, It mean The water quality is degradation.

The average WQI value in the Kanchanaburi, Ratchaburi and Samut Song Khram province, is 52 ± 8, 50 ± 9 and 50 ± 10 respectively. From table 1, its mean the water quality in in the Mea Klong watershed is degradation or bad, it's shown in figure 2.

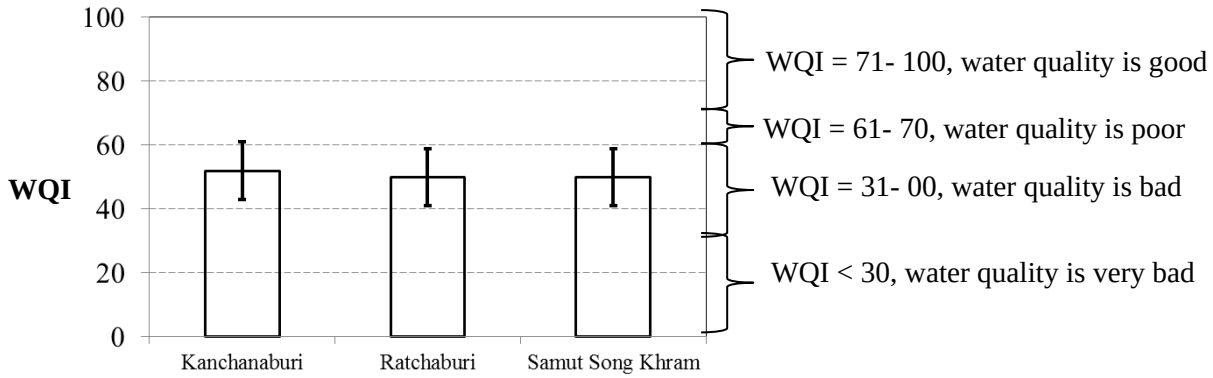

Figure 2. Water Quality Index in Mea Klong watersed

5. CONCLUSION AND FUTURE WORK

A study on the degradation of surface water quality in the Lower Mae Klong watershed area include Kanchanaburi, Ratchaburi and Samut Song Khram province This research were study of water quality in the Mea Klong watershed are summarized in table 2. The result showed the DO value of was 3.74 – 6.65 mg/L, The average value of DO was 4.65 ± 0.56 mg/L. The value of BOD was 0.20 – 8.21 mg/L, The average value of BOD was 1.39 ± 1.23 mg/L. The value of ammonia was 0.20 – 5.80 Mg/L, The average value of ammonia was 2.77 ± 1.42 mg/L. The value of Total Coliform Bacteria was 3.59 x 102 to 1.6 x 106 MPN/100 mL, the average value of Total Coliform Bacteria was 1.21 x 105 ± 3.89 x 105 Mg/L. Finally, the value of Fecal Coliform Bacteria was 3.59 x 102 to 1.6 x 10^6 Mg/L, The average value of Fecal Coliform Bacteria was 6.6 x 105 ± 2.8 x 10^5 MPN/100 mL. The Water Quality Index was 24 – 71, the average was 50.9 ± 8.89, its mean the water quality in the Mea Klong watershed is degradation or bad.

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STUDENTS' BEHAVIOR OF SOLID WASTE MANAGEMENT: A CASE STUDY OF SUAN SUNANDHA RAJABHAT DEMONSTRATION SCHOOL, BANGKOK, THAILAND

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ABSTRACT

Solid waste is a principle problem of every community throughout the world. With this recognition, this study is conducted, aiming to study and compare the behavior of elementary and secondary school students at Suan Sunandha Rajabhat University Demonstration School on solid waste management. A questionnaire was employed as a tool for collecting data. The 256 copies of questionnaire were distributed among the samples, applying multi-stage sampling. The data was processed by the statistical package program. The research results revealed that the majority of the respondents were female, aged between 9-18 years old, were studying at the secondary level and were Buddhist. When considering the behavior in 5 aspects, the study found that the students of both elementary and secondary school levels possessed high level on solid waste management, namely reduction, classification, recycling, collection and disposal, simultaneously. When applying the statistical test, the elementary school students have a better behavior than those of the secondary school level at 0.01 statistical significances, whereas male students have better behavior than female students at 0.01 statistical significance.

Keywords: solid waste management in school, behavior on solid waste management

1. INTRODUCTION

Suan Sunandha Rajabhat Demonstration School is located within the compound of Suan Sunandha Rajabhat University. The school has operated teaching and learning for elementary and secondary level, for 1,399 students. A report of 2010 revealed an approximate amount of 1,279.6 kilograms of solid waste or 1.3 tons per day within the university [1]. The report unveiled that each day there was an increase of solid waste caused from meal service activities during lunch and free times. Most of solid waste is plastic bags. This study therefore aimed to investigate behavior of waste management of students who studied at Suan Sunandha Rajabhat Demonstration School. The findings of this study also contributed to initiate of waste management strategic guideline for the school and the university.

Solid Waste

Pollution Control Department [2] defined solid waste as the range of garbage arising from animal and human activities being discarded as unwanted and useless, including the leftovers from daily consumption. Anat Thapinta [3] classified solid waste by its composition and recycling and reusability characteristics, as follows:

(1) Organic waste: it is made of materials that are biodegradable such as food leftovers, fruit and vegetable debris, plants, carcass waste or animal droppings. This kind of solid waste is quickly disintegrated and can be reused as fertilizer.

(2) Recycle waste: it is waste that can be recycled such as glass, paper, metal, iron, plastic, aluminum, leather and rubber. Through waste recycling process, recyclables are collected and sorted and transformed into raw materials for further manufacturing.

(3) Non- recycle waste: it is waste that cannot be recycled such as clothes, brick and gypsum from construction, debris from demolition of buildings, ashes from energy burns and some electronic parts. This kind of waste can only be managed by sanitary landfill method.

(4) Infectious waste: it is residual waste which is generated in the diagnosis, treatment, immunization or autopsy of human beings or animals, which is hazardous to human health and sanitation. This also includes human tissues, anatomical parts, and materials or products that have been in contact with or used in patient care and treatment such as needles, syringes, scalpel blades, bandage, cotton, and patient clothing.

Paiboon Jeamponk [4] classified sources of solid waste into 4 types:

(1) Municipal waste: it is waste generated from household daily uses in residential areas both in countryside and cities. Some sources of municipal waste include houses, offices, schools and markets in communities.

(2) Industrial waste: it is waste generated from manufacturing and entrepreneurial activities such as wastes from manufacturing of products, office and canteen operations in factories.

(3) Agricultural waste: it is waste generated from agricultural activities such as vegetation and domestication of animals. This kind of waste includes such as vegetation debris, carcasses, animal droppings, crop stubble, including containers of chemical used in agricultural activities and expired chemical products.

(4) Hospital waste: it is waste generated from medication activities in hospitals, public health centers and clinics; high accumulative amount of this waste such as syringes and bandage can be hazardous to health or lead to the spread of infectious diseases.

Paiboon Jeamponk and Sivapan Choo-in explained that amount and characters of solid waste were induced by the following factors [5]:

(1) Geographical or unique characteristics of an area or community: an instance is that in rural areas solid waste from foods may be found small quantity as most leftovers are used as animal feed.

(2) Seasonality: fruit season normally produces more wet solid waste from fruit peels.

(3) Economic factor: solid waste from packages of consumer products as a result of productions and consumptions, are found at huge amount especially in good economic or developing and developed countries.

(4) Behavior of population dwelling in an area or community: people's behaviors that cause waste are indicated by values and norms of consumptions; those of which are influenced by economic activities in particular communities such as productions of consumer products.

(5) Population density: areas of higher population density normally have more amount of waste.

(6) Patterns of and attitudes towards living as well as values about conservation

(7) Laws and regulations: important laws and regulation involve waste management service, establishment of fee system, legal forces and penalty for those violate laws and regulations of community waste management.

Solid Waste Management

Good solid waste management starts from high awareness towards environmental problems occurred from uses of resources. Anat Tapinta suggested 6 steps of solid waste management as follows [3]:

(1) Reduction and classification at the point of use: general points of use include workplaces, schools and universities, public places. Solid waste should be reduced by reducing consumptions. As well, waste should be classified at points of use under responsibility of those who use the place and owners.

(2) Collection: this is the process in which solid waste is collected and stored in a container before disposal to main container to be ready for further transportation such as truck.

(3) Storage: it is the process in which solid waste is stored in public bin at places like living areas, schools, bus stops and public parks. The practice of solid waste storage includes the following:

(3.1) There should be different categories of bins or waste containers.

(3.2) Each category of bins or waste containers should be labeled with sign that indicates its use and types of waste to be disposed.

(3.3) Bins or waste containers should be placed indoor or with shelter.

(3.4) Exceeded waste amount must be removed and disposed appropriately.

(4) Transportation: this process involves truck transporting solid waste collected from points of use to disposal area. Transportation of waste can also be stopped at stations on the way before proceeding to the destination or final area of disposal.

(5) Transformation: it is the process in which waste is converted into a form that is less costly or difficult to dispose of as well as that can be reused or recycled, in order to reduce amount of waste and to preserve natural resources.

(6) Disposal: common methods of waste disposal are such as ground dump, dumping at sea, use as fertilizer, methods of outdoor and stove incineration, and using appropriate sanitary landfill. Some methods are not environmental friendly and hazardous to health.

Department of Environmental Quality Promotion (DEQP) assigned the Principle of 5R in solid waste reduction as follows [6]:

(1) Reduce: reducing waste by reducing consumption

(2) Reuse: extending use time and reuse

(3) Recycle: recycling waste that is hardly degraded or has long degradation time such as glasses, plastic and metal

(4) Repair: repairing things for extended use time or increased product life

(5) Reject: avoiding chemical use such as pesticides and cleaning chemicals

Pollution Control Department (PCD) suggested guidelines of solid waste reduction and utilization as follows [7]:

(1) Reduction of solid waste amount

Effective reduction of solid waste amount starts at appropriate waste classification at points of use to avoid contamination. This produces or facilitates reuse and recycling.

(2) Reusing waste

To reuse waste has 5 main ways:

(2.1) Using or buying recycled products

(2.2) Transformation of waste into energy

(2.3) Using waste as animal feed

(2.4) Using waste as fertilizer

Applying sanitary landfill for new purposes of uses such as vegetation and public park

2. OBJECTIVE

This study aimed to investigate behavior of waste management of elementary and secondary school students who studied at Suan Sunandha Rajabhat Demonstration School, and to discuss comparative aspects.

3. METHODS

This study was a survey research conducted in order to apply the result in training the students of Suan Sunandha Rajabhat Demonstration School in managing solid waste of the school. Questionnaire was utilized as the research tool for collecting the data with the survey sample size of 256 respondents. The study used Multi-stage sampling technique to get the samples from both elementary and secondary school levels. The collected data was tested for completeness and analyzed with statistical program package.

4. RESULTS

The study found that the majority of the respondents were female with 53.52 percent. An average age of all respondents was 14.50 years old, at 66.16 percent. Most or 95.70 percent of them are from secondary school level, and are Buddhist.

Furthermore, the study discovered behavior of the students in elementary school level towards solid waste management in the school, as shown in Table 1.

Table 1. Elementary School Students' Behavior towards Solid Waste Management

Behavior towards Solid Waste Management	$\overline{X}$	S.D.	Level of Behavior	Ranking
1. Solid waste reduction	3.90	0.88	High	3
2. Solid waste classification	3.96	0.79	High	2
3. Solid waste transformation	4.14	0.72	High	1
4. Solid waste collection	3.90	0.78	High	3
5. Solid waste disposal	3.57	1.07	High	5
Average	**3.89**	**0.68**	**High**	

From table 1, an average score of the behavior in all factors was 3.89, which was ranked in high level. The factor with the highest mean was the behavior of solid waste transformation, followed by of solid waste classification, reduction and collection. The least- scored factor was the behavior of solid waste disposal.

Moreover, the investigation of solid waste management behavior of secondary school students revealed that an average score of the behavior was 3.48, which was ranked in high level. The highest- mean factor was solid waste transformation, followed by solid waste collection, reduction and classification. Solid waste disposal was found to be the factor with the lowest mean. This was shown in Table 2.

Table 2. Secondary School Students' Behavior towards Solid Waste Management

Behavior towards Solid Waste Management	$\overline{X}$	S.D.	Level of Behavior	Ranking
1. Solid waste reduction	3.56	0.79	High	3
2. Solid waste classification	3.45	0.76	High	4
3. Solid waste transformation	3.82	0.69	High	1
4. Solid waste collection	3.70	0.72	High	2
5. Solid waste disposal	2.88	1.06	High	5
Average	**3.48**	**0.64**	**High**	

The comparative analysis produced the following conclusion:

(1) The study concluded that the behavior of elementary school students towards solid waste management had higher average score than that of secondary school students, at a significant level of 0.01, as shown in Table 3.

Table 3. Comparative Analysis of Students' Behavior towards Solid Waste Management by School Levels

School Level	Number of Students	$\overline{X}$	S.D.	t	Sig. (2-tailed)
1. Elementary school	87	3.89	0.68	4.800	0.000*
2. Secondary school	169	3.48	0.64		

*Significant level of .01

(2) Identified by gender, the comparative analysis found that the behavior of solid waste management of male students had higher average score than that of female students. The statistical analysis confirmed that male students showed more desirable behavior in solid waste management that female students did, at a significant level of 0.01. This was shown in Table 4.

Table 4. Comparative Analysis of Students' Behavior towards Solid Waste Management by Gender

School Level	Number of Students	$\overline{X}$	S.D.	t	Sig. (2-tailed)
1. Male	119	3.80	0.67	4.139	0.000*
2. Female	137	3.46	0.65		

*Significant level of .01

5. CONCLUSION AND FUTURE WORK

Based on the findings of this study, it could be concluded that the students of both elementary and secondary school levels had desirable behavior of solid waste management. This conferred that the students had good attitude towards solid waste management of the school. To enhance this, the school's administration groups concerning solid waste management should initiate policy and planning of activities towards solid waste reduction and other necessary issues of waste management in school.

6. ACKNOWLEDGEMENT

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THE RESULT OF DONKO'S TEACHING METHOD IN BASIC CALCULUS

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ABSTRACT

The purposes of this study were to compare students ' achievement on Basic Calculus with 70 % criteria and to study students' attitudes toward learning management in Basic Calculus by Donko's teaching method. The sample was 31 students who enrolled in the Basic Calculus over the second semester academic year 2017. The instruments used include : 1) learning plan management in Basic Calculus by Donko's teaching method: there are 4 steps : 1. introduction, 2. teaching, 3. conclusion, 4.expansion of ideas, 2) achievement tests which were subjective confidence at 0.78 and 3) attitude questionnaires toward learning plan management in Basic Calculus by Donko's teaching method. The results show that:

1. Students' learning activities in Basic Calculus by Donko's teaching method had achievement result at 70 percentages.
2. Students' attitude on learning activities in Basic Calculus by Donko's teaching method was at good level.

Keywords: Donko's teaching method, Basic Calculus

1. INTRODUCTION

From National Education Act 1999 amended in 2002, Section 6, Education Management, Section 22 and Section 24 emphasis on educational management that all learners can learn by themselves. Encourage learners to develop their abilities to their fullest potential by practicing skills, thinking process and problem solving by learning together between the learner and the instructor [1].

Basic calculus is compulsory for students of geography and geo-informatics, that is to develop human's thinking and creativity, make them think logically systematic: can analyse problems or situations carefully and use it in the daily life correctly. But in reality the management of Basic calculus teaching in the past, it cannot proceed in accordance with the curriculum's objectives and guidelines.

Bungturng gansal said that conditions and problems of management of learning and teaching of calculus for Engineer 1 are 1. lecturers 2. teaching media 3. evaluation criteria 4. teaching techniques [2]. Others that Qualities of Thai education was explained that the cause of the education problem in science and mathematics learning focus on the learners' memorize formulas, did not foster the process, analytic thinking and problem solving. The learning method did not give significance for experimental process and hands-on experiences for the learners, therefore, students were instructed to be lack of planning skill and perseverance to solve difficult problems, which are the weaknesses of learning [3]. Due to most teachers use the lecture method alone, do not promote or encourage students to think. Teachers do not make lesson plans; teach too fast, regardless of individual differences. Therefore, the quality of teaching mathematics is not as effective as the curriculum [4]. Moreover in order to effectively improve Calculus studies, there must be a change in instructing method to promote the learners to be real learners by giving them importance. Thus, it should teach learners to be able to think and solve problems by themselves, independently study and research from media and technologies. The instructors' role is to manage the contents and activities according to the learner's interests and expertise by considering each individual's differences. The instructors should also act as counsellors and give directions to the learners, create activities that promote individual's thinking process, problem solving, discuss debate and comment with reasons. These processes will help the learners to develop their knowledge, skills, thinking processes and experiences.

From problems to teaching, therefore, there are educators presenting concepts in teaching and learning in various forms such as lecture, self-study, problem-based learning. Many several learning situations employed in order to enhance the receiving knowledge of student. However, there is no best teaching method. Therefore, the researcher has adopted a variety of teaching methods. As mentioned above, the researcher interested in creating learning activities that enhance the achievement of Basic Calculus, which are called Donko's teaching method. It contains 4 steps:1) introduction: to create a ready to learn and knowledge review, 2) teaching: describe the content in essence and examples, 3) conclusion: students are encouraged to summarize the process ,4) expansion of ideas: students are trained to do assignments and create new understandings via coaching, moderating, suggesting [5] in order to encourage study in some of the content by themselves for a period of time.

2. OBJECTIVES

The objectives of this research are to

(1) Compare students' achievement of Basic Calculus with criteria 70 %.

(2) Study students' attitudes toward learning management in Donko's teaching method.

3. SCOPE

The scope of this research is as follows

A. Scope on Population

Populations were students who enrolled in the Basic Calculus over the second semester academic year 2017 in Suan Sunandha Rajabhat university.

B. Scope on Content

This research used the content in the Basic Calculus.

C. Scope on Variables

The researcher defined the variables as follows

(1) The independent variable was Donko's teaching method.

(2) The dependent variable was achievement score of Basic Calculus, and attitude of the learners' towards Donko's teaching method.

D. Scope on Time

The duration of this research was in the second semester of teaching.

4. METHODS

This research was designed as quasi – experimental with the sequence of steps as follows

A.Populations

Populations used in this research were 31 learners who enrolled in the Basic Calculus of Suan Sunandha Rajabhat University.

B.Tools and the Quality of the Tools

The researcher created and tested the tools as follows:

(1) The steps in developing a plan for the learning activities.

(1.1) Study educational theories about active learning Basic Calculus.

(1.2) Interview student' problem on learning Basic Calculus.

(1.3) Study concepts, principles, theories of learning and documentation.

(1.4) Create plan learning activities.

(1.5) Three experts examine the appropriateness of activities, the content validity and choose activities that had IOC, value greater than or equal 0.6.

(1.6) Modify the learning activities as recommended by the experts.

(1.7) Take learning activities updated to experiment with populations.

(2) Achievement test, do the following:

(2.1) Study the contents of Basic Calculus, technical testing and evaluation.

(2.2) Create a table of content to analyze and determine questions.

(2.3) Take the questions from section (2.2) together as a subjective test- 9 items, 3 experts examine the content validity.

(2.4) To select items with the IOC greater than or equal to 0.6 7 items.

(2.5) The test form had the reliability value at 0.78.

(2.6) Take 7 questions from item (2.5) to do the sample for the test.

(3) Attitude measurement form was a questionnaire asking about the learner' opinions towards active learning plan, which had the following steps:

(3.1) Study the theories, papers and related towards active learning attitudes.

(3.2) Built test questions towards active learning, subject in the form of 5 Likert's scales had 25 test questions.

(3.3) Questions were examined by 3 experts for content validity and also their recommendations.

(3.4) The 20 test questions from section (3.3) which had the IOC value higher than 0.6 , they were modified according to the recommendation of the experts.

(3.5) Use attitude scales from section (3.4) to ask 31 students.

DATA COLLECTION

The research was conducted to collect data as follows:

1) Try out the active learning plan with the populations.
2) Use the achievement test on Basic Calculus.
3) Use attitude test after each active learning plan ending.

DATA ANALYSIS

The research was conducted to analyze the data as follows:

1) Compared with the 70 percentage of achievement test.
2) Calculate the scores of the student's attitude measurement test towards the active learning plan.

5. RESULTS

1) Mean values of students' achievement was no significantly different at 70 %
2) Students' attitudes were at good level.

6. DISCUSSION

The results of the research and findings related to the discussion as below:

(1) The mean values of student achievement was no significantly different at 70 % showing Donko's learning method is effective because it was arranged from easy to difficult respectively with four-step process: 1) introduction : to create a ready to learn and knowledge review such that the student's prior knowledge, expectations and perceptions with selected from learners' attentions, 2) teaching : describe the content in essence and more examples, 3) conclude : students are encouraged to summarize the process, according to C. Epcacan [6] who states that the learning is performed as a result of the experiences of the individual , and 4) expansion of ideas : students' errors trained to do assignments. Besides, there were exercises at the end of each topic hour [7]. Finally, errors were used to inform students on progress, understanding and idea changes [5].

(2) Students' attitudes were at good level with the mean of 3.54 and the standard deviation of .34. However, for individual item, it found that I learned step-by-step calculus solving and Learning activities give me the opportunity to comment at excellent level. C. Epcacan stated that the learning is performed as a result of the experiences of the individual [6].

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RAPID TEST OF ALPRAZOLAM

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ABSTRACT

The researcher examines 1) the physical changes of Alprazolam, hypnotic drug; 2) by using various chemical reagents in order to distinguish primary psychotropic substances apart from other types of narcotic drugs. According to the research of "screening color test of Diazepam" (Testing Methods of Drugs of Abuse, 1988) the chemical reagents will react to the structure of Benzodiazepine, which is an important composition in all types of hypnotic drug. In the examination uses 3 types of chemical reagent to identify the samples, namely Zimmermann Test, Hydrochloric Acid test, and Vitali-Morin Test against alprazolam, It's found that the physical change occurs only, when tested against Diazepam and Alprazolam. Moreover, the physical change from sample of Alprazolam will appear the color changing after reacted with reagent. Record the change color with camera immediately. The photo of color changing will be analyzed with Color Capture software to find the exact color. The research results were as follow: 1) The testing alprazolam with 3 types of reagent can occur different colors in samples 2) Times of color changing in between 3 reagents react with alprazolam.

Keywords: Rapid Test, Alprazolam

1. INTRODUCTION

Currently, drugs can spread quickly and widely in academia and community. Specifically, all drug-related crimes in Bangkok and suburbs between 2015 and 2019 are based on the Central Police Forensic Science Division found that teenage mingling and drug use are often used to seduce victims in entertainment venues. Cause intoxication, especially the active ingredient sleep medicine. It has been found that teenage mingling and drug use are often used to seduce victims in entertainment venues cause intoxication, especially the active ingredient sleep medicine. The benzodiazepines are alprazolam, which acts on the central nervous system. The people who took the drug temporarily lost memory, reduced ability to learn and memory, work that requires skill or sudden decay. Therefore, Thailand has organized alprazolam as a drug classified as active ingredient Category 2 according to the Mental and Neurological Act, 1975 [2].

The Act of Mental and Neuroscience Act, BE 2518 possession or use of a Type 2 actionable substance that will affect penalties is ephedrine, pseudoephedrine, and ketamine and because of the variety of drugs, the initial screening to arrest. Although there are currently studies on Alprazolam, Zolam, Xanax or Benzodiazepine by using a gas chromatography in the Chromatogram to analyze the quality and quantity of pure substances according to Drug Abuse Act [6].

Alprazolam is not included in the active ingredient category that will affect the penalty change [1]. Study on the qualification of alprazolam reactants for color change. The nature of the color change from the substrate will confirm the initial result for reduce time in working on primary drug interactions with other drugs (e.g., Methamphetamine, Amphetamines, Ketamine and Cocaine) before using the test to verify the test results.

2. OBJECTIVES

1. To study color changes of alprazolam with Zimmermann Test, Hydrochloric Test, and Vitali-Morin Test.
2. To study the appropriate chemical for use in screening alprazolam for laboratory or field use.
3. To study the duration of color changes of Zimmermann Test, Hydrochloric Test, and Vitali-Morin Test.

3. METHODOLOGY

1. Reagent Preparation

1) Preparation of chemical reagent for Zimmermann Test

Step 1 Prepare Potassium Hydroxide (15%) solution in water.
Step 2 Prepare a solution of 2,4-dinitrobenzene (1% w/v) in methanol.
Step 3 Mix the two solutions in a ratio of 1:1.

2) Preparation of chemical reagent for Hydrochloric Acid Test

Step 1 Prepare 2N Hydrochloric Acid (7.3% Concentrate).

3) Preparation of chemical reagent for Vitali-Morin Test

Step 1 Place the sample on the test plate.
Step 2 Prepare 0.5 ml of Nitric Acid solution.
Step 3 Prepare 5 ml of Acetone solution.
Step 4 Prepare 0.56% w/v Potassium Hydroxide solution in methanol.
Step 5 Mix all three solutions.

2. Testing procedures for the separation of narcotic substances that react with all three chemicals reagent

1) Take samples were Alprazolam, Diazepam, Methamphetamine, Amphetamine, Ketamine and Cocaine about 1 mg to put on a plate of 3 samples on experimental plate [3].

2) Record experimental result with the camera.

3) Drop the Zimmerman Test, Hydrochloric Acid Test and Vitali-Morin Test on 1 sample in 1 plate of about 5 drops.

3. The test procedure for studying the occurrence of Alprazolam with all 3 types of Chemical Reagent, while dropping the reagents and after passing drops.

1) Take Alprazolam crushed about 1 millimeter on a test plate.

2) Drop the Zimmerman Test, Hydrochloric Acid Test and Vitali-Morin Test on 1 sample in 1 plate of about 5 drops.

3) Record and apply the tested image to the software program for analysis of color shown by color comparison with Blank Chemical Reagent.

4. RESULTS

Table 1. Result of Test for Screening Drugs with 3 Chemicals Reagent

Experimental Sample	Chemicals Reagent Test		
	Zimmerman Test	**Hydrochloric Acid Test**	**Vitali-Morin Test**
Diazepam	Positive (Purple Color)	Positive (Yellow Color)	Positive (Orange Color)
Alprazolam	Positive (Orange Color)	Positive (Yellow Color)	Positive (Blue Color)
Methamphetamine	Negative	Negative	Negative
Amphetamine	Negative	Negative	Negative
Ketamine	Negative	Negative	Negative
Cocaine	Negative	Negative	Negative
Notes: **Positive -** Color Experiment Example **Negative -** No visible color change of the reagent to the sample			

From Table 1 The experiments showed that when the drops 3 with all 3 types of Chemical Reagent of drug reactions are available only with alprazolam and diazepam. The Control Plate is a sample that does not pass through the drug solution. The Diazepam with Zimmerman Test showed purple color, Hydrochloric Acid Test showed yellow color, and Vitali-Morin Test showed orange test [5]. The Alprazolam with Zimmerman Test showed orange color, Hydrochloric Acid Test showed yellow color, and Vitali -Morin Test showed blue color.

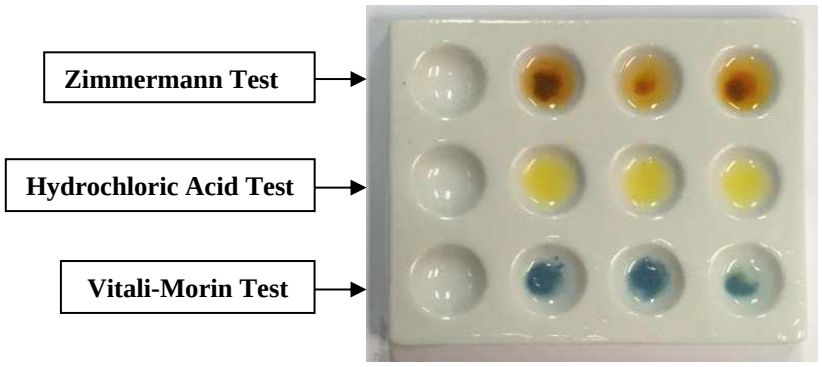

Figure 1. Example of alprazolam test after drop of test reagent

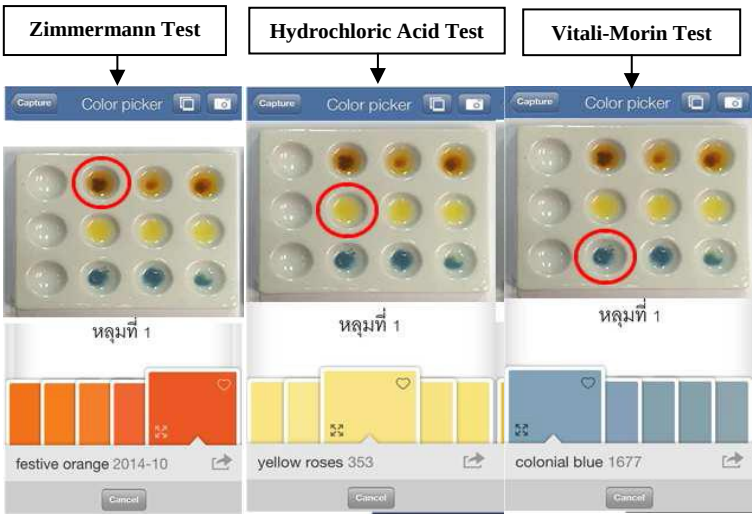

Figure 2. Analysis of color images on the software after drop of test reagent

From figure 1 and 2, The alprazolam experiment sample showed that reacted with Zimmermann Test showed orange color, Hydrochloric Acid Test showed yellow color and Vitali-Morin Test showed blue color. After saving the image and using the software program to analyze the color appear by comparing the colors with Blank reagent. All 3 types of Chemical Reagent can read the same color as the color analyzer with normal human eyes [6].

5. DISCUSSION

Testing procedures for the separation of narcotic substances that react with all three chemicals reagent can concluded that all three drugs do not add to the drug of Methamphetamine, Amphetamine, Ketamine and Cocaine, so This Testing can used to screen for Alprazolam when determining the reaction properties of Alprazolam with Zimmermann Test, Hydrochloric Test, and Vitali-Morin Test, and to study the color of the sample after the drop, the Zimmermann Test showed orange color, Hydrochloric Acid Test showed yellow color and Vitali-Morin Test showed blue color. Diazepam with Zimmermann Test showed purple color, Hydrochloric Acid Test showed yellow and Vitali-Morin Test showed orange color. It reads the image from the software, preventing the human eye from reading the color. The color will be analyzed as primary color. In order not to be confused if the result turns out to be shades. The ability to read the results precisely makes it possible to tell the color changes are clear. So, Zimmermann Test and Vitali-Morin Test can isolate alprazolam and Diazepam.

6. SUGGESTION

The Zimmermann Test has the slowest color change compared to the other two chemicals. But the color is clear when the reaction is complete and will continue to orange throughout the chemical. Hydrochloric Test can react with alprazolam well. However, it cannot be used to isolate alprazolam-only from the benzodiazepine category. Based on past research on hydrochloric acid, benzodiazepine drugs can react with this chemical and give yellow coloration as well. This matches the results of this experiment. It can only be used as a testimony of the test compound of the benzodiazepine [4]. The Vitali-Morin Test results in a clear blue color when dripping. At the time of trial release, the color of the sample will gradually fade to white.

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A WEB INFORMATION OF LOCAL KNOWLEDGE IN LOPBURI PROVINCE TO INCREASE SALES OF COMMUNITY PRODUCTS

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ABSTRACT

In this competitive world, online marketing plays an important tool in the whole products and competition in business. This study aims to propose a web application on local knowledge of Lopburi province to increase sales of community products by using web information technology. The work is collective of interesting local knowledge in Lopburi province and analysis by a researcher and expert community. PHP, JavaScript, MySQL software was used to develop this web application based on OMT technic. The performance of web application system is evaluated by user satisfaction and expert evaluation. The obtained mean and standard division by after users and experts explain on 4.01, 3.96 and 0.67, 0.59 respectively. Moreover, this application was increased sales of community products 33.28 % in the period of 10 months. This system can be used a main information tool to increase sales of community products in Lopburi province.

Keywords: Lopburi, Community product, Local knowledge

1. INTRODUCTION

Lopburi is a one of Thailand's oldest cities and it is famous of cultural tourism. It was developed in the Dvaravati period from 6th to 10th centuries by several Kingdoms, King Narai that was made for a second capital. The architect of palaces and temples were becoming from Khmer and Ayathaya empires. There are cover an area of 6,641,859 square kilometers on the western end of the Khorat Plateau. It borders Chaiyaphum and Nakhon Ratchasima provinces on the east, Phetchabun and Nakhon Sawan provinces on the north, Sing Buri, Ang Thong, Ayutthaya and Saraburi provinces in the South. It was still interesting for many foreign dignitaries because of inside the palaces and temples was confiscated as a habitat for many monkeys that known as Monkey City. In addition, Lopburi is a several provinces in the central region of Thailand that is far from Bangkok around 155 kilometers or about 2 hours to travel. It has many significant historical artifacts and prehistoric settlements over 1,200 years. Lopburi is also a unique blend of East and West that consist of ancient and modern, the beauty of the place and ruins [1] [2]. Moreover, Lopburi has natural Attractions, historic attractions antiques and collectibles that are in the field of ceremonies, customs, livelihoods, lifestyle, cultural centers and the native products. There are 10 best things to do in Lopburi province; get lost in Phra Narai Ratchaniwet, take time for yourself at Phra Prang Sam Yot, take part in the Lop Buri Heritage Walk, take part in King Narai Fair, pay your respects at Ban Wichayen, play with monkeys at the Monkey Festival, be in awe at Wat Nakhon Kosa, learn about history at Wat Phra Si Ratana Maha That, look at Thai architecture at the Kraison Siharat hall and watch the East meets the West at Wat San Paolo [3]. In addition, in Lopburi also has a lot of popular community product by transition from generation to generation that made from local material, culture, and art with the local knowledge, such as sunflower seed, brass, Mudmee cloth, Santol fruit, salted egg, sour fish and fermented rice. Some of these products are souvenir for tourism and income of a community area. They are SMEs and original community product that related to the unique knowledge and culture community. Thai government has a policy to promote the One Tambon One Product (OTOP) like small and medium sized enterprises (SMEs). Internet technology is becoming main accessories of life and widely uses for all activity such as education, business, agriculture, e-commerce and so on [4].

Now a day, the website technology system has widely used to publish and promote community product (OTOP) because users can access any place and any time [5]. Web application development has become to a long way, the use of the internet among online travelers increasing. There are many techniques and programing languages that can be used to create the web application such as JavaScript, Flash XML and

Web CL. Moreover, HTML and CSS are popular web environment that use to present data or information to users. Many players in this area, try to come up with different and new technology to improve the user experience and help developers build faster and more powerful web application [6] [7]. However, although Lopburi province is a popular place for both tourism and visitor, but some interesting place remain lack of knowledge that is cultural tourism, historical place, festival, culture activity and community products in the area. Especially, community products are important for the livelihood and survival of the people in the community that is a byproduct of tourism. It also improves the quality of life and the economy of the community. With the problem mentioned above, the others had an interest in doing research to create an information website of knowledge community that consists of interesting tourist place and best community products of Lopburi province. The aim of works is to create an information website of interesting place in this province by collecting the local knowledge and store in the dataset. Moreover, we want to publish that information in cyberspace and to increase sales of community products. The result was to benefit their lives, their community economically and the nation. Furthermore, this web application also supports the province, national tourism and government commerce.

2. LITERATURE REVIEW

2.1 Culture Tourism

Culture tourism is the subset of tourism concerned with a country or region's culture, specifically the lifestyle of the social in those geographical areas, history, art, architecture, religion, and other elements of the life society [8]. It is an area with significant historical and cultural features that presented the story of the social and human development through history as a result. Cultural tourism can show the state of life and the well-being of people at different times, such as the economy, society and tradition [9]. The technique for identification and classification on cultural tourism are classified as tangible immovable resources such as building, rivers and natural location [10]. In addition, Ballet Jittangwatana [11] proposed the scope of cultural tourism that consist of history, traces history, museum, vintage architecture, art, handicraft, drawing, religion, Religious ceremony, archeology, movie, language, literature, lifestyle, cloth, food, tradition, local culture, festivals and local knowledge. Besides, each country in Asia ware focuses on cultural tourism to make an income of their country. Thus, culture tourism is one of strategic of the country.

2.2 Local knowledge

Local knowledge is story about knowledge, skills, beliefs and behaviors that express the relationship between people and people, nature and people, people and the environment, people and the supernatural. It is expressed in the basic way of life local wisdom accumulated that is collected from the experience, society and in different environments. Community culture is a great asset to society and the nation. There are four main characteristics that consist of local wisdom, cultural base, integrated local wisdom, and linked to the lofty abstraction [12] [13]. Lopburi is a province with a long tradition of culture. There are also many immigrant populations and other provinces. They brought with them the knowledge of life, such as weaving, the white clay filler and sunflower honey. The patterns of local woven fabric vary according to the area. The weaving local cloth is a very popular tourism, woven fabric collector, and general customer that found in many districts. The largest source of weaving is Ban Mai. Ban Kluay Sub-district, Ban Sai Sub-district, Hin Lek Tum District, Amphoe Tha Luang, Amphoe Phatthana Nikhom which show a unique identity of ache local community. Another knowledge community product is the white clay filler. It is a famous producer in Thailand that use to make a rug for skin help care, paint industry, furniture product, mixed with various herbs and cosmetic skin. The last product is sunflower honey because of Lopburi is an area where sunflowers are grown. Most farmers are promoted and support from the government to grow sunflowers. Thus, beekeepers go to the sunflower field to collect the sweetener from sunflowers that is a good source of honey for bees. It brought through a safe production process and good quality product [14].

3. ANALYSIS AND DESIGN

In order to perform this study, the author investigated and collected data from the community OTOP products group, community development province and the tourism official of Lopburi province. All information was used in the analysis and design state that perform to management the web application and database. It also

was helpful the researcher to make the system fast and works easily. This web application must be compatible to use all international web browsers. In this study, the technique to use for analysis and design that can be divided into 3 steps as follow: system overview, use-case diagram of the system, database design of the web application and activity diagram of the system as shown in Figure 1-3 consequently.

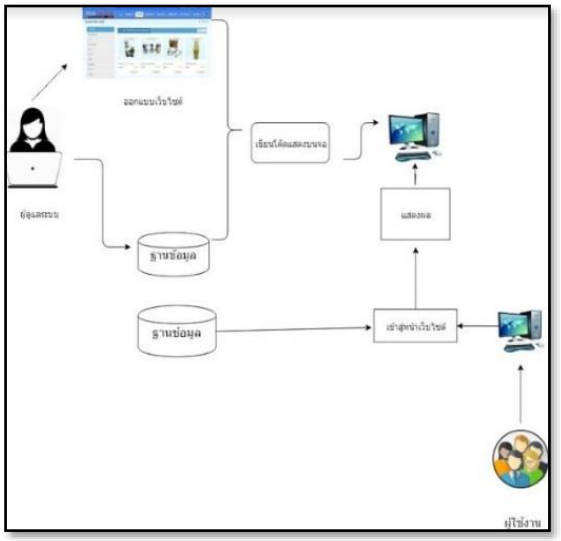

Figure 1. System overview

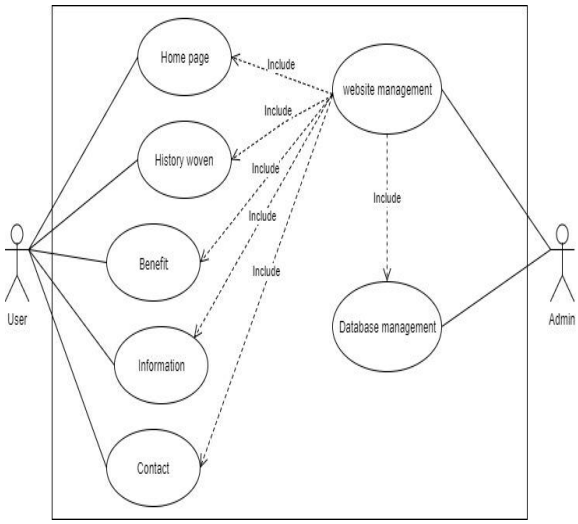

Figure 2. Use-case diagram of the system

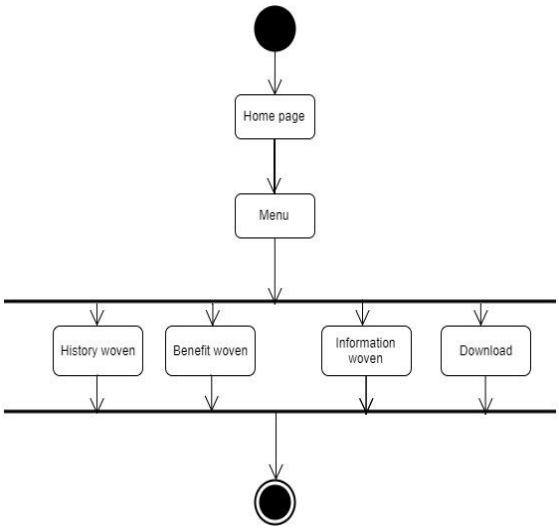

Figure 3. Activity Diagram

4. RESULTS AND DISCUSSION

In this study, the result was divided in 2 parts: development of web application and evaluating performance and satisfaction of web information of local knowledge application in Lopburi province.

4.1 Developing of Web Application

The state of development the web application of information of local knowledge in Lopburi province, PHP, HTML, Photoshop CS6, and XAMPP software were used to implement and coding with MySQL database. The system consists of the detail of local knowledge information's place and community products,

search system, categorization system and map. The home page is displayed the menu keys such as location name search, arrow selection show, main menu, rotation menu and location map. In each web page shown information of culture tourism place and community products that depend on the user selection. Besides, the user can click on the map or any area, products, and picture to see more information of interesting place in Lopburi province. For a backend, the system administrator used to manage the policy such as log-in name and password. This system also offers the administrator to edit or updating more information any time that corresponded to the related information in the database as shown in Figure 4-8.

Figure 4. Homepage of the Web Information application

Figure 5. The page of culture tourism

Figure 6. The page of culture tourism

Figure 7. The page of rice product

Figure 8. The page of the agriculture learning center

4.2 Evaluating the performance and satisfaction of web application

In the step of evaluating the performance and satisfaction of the web application, we tested and evaluated the performance of the system by using the Black Box Testing and Questionnaires. There are 10 experts and 30 users that were used to test this web application. Black Box testing was estimated in the error of the project as follows: functional requirement test, Function test, Usability test, Performance test and Security test. The functional Requirement test was evaluated the ability of the system to support the requirements of the users and Functional test was used to evaluate the accuracy of the system the proposed by Amman and Offutt [15]. The suitability of the system was tested by the Usability test. Performance test was estimated the processing speed of the system. Lastly, Security test was applied to evaluate the security of the system that proposed in Laurie Williams [16] as shown in Table 1 and Figure 9.

Table 1. The results of the Black Box testing of the system

	Experts		Users	
	$\bar{x}$	SD	$\bar{x}$	SD
1. Function Requirement Test	3.96	0.64	3.80	0.66
2. Functional Test	3.90	0.70	3.96	0.59
3. Usability Test	3.86	0.64	3.94	0.56
4. Performance Test	4.10	0.59	4.21	0.65
5. Security Test	4.22	0.76	3.87	0.51
Summary	4.01	0.67	3.96	0.59

The results of the Black Box testing of the system as shown in Table 1 and the chart is Figure 9 that a quality assessment of the system is good in all aspects and Mean were 4.01 and 3.96 and standard deviations were 0.67 and 0.59. In addition, the author also collects the sale of community product of 3 local knowledge products that consist of weaving, the white clay filler and sunflower honey in a period of 10 months 2017. The result shows the increase of sale community products as 33.28 %. Thus, it can be concluded that this web information application is a good to promote the both culture tourism and community products of Lopburi province.

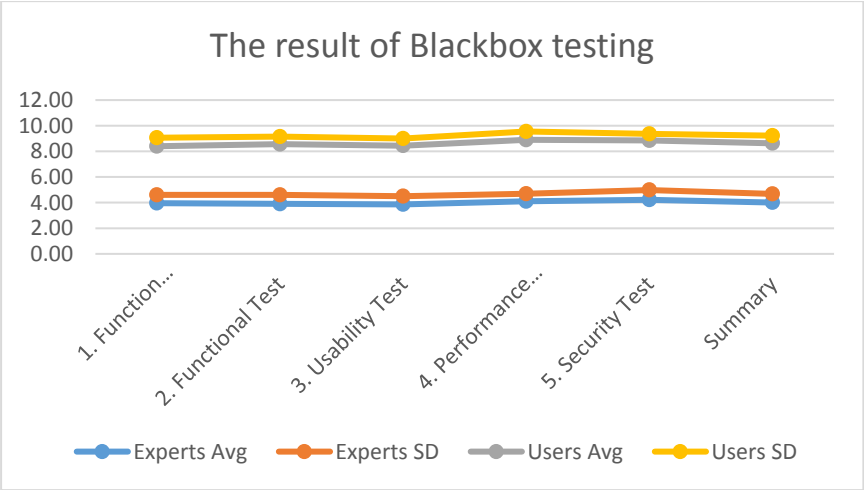

Figure 9. The page of agriculture learning center

5. CONCLUSIONS

The development of a Web information of local knowledge in Lopburi province to increase sales of community products, Thailand. The system was implemented by using any software that consists of PHP, HTML, Photoshop CS6, XAMPP and MySQL database based on MS-Windows10. Black Box Testing and Questionnaires were used to evaluate the system that estimated both 10 experts and 50 users. The result showed a statistically significant difference of quality assessment of the system is well in all research objectives. It can be concluded that a Web information of local knowledge is a good way and appropriate to promote the culture tourism and increase sales of community products in local province of Thailand.

6. ACKNOWLEDGMENTS

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SELF-STUDY PHYSICS USING THE INTERACTIVE SCIENCE SIMULATIONS

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ABSTRACT

This research aims to examine and compare the learning achievement of students who engage in physics self-study using the Interactive Science Simulations. They are demographically categorized. The self-study method based on the use of the Interactive Science Simulations for 3 hours per week has been developed by the authors. In this regard, 150-minute theoretical instruction is provided together with the implementation of 30-minute self-study using the Interactive Science Simulations. This is the home-based program of one-semester self-study in which pre-, mid- and post-tests are conducted for the evaluation of learning achievement. The package software is used in the data analysis and processing to identify the statistics, including, number, percentage, maximum, minimum, mean, standard deviation, analysis of variance (ANOVA) and t-test with a statistical significance at 0.05 (p=.05). According to research results, the mid- and end-semester achievement of physics learning among students who engage in physics self-study using the Interactive Science Simulations is different from their counterparts in the regular class with a statistical significance at 0.05. It can be said that the former has a higher learning achievement in the middle and end of semester than the latter.

Keywords: learning achievement, self-study, Interactive Science Simulations

1. INTRODUCTION

The world today is in the era of knowledge-based society and economy; therefore, the social capacity to apply the knowledge in the innovation creation is important for steering social development. The created knowledge and innovation must comprehensively benefit all sectors of diverse society and steer the economy towards the balance of competitiveness and sufficient economy [11].

The current instructional system plays a crucial role in creating the knowledge society in which the development of human, organization, economy, society, industry, agriculture and service relies on technology and scientific knowledge. All there are the important element for country development so the suitable and quality instructional system and process of science and applied science are the significant mechanism for the country to become the developed nation. Currently, different fields of knowledge are in very advance stage with a rapid scientific and technological development. Numerous changes tend to increase to a level that can be regarded as the information or science society. As a result, the science instruction should focus on present and future conditions through the examination of 3 areas: actual state of science instruction, science instruction problems and instructional trend on the basis of the creation of systematic instructional process.

The experiential learning is a popular instruction for its consistence with 21st-century people's learning style because their learning conditions are changed and require both formal and informal family interactions. The instruction have to conform to the changing community context, while the in- and out-class practices through project making are needed for activities (Newell, 2003; Grant and Branch, 2005; Gultekin, 2005 cited in Prasart Nuangchalerm, 2015).

The inquiry-based instructions of science and mathematics comprise the engagement, exploration, explanation, elaboration and evaluation. The problem solving process focuses on the student's practice of problem-solving skills through systematic thinking and performing process. The training results will enable students to make a rational decision to solve different problems based on processes or methods, knowledge, skills and problem understandings. All these are then translated into the data for problem solving in which

many possible ways are available depend on problem characteristics as well as knowledge and experience of people solving problems. The problem solving process is hierarchical beginning from acquiring problem understandings, preparing solution plans as well as pursuing, assessing and examining those solutions. In respect of hand-on/mind-on activities, science educators suggest teachers to organize activities enabling students to think and practice. After practicing or making science experiments, they will come up with a range of ideas and questions, while the activity participation also encourages them to observe results on their own. This will serve as the data to make questions, explanations, discussions, summaries and further studies. This kind of activity thus allows student to perform and to practice thinking skills leading to self-production of knowledge with the understanding and meaningful learning. Meanwhile, the cooperative learning is also a suitable approach to be implemented in the science instruction because, during the students' group work in an activity, they will enjoy an opportunity to exchange knowledge with peers. As they are relatively same age, their communications become effective. To achieve the effectiveness of cooperative learning, good model or systemization is needed. The comprehensive studies and researches in such regard have been conducted by several educators in order that the findings can be applied in the instruction of different subjects including science and mathematics [4].

Physics, a branch of science, involves the examination of natural truth for the learner's acquisition of understanding of natural phenomena and is regarded as the heart of science due to its wide applicability in daily life when compared to other fields of science. Apart from being behind of most technology, physical theories lay the foundation of technological breakthrough and of theoretical and applied knowledge. As physics concerns the study of natural phenomena, its application and explanation are mostly abstract so learners have to create an imagination that agrees with lessons they learn. However, the teacher's instructional activities still focus on the memorization for examination not on the opportunity for student to think, analyze and acquire knowledge on their own (Niyom Sriyaphai, 1998).

The learner-centered instruction integrated with simulation-based learning is a concept that promotes self-learning and acquisition of thinking, analytical and problem-solving skills. This kind of instruction adopts different approaches allowing learners to choose their interested lessons and to enjoy learning activities and self-practice. The simulation-based learning (SBL) is thus an alternative instruction that university lecturer's awareness of promoting its implementation in the instruction should be promoted [2].

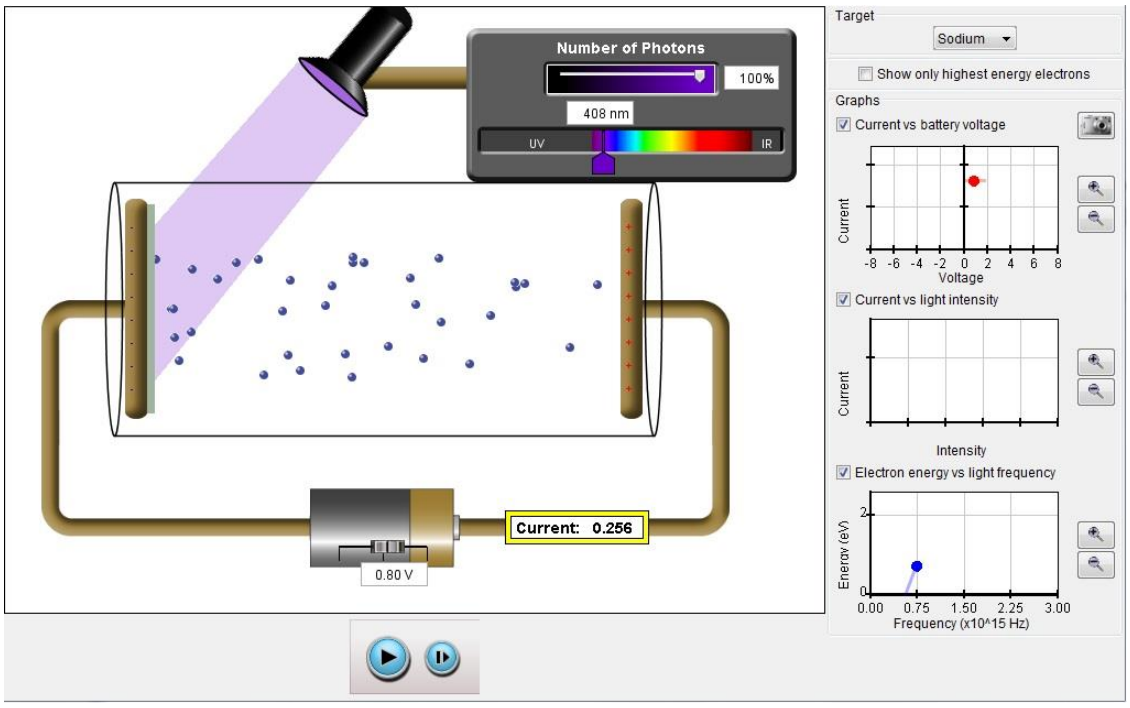

Figure 1. Photoelectric Effect Interactive Science Simulations [12].

In sum, physics is the science that examines natural phenomena and mostly involves abstract applications and explanations. Therefore, learners have to imagine contents they learn. This produces difficulties and reflects the important role of teaching method and learning process. It can thus be said that good physics instruction needs clear learning materials. Thanks to present computer technologies, the interactive simulations are capable to demonstrate a range of physical phenomena and invisible experiments. The Interactive Science Simulations (ISS), developed by Colorado University at Boulder using computer languages, are available for free download with constant updates. The author is interested in experimenting whether the implementation of ISS-integrated self-study will contribute to the students' better understanding of physics. Apart from the benefit for lecturers and physics students, this study can also be an alternative for physics learning development.

2. OBJECTIVES

(1) To examine physics learning achievement of students in ISS-integrated self-study
(2) To compare physics learning achievement between students in ISS-integrated self-study and in traditional classroom setting

3. RESEARCH HYPOTHESIS

There is a difference of physics learning achievement between students in ISS-integrated self-study and those in traditional classroom setting.

4. METHODS

This research aims to examine and compare physics learning achievement between students in ISS-integrated self-study and those in traditional classroom setting. The ISS-integrated self-study with duration of 3 hours per week is developed by the author. There are 150-minute theoretical session and 30-minute ISS-integrated self-study. This ISS-integrated self-study adopts home-based approach and lasts for 1 semester. The learning achievement is measured through pre-, mid- and post-test.

The package software has been used by the author in the statistical analysis as follows:

1. Descriptive statistics analysis (minimum, maximum and standard deviation) explains the physics learning achievement in ISS-integrated self-study and traditional classroom setting.

2. Data analysis is carried by means of inferential statistics, while the hypothesis related to the comparison of physics learning achievement between students in ISS-integrated self-study and those in traditional classroom setting is tested using t-test. At the beginning, the independence sample t-test through Levene's statistical test is conducted to examine the difference of deviation of both samples. If the deviation of 2 groups is indifferent, the equal variances assumed t-test will be carried. However, the equal variances not assumed t-test will be conducted in case of non-existence of different deviation of 2 groups.

5. RESULTS

1. According to Table 1, a total of 55 physics students are grouped as follows: 28 of them (50.91%) studying in traditional lecture and experiment-based class are from the Environmental Science Faculty, while the other 27 students (49.09%) from the Food Science Faculty learn in ISS-integrated self-study.

Table 1. Quantity and percentage of subject group

Subject Group	Quantity	Percentage
ISS-integrated self-study	27	49.09
Traditional lecture and experiment-based classroom	28	50.91
Total	55	100.00

2. Table 2 shows the physics learning achievement of 55 students. With respect to their achievement of fundamental physics learning with full mark of 40 points, the average score is 19.43 with a standard deviation of 3.61. The highest and lowest ones are 26 and 11, respectively. Respecting mid-term achievement with full mark of 30 points, the average score is 12.9 with a standard deviation of 4.95. The maximum and minimum ones are 27 and 2, respectively. For the end-term achievement with full mark of 30 points, the average score is 15.5 with a standard deviation of 6.25. The highest and lowest ones are 30 and 4, respectively.

Table 2. Maximum, minimum, mean and standard deviation of students' physics learning achievement

Learning Achievement	Minimum	Maximum	$\overline{X}$	S.D.
Fundamental knowledge test score (40 points)	11.0	26.0	19.4	3.61
Mid-term test score (30 points)	2.0	27.0	12.9	4.95
End-term test score (30 points)	4.0	30.0	15.5	6.25

The learning achievement of 27 physics students in ISS-integrated self-study is shown in Table 3. Their average score is 19.59 with a standard deviation of 3.20. The highest and lowest ones are 25 and 12, respectively. With regard to the physics learning achievement of those in traditional lecture and experiment-based class, the average score is 19.28 with a standard deviation of 4.03. The maximum and minimum ones are 26 and 11, respectively.

Table 3. Maximum, minimum, mean and standard deviation of students' physics learning achievement

Achievement of Fundamental Learning	n	Minimum	Maximum	$\overline{X}$	S.D.
ISS-integrated self-study	27	12.0	25.0	19.59	3.20
Traditional lecture and experiment-based classroom	28	11.0	26.0	19.28	4.03

According to Table 4, the students in ISS-integrated self-study and in traditional lecture and experiment-based classroom have the indifferent physics learning achievement.

Table 4. Comparison of physics learning achievement of Suan Sunandha Rajabhat University students categorized according to the class group

Physics Learning Achievement	Group	$\overline{X}$	S.D.	t	df	p-value
Physics Learning Achievement	ISS-integrated self-study	19.59	3.20	.312	53	.757
	Traditional lecture and experiment-based class	19.28	4.03			

According to Table 5, the difference of mid-term learning achievement between students in ISS-integrated self-study and those in traditional lecture and experiment-based classroom is found with a statistical significant level of .05. Indeed, the former has a higher mid-term physics learning achievement than the latter.

Table 5. Comparison of mid-term physics learning achievement of students in ISS-integrated self-study categorized according to the class group

Physics Learning Achievement	Subject Group	$\overline{X}$	S.D.	t	df	p-value
Mid-Term Physics Learning Achievement	ISS-integrated self-study	14.92	5.49	3.115*	53	.003
	Traditional lecture and experiment-based classroom	11.03	3.52			

*statistical significant level of .05

In Table 6, the students in ISS-integrated self-study have different end-term physics learning achievement from those in traditional lecture and experiment-based classroom with a statistical significant level of .05. In particular, the end-term physics learning achievement of the former is higher than the latter.

Table 6. Comparison of end-term physics learning achievement of students in ISS-integrated self-study categorized according to the class group

Physics Learning Achievement	Class Group	$\overline{X}$	S.D.	t	df	p-value
End-Term Physics Learning Achievement	ISS-integrated self-study	18.20	6.27	3.42*	53	.001
	Traditional lecture and experiment-based class	12.98	5.12			

*statistical significant level of .05

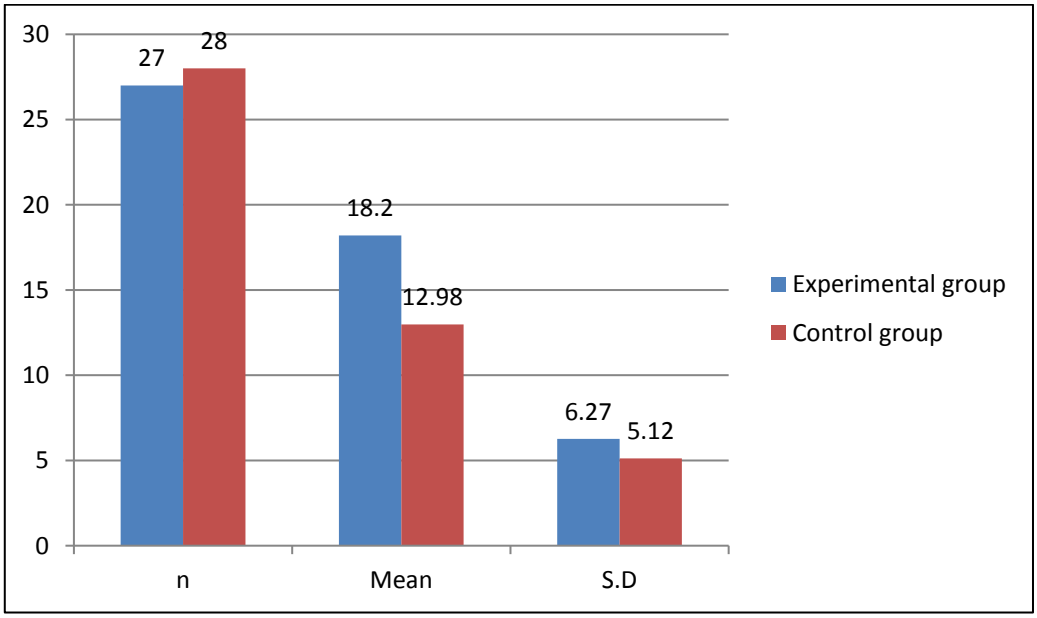

Figure 2. Mean and Standard deviation of achievement scores.

6. DISCUSSION

According to research results, the students in ISS-integrated self-study have different learning achievement from their counterparts in traditional lecture and experiment-based class at a statistical significant level of .05. A higher learning achievement of the former when compared to the latter indicates that the implementation of Interactive Science Simulations promote the learners' self-study, situational analysis, application of various lessons for problem-solving and decision-making based on the principle and reason of one given topic. This agrees with Thornton, R.K. & D.R. Sokoloff [7] who claim that Microcomputer–Based Interactive Lecture Demonstration (ILD) is an inquiry-based learning with a focus on learner's continual interactions during the course of self-study. It has been incorporated in the physics instruction since 1989 and become very successful in teaching physical concepts, especially improved learning and long-lasting acquisition of fundamental concept. The learner-centered approach integrated with Simulation-Based Learning aims to enhance learners' knowledge of self-study, analytical skills, situational analysis and problem-solving ability. Therefore, several methods must be incorporated into the instructional process, while learners are welcomed to choose their interested lessons, to participate in learning activities and to practice. It can be said that Simulation Based Learning (SBL) is an alternative instruction that university lecturer's awareness of promoting its implementation in the instruction should be promoted [2].

7. SUGGESTIONS

1. The suggestions derived from the application of research results:

1.1 The model and tool for creating the Simulation Based Learning (SBL) should be constantly developed.

1.2 The implementation of Simulation Based Learning (SBL) in various fields of study should be promoted.

2. Suggests for future research

2.1 The relation between Simulation Based Learning (SBL) and learning attitude should be studied.

2.2 The possible ways to apply Simulation Based Learning (SBL) in various field of study should be examined.

8. ACKNOWLEDGEMENT

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DETERMINANT OF MENTAL HEALTH AMONG THAI ADOLESCENTS

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ABSTRACT

Abstract: This research study was of a descriptive design. The objective of the research was to study the level mental health of sports science and relationship of the determinants of mental health among thai adolescents. The sample consisted ninety-nine student are in sports science student of Suan Sunandha Rajabhat University; their ages ranged from 18 years up amount 99 people. The sample size was calculated from the formula Taro Yamane. The tool was a questionnaire including three parts: Part 1 demographic questionnaire, part 2 the way to handle the problem (ways of coping questionnaire, WOC) created and developed by Folkman and Lazarus (1988), and part 3 test the mental health indicators for Thailand shorter version of article 15 of the 2550 department of mental health. The data was analyzed using statistical methods: (1) personal information, gender, age, marital status, income, analyzed by using frequency and percentage, (2) scale of the problem management and scale of mental health analyzed by mean and percentage, and The results showed that the mental health scores of general mental health (fair). All married were interpreted in terms of the general mental health (fair). Then the relationship of these factors affects the mental health status differences statistically significant at the 0.05 level. Factor income resulted in a different level of mental health statistically significant at the 0.05 level. Suggestions in the research application: Programs should provide information on mental health care for the elderly in the community.

Keyword: level mental health, problem management, among Thai adolescents

1. INTRODUCTION

Social inclusion is important for our mental health. Social inclusion means feeling you belong, are valued and respected, and can take part in your community and benefit equally from what your community has to offer. Communities are defined not only by place but also by identity, culture, ethnicity, and faith.

Mental health and many common mental disorders are shaped to a great extent by the social, economic, and physical environments in which people live. Social inequalities are associated with increased risk of many common mental disorders. Taking action to improve the conditions of daily life from before birth, during early childhood, at school age, during family building and working ages, and at older ages provides opportunities and local interventions. Such actions to prevent mental disorders are likely to promote mental health in the population

The prevalence and social distribution of mental disorders has been well documented in high-income countries. While there is growing recognition of the problem in low- and middle-income countries, a significant gap still exists in research to measure the problem, and in strategies, policies and programs to prevent mental disorders. There is a considerable need to raise the priority given to the prevention of mental disorders and to the promotion of mental health through action on the social determinants of health

The consequences of mental health are not good or none. Happiness in the among Thai adolescents is a risky situation. Disability risk is higher than the elderly. Happiness Mental health problems It is a problem. Therefore, the study of the factors affecting. Mental health of the elderly is therefore important for Enhance the quality of life for the among Thai adolescents.

The populations in this study were students in Sport science Suan Sunandha Rajabhat University, Bangkok Thailand. The sample were selected by formula Taro Yamane were classified. Their ages ranged from 18 years up amount 99 people. Researcher Study on the factors that have. Health promotion is the range

of actions and mannerisms made by individuals, exercise is any bodily activity that enhances or maintains physical fitness and overall health and wellness, and the student in sports science, Bangkok Thailand The effect of mental health on the among Thai adolescents. The study will be important information for planning. Care for the elderly to have a good quality of life.

2. OBJECTIVE

To study the level mental health of sports science and Health relationship determinants of mental health among thai adolescents. Suan Sunandha Rajabhat University.

3. METHODS

1. Population

The participants included 99 early studying in the 2rd year of Sports Sciences and Health were 80 males and 19 females.

2. The instruments used in research

The tool was a questionnaire including three parts:

Part 1- demographic questionnaire.

Part 2- the way to handle the problem (ways of coping questionnaire, WOC) created and developed by Folkman and Lazarus (1988)

Part 3- test the mental health indicators for Thailand shorter version of article 15 of the 2550 department of mental health.

Data Analysis

The data was analyzed using statistical methods:

(1) Personal information, gender, age, marital status, income, analyzed by using frequency and percentage.

(2) Scale of the problem management and scale of mental health analyzed by mean and percentage.

4. RESULTS

Table 1. General information of sample

general information		number	%
1.SEX	**male**	**80**	**80.80**
	female	**19**	**19.2**
2.AGE	**18-20**	**99**	**100**
	Married	**-**	**-**
3.STATUS	**Single**	**99**	**100**
4.EDUCATION	**Bachelor Degree**	**99**	**100**
5.MONEY INCOME	**Have income**	**35**	**35.35**
	No income	**64**	**64.65**

Table 2. Rating of how to handle the problem sample

Rating of how to handle the problem Sample	number	%
how to handle the problem		
1.Confrontation	15	15.15
2.Planning	20	20.20
Problem management		
1. Positive valuation	20	20.20
2. Self-control	10	10.10
3. Social support	15	15.15
4. Regression	10	10.10

Table 3. Level mental health

level mental health	MEAN	S.D.
Mental health is equal to the people	40.12	0.527

5. CONCLUSION

The researcher concerned to study the sports science and health Suan Sunandha Rajabhat University Bangkok, on the subject of knowledge of the mental Health and the exercise attitude. The aim of the research is to study and consider the of students in Sports and health Suan Sunandha Rajabhat University, Bangkok Thailand. The results showed that majority of the subjects took exercise for health. The subjects showed their significantly statistically at 0.05 levels**.**

6. DISCUSSION

The study of factors affecting the level of mental health. The among Thai adolescents using the Thai Mental Health Indicator Test (Thai Mental Health Indicators version 2007 = TMHI-15) Mental health Individuals with single marital status have a grade point average. Mental health is good level and have grades Mental health in this sample is in mental health criteria Equal (fair) is a condition where the person has a mental state. Mental capacity Quality of mind and factors Support is the same as most normal people, but it cannot. I find that the relationship is separate. Dealing with problems 3

Coping each method affects the rating. Mental health as the elderly chooses to deal with. Many problems in each situation / event / problem.

7. ACKNOWLEDGEMENTS

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THE EVALUATION OF THE PUBLICATION RESEARCH RESULTS OF PERSONNEL FACULTY OF SCIENCE AND TECHNOLOGY, SUAN SUNANDHA RAJABHAT UNIVERSITY

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ABSTRACT

The study and evaluation numbers of papers publication and academic creative working of personnel staff in Faculty of Science and Technology Suan Sunandha Rajabhat University (SciSSRU). The aim was to assess the strengths and weak points of improvement from the published research. It leads to being used as a guideline for analyzing and improving quality and quantity of published research on both national and international works. The evaluation obtained data collection of the publication between 2012 and 2017. To performed, national and international lineage divided into 8 groups such as Computer and Information Technology, Physics and Energy, Biology Biotechnology and Microbiology. There were 150 national and 491 international publication in 6 years ago. The results of 105 academic staff of SciSSRU shown the trend of international publication increasing with statistical significance. This evaluation result is beneficial used assessment of University ranking such as such as Webometrics, QS Ranking, and Time Higher.

Keywords: Publication, evaluation, ranking, SSRU

INTRODUCTION

At the present, all higher education institutions have objects of main missions following the production of graduates, research, academic service to the society, and including to maintain the arts and culture. The challenges to higher education institutions are to ensure that the institution is able to develop its knowledge and produce graduates that respond to the national development strategy, whether it is to build international competitiveness, production of graduate's development of manufacturing industry and service sectors for career path development with local country.

The U-Ranking is the one good competitive factor the University's KPIs (Key Performance Indicators) to reflect on the overall and shown a potential for Thai universities in today's world society and to promote the development of equal international civilization. The ranking comparison has wide variety guidelines such as Webometrics Ranking of World Universities, QS Stars University Ratings, SCImago Institutions Ranking (SIR), Research Performance World University Rankings (RUR), University Ranking by Academic Performance (URAP), and Times Higher Education World University Rankings. The ranking of a higher education institution or rating is a measure of the strengths and weaknesses of higher education institutions in terms of quality of education, research, the acceptance of the employee, education budget, Alumni Network, and for Internationalism, etc. each rank determines the importance of each indicator, depending on the type of rating objective, and varies by country. In Thailand, two institutes have been set up in Thailand, namely, the Office of the Accreditation and Quality Assurance (Public Service and Quality Assurance), with the objective of self-evaluation and quality assurance both the basic level of vocational education and higher education and the other is the Department of Education (Office of the Higher Education Commission) to provide Information for help student make decisions to take the examinations for admission in various institutions [1]. In general, the quality journals are should be a journal with good content. There are quality reviews by professionals that specialize in academic journals and follow the rules of each journal and are not periodicals that have been published over and over. There are definite bibliographic details of a reference, and there are a number of references to these articles [2]. The research is not a guarantee or confirmation that the researcher has quality but what is confirmed quality of research it should be accepted by the experts for publication in international

academic journals. The dissemination of research results can be done in two forms: publication in national or international academic journals and publication in national or international academic conferences. The publication of international academic journals advantages is the research papers published in international academic journals are of more quality than those published in academic conferences, with more complicated procedures and more rigorous screening. If a research article has been accepted by the editors of the journal, it will be confirmed that the article is quality and researchers can learn more from the advice of the experts, in the clearer ways to improve the research articles. The disadvantage is of the dissemination process takes about 1-2 months or more than sometimes the article is considered by experts, then it may have to be modified as the advice of another qualified and important. When a research article is accepted for publication, it does not mean that research papers will be published immediately in academic journals, but must in order to be published [3].

Research published in the national journal appeared in the Thai-Journal Citation Index Center (TCI) was supported by Thailand Research Fund (TRF) for collecting information, publication of articles and reference information of Thai Journal articles for the benefit of publishing and developing. TCI was using the quantitative criteria in journal quality assessment the quality of the journal as an international standard, it had classified into 3 groups as follows.

1) Journal group 1 (TCI-1), Qualified Journal of TCI (5 years) and in the TCI database will then be screened into the ASEAN Citation Index (ACI) database the criteria for all major deals passing the minimum of 4 items and score of each criterion not less than 15 points (from 20 points).

2) Journal group 2 (TCI-2), Journal of quality improvement and it are in the TCI database. The consider following the rating criteria included quality, all under 15 points, but no less than 10 points (out of 20 points).

3) Journal group 3 (TCI-3), Journal of Non-Qualification and may not appear in the database of TCI in the future. All scores from all quality criteria are lower than 10 points (from the 20 points total) [4].

The journals that accepted are had many journals such as paneling journals and databases. In part of science and technology journals in Thailand is accepted in the database, TCI such as Suan Sunandha Science and Technology Journal (SSSTJ). An examples of sciences academic journal is in English language publication, which has passed the quality certification in the TCI-2 (International Standard Serial Number – ISSN 2351-0889) and the Journal of Industrial Technology belongs to Suan Sunandha Rajabhat University (SSRU) is a Thai language publication journal has been certified in the TCI-1 (International Standard Serial Number – ISSN 2351-0811). Both of them were selected a qualified manuscript from SSRU staff and worldwide other researcher publication.

Reference database research papers published in the international journals had been more citation, and impact factor was classified in these reference database. The Journal Quartile for Journal Quartile will be used to rank the journals in each category according to the impact factor from low to high and divide the journals into 4 groups including, quartile 4 (Q4) is a bottom position is the group of journals below the 25th percentile, quartile 3 (Q3) is a middle-low position is a group of journals that are between the 25th percentile and the median, quartile 2 (Q2) is a middle-high position is a journal between median and percentile, and quartile 1 (Q1) is a top position (highest 25% of data) is the best journal group in this field, i.e., a group of journals with a Quartile value as a Percentile of 75 [5]. The academic publishing for international journals with peer-reviewed and citations systems were referred to journal h-index (Herfindahl index). It is one measure of the quality of a journal and can be calculated using data from Web of Science, Scopus or Google Scholar as follows.

Scopus database is a database that covers all subjects. Scopus is Elsevier's abstract and citation database launched in 2004. In 2009, the Content Selection and Advisory Board (CSAB) were formed to develop an objective system of evaluation and validation of peer-reviewed journals for inclusion or exclusion in Scopus against transparent and fair criteria. The Elsevier database is only available to Scopus, but there will be links do not have the original. If the journals found in Scopus are journals received by the agency in the form of an e-journal, clicking on the link will then be able to view the full text both are searchable in basic search, advanced search, author search, search fields, limit to, sources, search history, refine results, search within results, view at publisher, and full text. The key part of this database is cited by, Cited times and Affiliation

Search. If any university has this database, it can be accessed from the information website [6]. All journals covered in the Scopus database, regardless of who they are published under, are reviewed each year to ensure high-quality standards are maintained. Searches in Scopus also incorporate searches of patent databases [7]. Scopus gives four types of quality measure for each title; those are h-Index, CiteScore, SJR (SCImago Journal Rank) and SNIP (Source Normalized Impact per Paper). Anyone can find all included journals on the SCImago Journal Rank website [8].

International Scientific Indexing (ISI) or Web of Science (WOS) is a citation database that provides bibliographic information along with cited reference and citing article science, such as chemistry, physics, engineering, psychology, business administration, including with liberal arts and humanities, Asian studies, religion, philosophy, art, music, and etc. More than 10,000 journals are available from 2001 to present. [9]. There are 3 types of search as basic search, author search, and cited reference search [10]. The ISI server provides indexing of major international journals and proceedings. An author can get information about international journal impact factor, proceedings (research papers) and information on upcoming events. All the journal pages have pointers to Web pages of the publishers which are integrated into the ISI stream pages.

Scimago Journal & Country Rank (SJR) is an index developed in 2009 by Professor Félix de Moya in collaboration with SCImago research group (researchers from CSIC, Granada University, Extremadura, Carlos III and Alcalá de Henares, Spain). The used of reference data based on the Scopus database, the same principle applies to Google's PageRank, the subject matter of journals, the quality and reputation of journals. The SCImago Journal & Country Rank is a publicly available portal that includes the journals and country scientific indicators developed from the information contained in the Scopus® database (Elsevier B.V.). These indicators can be used to assess and analyze scientific domains. Journals can be compared or analyzed separately. Country rankings may also be compared or analyzed separately. Journals can be grouped by subject area (27 major thematic areas), subject category (313 specific subject categories) or by country. Citation data is drawn from over 21,500 titles from more than 5,000 international publishers and country performance metrics from 239 countries worldwide. The SJCR allows you also to embed significative journal metrics into your web as a clickable image widget [11]. SNIP: Source-Normalized Impact on Paper is a new index developed by Professor Henk F. Moed of Center for Information Technology. Science and Technology Studies (CWTS), Leiden University, Netherlands, 2010 SNIP uses reference data from the Scopus database to solve the problem of IF values that is the difference between the majors between SNIP and IF that why the growth rate of referrals is not the same. SNIP is an average of the number of referrals received per article. The citation potential of each subject is also taken into consideration. The citation potential does not difference just between journals in different fields, but It also different between journals in the same field in a different kind of journal such as basic journals will have citation potentials higher than applied journals and clinical journals or periodicals emerging topics that citation potentials will higher than general journals, etc. It called that a measure of citation impact of a journal in a way in context or contextual citation impact of the journal. The quality of the researcher or author of the article h-index is used to measure the quality of individual researchers; there are two types of performance indicators: First is the volume number of the articles in published. The next indicator is quality that means the article able to use, have to a reader and can be a citation [12].

ScienceDirect is a website database which provides academic journal and books accessible to a large database of scientific and medical research. The full bibliography and full-text journals from Elsevier publishers include science books and journals. There are four categories were filter by subject as Physical Sciences and Engineering, life science, Health Sciences, and Social Sciences and Humanities ScienceDirect had accepted reliability from various researcher, it has over 3,800 journals and more than 37,000 books, there are over 15 million peer-reviewed publications (and growing) from Elsevier imprints and society partners. Most of the publication was limited by the paid for the expenses journal [13].

Google Scholar is an online accessible web search engine that indexes the full text or metadata of scholarly literature across an array of publishing formats and disciplines. This database introduced very recently and rapid online the international profiles for providing a ranking of publication. The advantage of Google Scholar is free of charge and very faster online publication. It will most likely offer a higher number of documents which have cited a work and an almost unlimited universe of content. Whatever has been cited

by another work on the web and can be collected by Google will be in Google Scholar. The limitation of Google Scholar was not standardization of author names, so you may have to search multiple variations in a name to find works written by an individual. Although it cited in another article, it wasn't included in the times cited lists. Every version of an article is included in search results so there are likely duplicating entries to the same article and the times cited count may also include duplicates [15]. Google Scholar does not index all scholarly articles; therefore, some articles citing the item under study may not be counted. It includes citations from an array of sources of it's cited by calculation, including PowerPoints and Word documents, and gives everything an equal rank. Author names can be tricky to search and the results can vary greatly depending on how the name is entered and the searching represents only the author's last name and combining that with the main title in quotations [15].

The papers are structured as follows: The represent data and some statistics derived from the publication of the Faculty of Science and Technology SSRU (SciSSRU) had published between from 2012 to 2017. The study was therefore driven by three main research questions:

1. How stable is citation-based journal rankings over time?
2. How stable are cross-discipline rankings of journals classified into multiple subject categories?
3. How stable are journaled rankings across the lists based on different ranking criteria, i.e. different impact measures and data sources?

METHODOLOGY

In 2010, SciSSRU had two departments as Science Department (7 programs) were following; Program in Chemistry, Program in Biology, Program in Industrial Microbiology, Program in Applied Physics, Informatics Mathematics, and Applied Statistics, and Applied Science department (8 programs) were following; Program in Environmental Science, Program in Biotechnology, Program in Food Science and Technology, Program in Information Technology, Program in Computer Science, Program in Home Economics, Program in Sport Science and Health, and Forensics Science. The data collected were the total publication of SciSSRU researchers between 2012 - 2010 then analyzed and classified into 8 categories following:

1. Computer and Information Technology
2. Mathematics and Statistics
3. Physics and Energy
4. Chemistry and Forensic Science
5. Biology Biotechnology and Microbiology
6. Environmental Science
7. Food Science and Technology, Home economics
8. Sports and Health Science.

It is the research work of the staff within the faculty to demonstrate that the potential of the researcher to be able to publish both nationally and internationally. It is a very important part of analytical data of the human resources section to demonstrate their academic ability and progress including to continuation or development of knowledge. The weight of the evaluation quality of the internal quality assurance criteria was fit in the 2.3 Indicators of Bureau of Higher Education Standards and Quality, Military of Education, Thailand [16].

RESULTS

1. National publication

The research results are summarized as follows in Table 1. A total of eight groups of scientific categories was published in the national journal (TCI-1, TCI-2, and TCI-3). There were published within the six-year periods from 2012 to 2017. The eight groups scientific categories were based on SciSSRU composed

with fifth teen programs of two departments which were related in subject categories. Total of national journal publication was increasing from the year 2012 is 7 papers, the year 2013 is 16 papers, the year 2014 is 20 papers, the year 2015 is 22 papers, the year 2016 is 57 papers, but year 2017 is decreased to 28 papers. The comparison of scientific categories was shown the most of publication in each year came from the Environmental Science were 38% (57/150), the second was Mathematics and Statistic 14% (22/150), and the third were Physics and Energy and Food Science and Technology, Home economics 10% (15/150) respectively. The index total National Publication per personnel staff represented in Figure 1. There were increasing from the year 2012 was 0.07, the year 2013 was 0.18, the year 2014 was 0.22, the year 2015 was 0.23, the year 2016 was 0.54, and decrease to 0.26 in the year 2017.

Table 1. Total of National Journal publication in the year 2012 to 2017 of SciSSRU staff.

Scientific Categories	National Publication					
	2012	2013	2014	2015	2016	2017
Computer and Information Technology	0	2	5	1	6	2
Mathematics and Statistic	1	2	4	4	7	4
Physics and Energy	1	0	2	1	11	0
Chemistry and Forensic Science	1	2	1	1	6	1
Biology, Biotechnology and Microbiology	0	1	3	2	3	3
Environmental Science	3	8	4	11	16	15
Food Science and Technology, Home economics	1	1	1	2	7	3
Sports and health science	0	0	0	0	1	0
Total	**7**	**16**	**20**	**22**	**57**	**28**

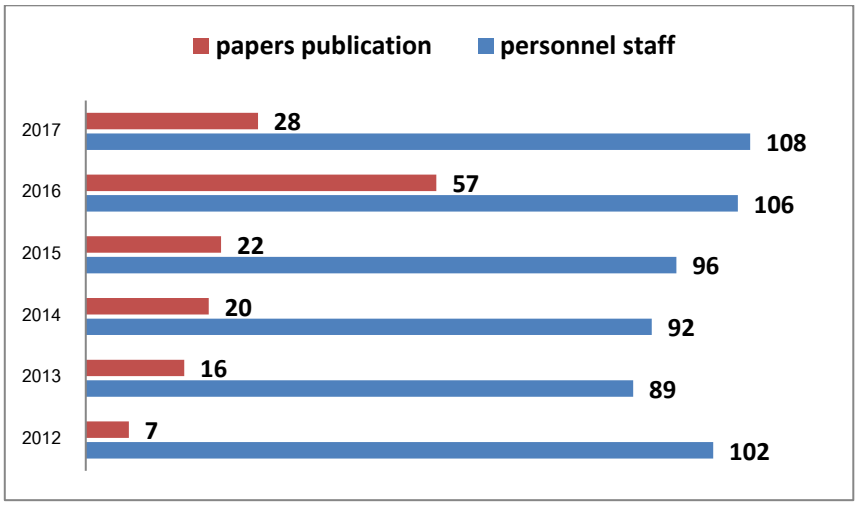

Figure 1. The bar chart of total publication in National Journal comparison with the number of personnel staffs report in between 2012 to 2017.

2. National publication

The results are summarized in Table 2. There were eight groups of scientific categories were published in the international journal. There were reported within the six-year periods from 2012 to 2017. The eight groups scientific categories as described in the related subject as the previous information. Total of international journal publication was increasing the form year 2012 is 23 papers, the year 2013 is 45 papers,

the year 2014 is 129 papers, then where the decrease in the year 2015 is 102 papers, the year 2016 is 111 papers, and the year 2017 is 81 papers respectively. The comparison of scientific categories was shown the most of publication in each year came from tree Scientific Categories were Computer and Information Technology, Chemistry and Forensic Science, and Environmental Science. There shown total publish in 6 years were 24% (121/491) in Computer and Information Technology, 18% (87/491) in Chemistry and Forensic Science, and 15% (74/491) in Environmental Science. The index of total International Publication per personnel staff represented in Figure 2. There were increasing from the year 2012 was 0.23, the year 2013 was 0.51, the year 2014 was 1.40, the year 2015 was 10.6, and decrease to 1.05 the year 2016 and 0.75 in the year 2017.

Table 2. Total of International Journal publication in the year 2012 to 2017 of SciSSRU staff.

Scientific Categories	International publication					
	2012	2013	2014	2015	2016	2017
Computer and Information Technology	11	12	30	31	20	17
Mathematics and Statistic	0	2	18	12	15	7
Physics and Energy	1	1	20	12	17	11
Chemistry and Forensic Science	3	12	24	14	25	9
Biology, Biotechnology and Microbiology	5	8	10	9	11	7
Environmental Science	3	10	19	16	10	16
Food Science and Technology, Home economics	0	0	9	6	12	9
Sports and health science	0	0	1	2	1	5
Total	**23**	**45**	**129**	**102**	**111**	**81**

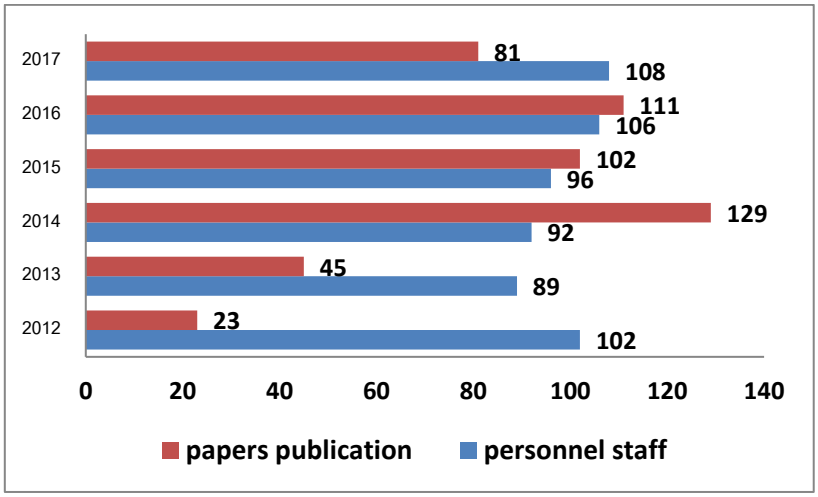

Figure 2. The bar chart of total publication in International Journal comparison with the number of personnel staffs report in between 2012 to 2017.

DISCUSSIONS AND CONCLUSION

In conclusion, we classified the publication of the researchers working at the national level and international level. The data were used from the year 2012 to 2016 for comparison the evaluation efficiency of research. The Research and Academic Service Center (SSRU) was responsible for research and academic services that support the most of research grant and also rating a research publication score in the assessment

of teaching quality of the lecturer staff of SciSSRU and also others faculties. The research database was score and evaluated rating of the University ranking such as such as Webometrics, QS Ranking, and Time Higher. The score for national publication is 0.20-0.60 unit and international publication is 0.25-1.0 unit.

The quality index unit was assessment based on publication in both national (TCI) and international (Scopus, ISI, SJR, and etc.) was represented in the year following. In 2012 represent national publication 7 papers was 1.4 units and international publication 23 papers was 12.8 units that the total is 14.2 units. In 2013 represent national publication 16 papers was 3.2 units and international publication 45 papers was 20.6 units that the total is 23.8 units. In 2014 represent national publication 20 papers was 4.0 units and international publication 129 papers was 74.00 units that the total is 78.0 units. In 2015 represent national publication 22 papers was 5.6 units and international publication 102 papers was 67.4 units that the total is 73.0 units. In 2016 represent national publication 57 papers was 14.2 units and international publication 111 papers was 70.4 units that the total is 84.6 units. In 2017 represent national publication 28 papers was 6.60 units and international publication 81 papers was 49.00 units that the total is 55.6 units respectively. The results shown in the year 2016 were the highest score was 84.6 units of quality index compare to the year 2014 was the highest total publication (national 20 and international 129) was 78.0 units.

The international publication of the quality index was important for the reference of the University Ranking in a various organization such as Webometrics, QS Ranking, and Time Higher. The Webometrics has represented SSRU is the 1st ranking for eight years out of in the 38 Thailand Rajabhat University. In 2018, SSRU was 23 country ranking and 3438 world ranking (webometrics). The overall publication and journal citation were the most score came from faculty Science and Technology SSRU.

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FACTORS THAT INFLUENCE THE DECISION TO STUDY AN UNDERGRADUATE DEGREE AT THE FACULTY OF SCIENCE AND TECHNOLOGY, SUAN SUNANDHA RAJABHAT UNIVERSITY, BANGKOK, THAILAND

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ABSTARCT

The objective of this research were to 1) study the affecting factor of students' opinions that impact for decision to study undergraduate. 2)Compare the demographic characteristics towards the decision to study of undergraduate. The samples in this study consisted of 265 first year students from Faculty of Science and Technology, Suan Sunandha Rajabhat University in 2017. The method used for sampling was stratified random sampling. The materials for collecting the data were questionnaires. The statistical methods used to analyze data were frequency, percentage, mean, standard deviation, t-test and one-way analysis of variance. The findings were: 1) the factors affecting the decision to study an undergraduate degree at Faculty of Science and Technology, Suan Sunandha Rajabhat University in the most aspects were at high level. The level of students' opinions about factors affecting the decision to study ranking from high to low were teaching and learning management, the faculty image, the environment and location of the university, cost and scholarship, public relations and person involved with students. 2)The different gender, department and grade point average from high school showed no differences of the decision to study an undergraduate degree, but information that Suan Sunandha Rajabhat University is the 1st university of all Rajabhat University was affect to factors that influence the decision, the image of the Faculty of Science and Technology, teaching and learning management, the environment and location of the university, cost of study and scholarship and public relations were statistical significant different at 0.05 level.

Keyword: Factors, Undergraduate degree, Decision

1. INTRODUCTION

In each semester, the finished high school students or equivalent from several schools that will continues to study at the undergraduate level. They will consider higher education institutions in reputable institutions or interested in the curriculum for self- development and used in the occupation as expected.

Thai population increasing rate is slowly for now and in the future. The affect in each year of the decline in the number of school-age children (ages 6-21) from 16 million in 2005 to 11 million in the year 2035 [1].

Found that the competitions among higher education institutions to attract students to their university were increasing. Higher education institutions aims to provide created graduated with quality to meet demand of the society under line of changing patterns and life learning, adaptable, virtue, responsible for the development of the country in the globalization [2].

The Faculty of Science and Technology, Suan Sunandha Rajabhat University during the past academic year there are plans to reduce student enrollment in some majors to meet the target the real number of student, and continue an aggressive publicity campaign to keep the students informed for enrollment that make researchers have the idea of conducting research on the affecting factor of students' opinions that impact for decision to study undergraduate of science and technology students, Suan Sunandha Rajabhat University, and this is also a public relations approach and a solution to reducing the number of students enrolled in some majors. It also provides information on student counseling to assist in deciding to study in the Faculty of Science and Technology. Suan Sunandha Rajabhat University

2. OBJECTIVES

1. To study the affecting factor of students' opinions that impact for decision to study undergraduate.
2. Compare the demographic characteristics towards the decision to study of undergraduate.

3. METHODS

The samples in this study consisted of 265 first year students from Faculty of Science and Technology, Suan Sunandha Rajabhat University in 2017. Determine the sample size by using the Yamane formula. [3] at 5% tolerances for stratified sample and the tools of data collection was a questionnaire. This research study the affecting factor of students' opinions to decision study undergraduate of 6 perspective detail following the image of the Faculty, teaching and learning management, the environment and location of the university, cost of study and scholarship , public relations and person involved with students. The statistical methods used to analyze data were frequency, percentage, mean, standard deviation, t-test, one-way analysis of variance, and the statistical significance was calculated at the 0.05 level.

4. RESULTS

Part 1 The results of demographic characteristics analysis of the 265 samples, who are first year students from Faculty of Science and Technology, Suan Sunandha Rajabhat University consisted male 136 students (51.32%) and females was or 129 students (48.68%). The group of sample come from 2 departments, 219 students (82.64%) study in department of Applied Science and 46 students (17.36%) study in science department. The average GPA of high school was show 2.50-2.99 totally 109 students, (41.13%), followed by 100 students (37.74%) that show the average GPA more than 3.00, for student that GPA lower than 2.50 was 56 students (21.13%). They know that The Suan Sunandha Rajabhat University is first-ranking of Rajabhat University in Thailand the percentage was show 94.34 % from 250 students and the percentage unknown people was 5.66 % calculated from 15 students.

Part 2 The results of the analysis show the opinions level of first year students on the effect factors that impact to student for decision study undergraduate in Faculty of Science and Technology, Suan Sunandha Rajabhat University within 6 perspective As following first, teaching and learning management (= 4.12, S.D. = 0.61), was followed by the faculty image (=3.95 S.D. = 0.57), The environment and location (= 3.92, S.D. = 0.62), cost and scholarship (= 3.78, S.D. = 0.71), then related with the public relations (= 3.76, S.D. = 0.73), and last was the person involved with students (= 3.53, S.D. = 0.86).

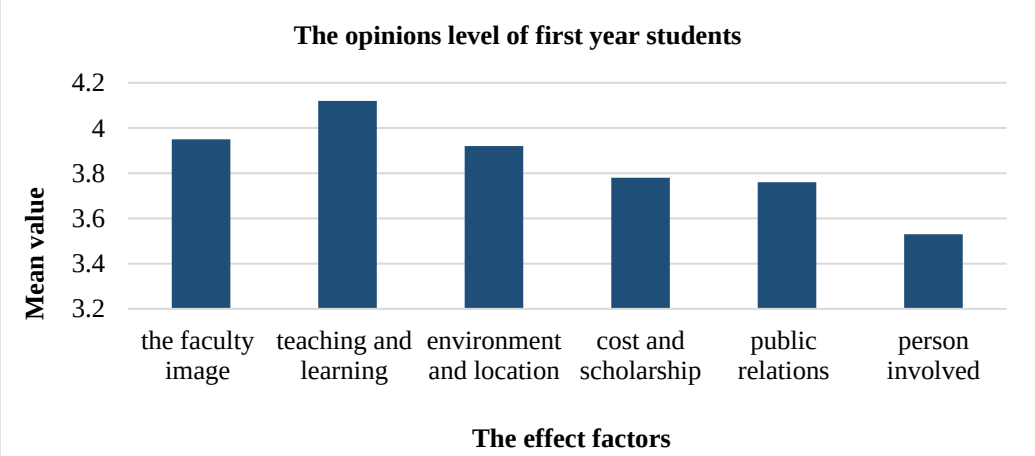

Figure 1. The analysis show the opinions level of first year students on the effect factors that impact to student for decision study undergraduate in Faculty of Science and Technology, Suan Sunandha Rajabhat University

Form the figure 1 show that the result of each accept following, first is teaching and learning management ($\overline{X}$ = 4.12, S.D. = 0.61), was followed by the faculty image ($\overline{X}$ =3.95 S.D. = 0.57), The environment and location ($\overline{X}$ = 3.92, S.D. = 0.62), cost and scholarship ($\overline{X}$ = 3.78, S.D. = 0.71), then related with the public relations ($\overline{X}$ = 3.76, S.D. = 0.73), and last was the person involved with students ($\overline{X}$ = 3.53, S.D. = 0.86).

Part 3 The comparative analysis results of students' opinions on factors affecting decision to study at undergraduate of first year students of Faculty of Science and Technology Suan Sunandha Rajabhat University classified by demographic characteristics. The t-test was used to analyze the difference the mean of the two groups and the one-way analysis of variance was used for find the average of samples.

Table 1. Comparative Analysis of Students' Opinions about the factors affecting the decision to study the undergraduate degree classified by Gender

The factors affecting the decision to study the undergraduate degree	Male		Female		t	p-value
	$\overline{x}$	S.D.	$\overline{x}$	S.D.		
1. The faculty image	3.99	0.58	3.98	0.57	0.202	0.840
2. Teaching and Learning management	4.08	0.62	4.15	0.61	-0.934	0.351
3. The environment and location	3.91	0.62	3.93	0.71	-0.172	0.864
4. Cost and scholarship	3.75	0.73	3.85	0.69	-1.240	0.216
5. Public relations	3.81	0.66	3.70	0.80	1.290	0.198
6. Person involved with students	3.55	0.84	3.50	0.89	0.549	0.583

From Table 1, the results analyze of students' opinions about the 6 factors affecting the decision to study the undergraduate degree classified by Gender. The findings were different gender showed no differences of the decision to study an undergraduate degree.

Table 2. The comparative analysis results of students' opinions on factors affecting decision to study at undergraduate classify by department

The factors affecting the decision to study the undergraduate degree	Science		Applied Science		t	p-value
	$\overline{x}$	S.D.	$\overline{x}$	S.D.		
1. The faculty image	3.88	0.61	4.02	0.56	1.578	0.116
2. Teaching and Learning management	4.10	0.57	4.12	0.63	-0.203	0.839
3. The environment and location	3.95	0.76	3.91	0.63	0.332	0.740
4. Cost and scholarship	3.83	0.74	3.80	0.71	0.449	0.653
5. Public relations	3.80	0.92	3.75	0.68	0.382	0.704
6. Person involved with students	3.51	0.99	3.53	0.83	-0.107	0.915

From Table 2, the results of the comparative analysis of students' perceptions of the factors influencing the decision to study at the bachelor level in all 6 aspects were classified by department did not difference.

Table 3. The comparative analysis results of students' opinions on factors affecting decision to study at undergraduate classify by GPA in high school.

The factors affecting the decision to study the undergraduate degree	Less than 2.50		Between 2.50-2.99		More than 3.00		F	p-value
	$\bar{x}$	S.D.	$\bar{x}$	S.D.	$\bar{x}$	S.D.		
1. The faculty image	3.95	0.68	3.98	0.50	4.02	0.60	0.345	0.708
2. Teaching and Learning management	4.02	0.76	4.15	0.54	4.14	0.60	0.848	0.430
3. The environment and location	3.88	0.75	3.94	0.65	3.92	0.62	0.176	0.839
4. Cost and scholarship	3.71	0.79	3.75	0.68	3.90	0.70	1.617	0.200
5. Public relations	3.65	0.78	3.75	0.71	3.82	0.73	0.996	0.371
6. Person involved with students	3.49	0.98	3.53	0.78	3.55	0.88	0.088	0.916

From Table 3, the results of the comparative analysis of students' perceptions of the factors influencing the decision to study at the bachelor level in all 6 aspects were classified by GPA in high school did not difference.

Table 4. The comparative analysis results of students' opinions on factors affecting decision to study at undergraduate classify by knower and unknown people that Suan Sunandha Rajabhat University is first-ranking of Rajabhat University in Thailand.

The factors affecting the decision to study the undergraduate degree	Know		Unknow		t	p-value
	$\bar{x}$	S.D.	$\bar{x}$	S.D.		
1. The faculty image	4.01	0.57	3.55	0.52	3.118*	0.002
2. Teaching and Learning management	4.14	0.60	3.78	0.67	2.187*	0.030
3. The environment and location	3.94	0.66	3.59	0.50	2.033*	0.043
4. Cost and scholarship	3.82	0.71	3.37	0.66	2.445*	0.015
5. Public relations	3.78	0.73	3.37	0.72	2.128*	0.034
6. Person involved with students	3.53	0.87	3.44	0.70	0.397	0.692

* Significance at the 0.05 level

From Table 4, the comparative analysis results of students' opinions on factors affecting decision to study at undergraduate classify by knower and unknown people that Suan Sunandha Rajabhat University is first-ranking of Rajabhat University in Thailand. Influence of decision making on bachelor degree in different aspects of the faculty image, teaching and learning management, the environment and location, cost and scholarship, and public relations at 0.05 significance, it was found that the first ranking of Suan Sunandha Rajabhat University was impact with the decision to choose study at undergraduate than the unknown.

5. CONCLUSION AND FUTURE WORK

The results of study analysis the samples was consisted of 265, who are first year students from Faculty of Science and Technology, Suan Sunandha Rajabhat University. Found that all aspects factors are most important for making decision to Study at a Bachelor's Degree. The teaching and learning process that can make the curriculum is tailored to the needs of the learner, achieve learner believe in the effectiveness of courses taught in the faculty, and can be completed within the specified period. This is consistent with [4]. The study factors affecting the selection of higher education at Dhurakij Pundit University. Found that the curriculum is important because after graduation it can help the graduated to study in a higher level, to be accepted by the society, and the can get good career. Next followed by the image of the Faculty of Science and Technology is the first rank of Rajabhat University, in line with [5], studied factors influencing the decision to study in higher education of high school students in the Silpakorn University Demonstration School found that the students placed high priority on the Institute credibility, well known to the public, and including

the confidence that after graduation they will have a job, then continue respectively with the environment and location of the university, cost and scholarship, public relations, and the person involved with the students.

After comparative analysis results of students' opinions on factors affecting decision to study at undergraduate classify by knower and unknown people that Suan Sunandha Rajabhat University is first-ranking of Rajabhat University in Thailand. It was found that this is impact with decision making on bachelor degree than the unknown in aspects following the faculty image, teaching and learning management, the environment and location, cost and scholarship, and public relations at 0.05 significance.

From result analysis, Suan Sunandha Rajabhat University, it should to publicized about teaching and learning process, making good image of the Faculty of Science and Technology, including with public relations should be added to the reputation to continuously first-ranking of Rajabhat University in Thailand and to support under the decision of student to study a bachelor degree in Faculty Science and Technology, Suan Sunandha Rajabhat University.

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A MIXED-METHOD STUDY ON AGING-IN-COMMUNITY FACTORS AMONG OLDER ADULTS IN TWO VILLAGES IN FLORIDA, USA

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ABSTRACT

Purpose: This convergent mixed method research study examines how key factors related to aging-in-community differ in two villages in Central Florida. Villages are a new, consumer directed organization that aim to promote aging-in-community through a combination of social engagement, member-to-member support, and collective bargaining for services. Methods: Validated neighborhood social cohesiveness (NSC) (4-item), remaining independent (RI) (3-item), and quality of life (QOL) (13-item) scales were used. Members and volunteers from the Thriving-In-Place (TIP) and Neighbors Network (NN), both are members of the National Village-to-Village (VtV) network, participated. Qualitative open-ended questions on aging-in-place barriers and strategies were asked to gain deeper understanding. Results: A total of 96 members participated. Majority of the participants were white (93%), female (84%), college education (87%), and retired (70%) (n=70). Although NN members were older, less likely to be married, more likely to live alone, quantitative data didn't show statistically differences. Overall, TIP members perceived higher neighborhood social cohesiveness (18.09 vs. 13.91; $p<.001$), higher remaining independent scores (11.5 vs. 8.5; $p=.002$), and higher perceived QOL (3.50 vs. 3.22; $p=.020$). TIP members mentioned fewer barriers; whereas NN members voiced more health concerns including wheelchair bound, chronic illness, needing personal care and home help, etc. TIP members also suggested providing more health promotion activities; whereas NN members receiving government subside services voiced significant concerns with paid home help and strong need for affordable, dependable, and motivated housekeeping workers. Discussion: Results showcase each village is unique in its characteristics. The convergent mixed method research integrating both quantitative and qualitative data provided deeper insights and understanding of the complex factors influencing aging in community among village program members.

Keywords: village movement, aging in place, older adults, mixed methods research

INTRODUCTION

1.1. Older Adults Prefer Aging-in-Community (AIC)

The U.S. current older adults population (age 65 and over) has increased to over 14% making American an "aged society", and its older adult population is estimated to grow to over 21% in 2040, which will make American a "super-aged society" [1, 2]. Data show that over 90% of the older adults prefer aging with quality of life via continue staying in their own homes as long as possible, i.e. aging in place or aging in own home [3]. Centers for Disease Control and Prevention (CDC) defined age in place as "the ability to live in one's own home and community safely, independently, and comfortably, regardless of age, income, or ability level" [4].

1.2. Factors Effecting Aging-in-Community

This study discussed three important factors related to aging in community (AIC). Specifically, we examined neighborhood social cohesiveness (NSC), remaining independent (RI) at own home and community, and quality of life (QOL) among members from two village program in Florida USA.

The Village model is a consumer-driven approach aimed at increasing QOL among older adults through providing a supportive environment and community services [9]. A survey among 282 active village members showed that over 50% of the members reported village program improved their QOL [5]. In addition, studies also show village programs help promote social connection as well as remaining independent at own home and community [5, 6]. Minimizing the risk of disability or maintaining independence is one of the core components of successful aging [5]. Meaningful social interactions are critical in the lives of older adults to prevent isolation as they aging in place or community [6]. A study conducted in the Netherlands showed that NSC can predict the well-being of older adults, and even the effect of marital status and income on well-being were mediated by NSC [7].

1.3. Community-based Programs Promoting AIC

Community-based models integrated both health and community supports together, have potential to improve NSC, RI and QOL and facilitate aging in place among older adults. Some of the community-based models include modern cohousing and livable communities, which mainly focus on government-initiated planning efforts to change cities' physical and social infrastructures [11]. Modern cohousing provides a form of collaborative housing to build social contact among community members while preserving and respecting individual privacy [12]. A livable community provides affordable and appropriate housing and transportation options, and offers supportive community features and services. These resources intend to enhance personal independence, social engagement and allow residents to age in place or community [13]. In addition, public housing provides low income older adults with affordable housing opportunities, along with congregate meals and therapeutic recreation services [8].

Besides these government-initiated program efforts, Village model, started in 2001, is an emerging consumer-driven network that aim to promote aging-in-community through a combination of social engagement, member-to-member support, and collective bargaining for services [14]. The Village Movement commonly involves a group of residents in a given community, typically age 50+ years, form a non-profit membership organization to provide access to services that support their remaining at own home as long as possible, before they have to move to senior housing or assisted living. The models involve grass-roots programs, run by trained volunteers and paid staff to connect members with free/low cost/or discounted services as needed, and also coordinate village-wide programs and activities [14]. Unlike government-initiated models, Village model is for everyone including middle-income older adults who are often not qualified for public programs [9]. Older adults do not need to move to another place and can receive community-based services, such as transportation, house maintenance, companionship, as well as referrals to existing community services [9]. This model may help addresses the increasing government financial challenges caused by the increasing aging population [1].

1.4. Gap on Existing Literature

Despite the growth of the village movement, there has been limited studies examining the impact of village programs on social connectives, remain independent, and quality of life among members. Although all villages have the common goal to prevent institutionalization, there is a great variation in the organization structure and service provided as each village adapts available resources to address unique needs in the neighborhood community it serves [15]. It remains unclear whether village programs contribute to positive member outcomes in different environmental contexts [15]. This study used a mixed method to compare and contrast two open villages in Central Florida, the Thriving-In-Place (TIP) and Neighbors Network (NN) villages. The current study examines demographic characteristics, services used and suggested, as well as the three critical factors influencing aging in community (NSC, RI and QOL) among the two villages. This study used a convergent mixed methods research design, collecting both quantitative and qualitative data on the same research focus, intends to provide more comprehensive understanding and insights on the impact of the village programs than either quantitative or qualitative approach alone can offer. This study will allow those who are interested in the village model to have a deeper understanding of the complex relationships and impact different village programs had among members.

METHODS

2.1 Sample

This is a cross-sectional study of two social engagement networks of older adults residing in the Central Florida area. TIP and NN are the first two open village members of the National Village to Village Network

(VtVN) in Florida and participated in the study. Both TIP and NN are still relatively young, and each had about 50+ members at the time of the study.

The Thriving Committee, was formed in early 2012. The Thriving in Place program was developed in 2012, under the direction of the Celebration Foundation, based on the national movement of community villages supporting individuals as they age to stay in their own homes. TIP tries to address the needs of the rapidly aging group in the community, and is a full member of the VtVN, a national association of Villages. TIP had about 50 members and 70 volunteers at the time of the study.

NN village is a non-profit member organization for adults 55+ who live in Winter Park, Maitland, and close-by neighborhoods. NN provides access to vetted service providers when necessary and includes group activities and local events for their members. NN also had about 50 members and 30 volunteers at the time of this study, and is also a full member of the VtVN.

The TIP and NN villages consist of different member and community characteristics which allowed this study some variability to analyze how village model may play a role among seniors with difference characteristics, as well as in different community context and environment.

2.2 Measures

Validated neighborhood social cohesiveness (NSC 4-item), remaining independent (RI 3-item), and quality of life (QOL 13-item) scales were used. Qualitative open-ended questions on aging-in-place barriers, services used, and services suggested were asked to gain deeper understanding of factors related to aging-in-community among village program members.

Demographics information, including age, gender, race, marital status, education, and living arrangement, was gathered. Besides, self-reported health status was assessed using a single-item question "would you say your over- all physical health is: poor, fair, good, very good, and excellent"? [16].

The NSC is adapted from the National Health Interview Survey (NHIS). Participants were asked whether they agreed or disagreed with these statements: "1) People in this neighborhood help each other out; 2) There are people I can count on in this neighborhood; 3) People in this neighborhood can be trusted; and 4) This is a close-knit neighborhood" [17]. The internal consistency of the items in this scale is high (Cronbach's α =0.93) [17].

RI in own home scale was a 3-item research tested scale used in village member samples (range 4-12, Cronbach's alpha=.660) [5]. The scale was calculated by summing scores to participants' agreement level (1 = strongly disagree, 2 = disagree, 3 = agree, 4 = strongly agree) with three statements: "I have an easier time taking care of myself than I used to," "I have an easier time taking care of my home than I used to," and "I am more likely to be able to stay in my own home as I get older" [5].

The 13-item 5-point Likert scale Older People's Quality of Life scale (OPQOL-brief) was used to measure QOL among participants [18]. This validated scale has satisfactory reliability (Cronbach alpha =.856) [18].

Open-ended questions on barriers towards remaining independence, current services / programs used, services suggested, to provide researchers deeper insights on the study topics.

2.3 Data Analyses

Descriptive statistics were used to describe the study sample. T-tests were used for continuous variables and chi-square were used for dichotomized variables to compare study variables between the two villages. Linear regression analyses were used to examine how social cohesiveness, remain independent, village, predicted our two dependent variables quality-of-life and health, adjusting for age and marital status. Qualitative data on AIP related factors (barriers towards remain independent, current services used, services wished) were analyzed via open, axial, and selective coding among participants enrolled in the two village programs to gain deeper insights on AIP related issues. Results were interpreted via considering both the quantitative statistics along with qualitative code / themes identified. All data were de-identified before analyses.

RESULTS

Majority of the participants were white (93%), female (84%), college education (87%), and retired (70%) (n=96). About two-thirds of the participants were from the Thriving village (65%). Overall 57% were married, 66% were volunteers, and 46% reported lived alone. Overall 23% were less than 65 years (pre-old), 40% were in young old age (65-74 years), 30% were in old age (75-84 years), and 8% were in the oldest old age (85+ years). Almost everyone (90%) reported regular annual health check-ups. Statistics showed that there were no significant differences on age, marital status, education, volunteer, or living alone status by villages. In general, participants from both villages rated their overall health above average (mean of 3.68 on a 5-point Likert scale), with no statistical differences (Table 1).

Despite similarities on these many demographics variables and health status between villages, self-reported quality-of-life score were significantly different. Although participants from both villages overall reported high QOL, Thriving members rated higher QOL than NN members (4.57 vs. 4.10 on a 5-point Likert scale; p=.026). In addition, TIP members also perceived higher neighborhood social cohesiveness (NSC) (16.64 vs. 14.10; p<.001) and remaining independent (RI) (10.77 vs. 7.93; p=.005) (see Table 1).

Table 1. Demographics and Aging-in-Place Factors by Villages

Variables	Thriving Village	NN Village	p-value
Age (years)	70.93 (9.108)	72.19 (10.212)	.549
Marital (yes %)	62.1%	41.9%	.069
Education (% college+)	83.9%	87.1%	.924
Lived alone (yes %)	40.5%	53.1%	.279
Volunteer (yes %)	71.2%	59.4%	.252
QOL	4.57 (.602)	4.10 (1.029)	.026*
Perceived Health	3.79 (1.056)	3.42 (1.336)	.183
Remain Independence (RI)	10.77 (2.121)	7.93 (3.025)	.005**
Social Cohesiveness (NSC)	16.64 (3.142)	14.10 (3.809)	.001**

QOL = Quality-of-Life (5-Likert scale); Perceived Health (5-Likert scale)
* P<.05; ** p<.01

Univariate analyses showed that both RI and NSC were independently associated with QOL. However, after adjusting age and marital status, and putting RI and NSC together in the regression models, results showed that only RI remained as a significant factor predicting QOL (p=.009). For perceived health status, univariate analyses showed that only RI was a significant predictor, but not NSC. After adjusting for age and marital status, and adding NSC into the model, regression results showed that RI still remained as a significant predictor for perceived health status (p=.002) (Table 2).

Table 2. Linear regressions of RI, SC, adjusting for age and marital status on QOL and perceived health.

IV	**Model 1 (QOL)**		**Model 2 (Perceived Health)**	
	beta	***p-value***	***beta***	***p-value***
RI	.389	.009**	.433	.002**
SC	.034	.819	-.058	.679
Age	-.026	.868	-.086	.560
Marital	.288	.060	.282	.053

Qualitative analyses showed that the top three barriers towards aging in place among TIP were house mobility (39.3%), help needed (33.3%), and house maintenance (15.2%); while among NN, health issues (31.3%) was the biggest barriers, followed by house mobility (28.1%), and house maintenance (25.0%).

Most commonly used services in both village groups was housekeeping (TIP: NN = 44.2% vs. 34.8%) or existing village services including transportation (19.2% vs. 26.1%). TIP members also often used caregiving or health advise (19.2%) and financial management (19.2%). NN members, on the other hand, used more landscape or yard or pool services (21.7%), and personal care (13.0%). For services suggested, house help was an overwhelming suggested (TIP vs. NN = 42.4% vs. 68.9%). Participants need helpers with activities that require climbing ladders or lifting heavy items or yardwork and clearing (TIP #75, 79, 86; NN#21, 25, 27, 29, 32, 33, 59), as well as home meal services (TIP #10, 14, 37). In addition, reliable and dependable helpers were particularly voiced by NN members (NN#4, 47, 62). There were significant concerns towards existing helpers from agencies not being reliable, competent, or good motivation to do simple tasks. Consequently, participants felt frustrated and stressful about having to constantly supervise, watch, or correct the work these helpers did.

Social activity was another commonly suggested service by both village members to help them stay connected. TIP members would like to see more health promotion or safety services including fall prevention, tips to modify home environment such as chair rides to upper floors, physical activities or mental health services (TIP #6, 7, 15, 22, 36); while these were not mentioned among NN members.

DISCUSSION

Respondents in this study were majority White (93%), female (84%), and had a college education (87%). Theses demographic characteristics were similar to a previous California village study [5]. Older adults were often characterized by gradual reductions in social networks [6] and increase in Chronic diseases both are barriers to RI and maintaining a high QOL [5]. The village programs strive to build social connections and provide volunteer opportunity and community services to strengthen these areas [7, 10]. In the current study, two villages scored significantly differently. TIP members perceived significantly higher NSC scores (18.09 vs. 13.91; p<.001), higher RI scores (11.5 vs. 8.5; p=.002), and higher perceived QOL scores (3.50 vs. 3.22; p=.020). These may partly due to the young villages in years of operation and also members were at younger age at village T, in addition to the differences on the built environment of the two village communities. A 12-month follow-up longitudinal study among seven villages also found that social contact declined significantly compared with the baseline data [19]. The result indicated that when people get older, health or physical ability may also decline, and those changes may weaken social connectedness [19]. The higher linkage on NSC and QOL in village T was consistent with existing finding [7], although this was the first village study specifically measuring and examining NSC and QOL.

In a recent Graham's village study measured RI showed that the total RI score was 7.38.mean [5], which is lower than 11.5 among TIP members and 8.5 among NN members in the current study. One main reason may because participants are older in Graham's study, with 41.5% in old old (75-84 years) and 30.1% in the oldest old age groups (85+ years) [5]. Whereas in the current study, data showed about 30% members were in old age (75-84 years), and only 8% were in the oldest old age (85+ years).

A small sample study in Turkey compared the older adults living in nursing home (n=33) and living at home (n=25) surprisingly found that home-dwelling residents had lower functional mobility and independence level than the nursing home residents (95% CI: -4.88, -0.29 and 0.41, 6.30, respectively). Yet data also showed that nursing home residents had more depressive symptoms (95% CI: 0.30, 5.45), and lower QOL (95% CI: -15.55, -2.93) [20]. One possible reason maybe that, in Turkey, older people living at home may have more interaction with their family members, and receive more help in daily activities from family. [20]. Despite scored lower on independence, The Turkey study data showed older adults living at home had a relatively higher QOL and mental health [20]. Still, remaining independent (RI) is an important aspect of QOL and was positively associated with mental health [18]. Current regression data showed that RI is the single most important factor predicting both QOL and perceived health status. Thus, if RI can be improved through village program, QOL and mental health maybe improve according for community dwelling older adults to aging-in-place.

Although health status was not significant by village, NN members significantly voiced health issues influencing mobility as the biggest AIP barriers, and also reported use of existing services more often. Data showed that house mobility was a significant barrier among both villages. These include stairs, bedrooms on the 2nd floor, or bathroom support handles, or wheelchair accessible environment, etc. House maintenance included managing space, yard, pools, or household related helps. Current qualitative data showed that NN members significantly used these services more. Consistent with the quantitative data regression analyses showing the importance of RI, top priority services suggested from the current qualitative data were overwhelmingly in-house help related to mobility and remaining independent. Although neighborhood social cohesiveness became not significant in the quantitative regression analyses results after adjusting for RI and demographics, current qualitative findings showed social services providing social cohesiveness was the 2nd highest priority services suggested that should not be overlooked.

The quantitative and qualitative methodology provided complementary pictures to explain the results and deeper understanding of the unique context of each village. Quantitative findings showed that TIP residents scored higher at NSC, RI and QOL, and qualitative findings further confirmed that they mentioned fewer barriers and fewer needs related to aging-in-place compared with NN. TIP members specifically suggested health promotion programs whereas NN members receiving existing government-subside assistance voiced significant concerns with paid home help and a strong need for affordable housekeeping workers and health related services. One main reason may be that the members of NN are older with lower perceived health condition, and this community is also located at a more diverse area with greater needs compared with TIP, which is in a wealthier community.

Although village program does not normally provide disease management or health-related services [10], based on the current qualitative data, older adults do desire health promotion services, especially when the majority of village members are younger. In particular, current study suggests for younger villages like TIP, health promotion programs may need closer attention and support. Future research should further examine barriers, needs, and services important for village programs helping older adults aging-in-community. Current findings provide supporting data highlighting that each village may have its own unique characteristics and member needs. Study show that members' age, health condition, RI and NSC are all

important factors to consider for program development and services provision. Continued attention is also needed for adapting and addressing the changing needs as members aging in the community.

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A STUDY ON THE CLASSIFICATION OF COUNTRIES OPERATING NPPs: AN APPLICATION OF FUZZY-SET IDEAL TYPE ANALYSIS

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The purpose of this study is to classify the types of countries that operate nuclear power plants and to analyze the changes in nuclear energy policies by using the fuzzy-set ideal type analysis, which is a methodology developed to overcome the limitations of the existing typology approach.

According to the prior study on the factors influencing the nuclear power plant policy, the ideal type of countries operating NPPs was configured by using three dimensions, which are defined as, respectively: C (regulatory pressure in response to climate change), S (energy security), and E (economic factor).

The findings of the analysis showed that the United States and Japan are classified as countries that have high-impact from regulatory pressure in response to climate change and economic factors, but have low-impact from energy security. Countries classified with having high-impact from regulatory pressure in response to climate change and energy security, but have low-impact from economic factors include China, India, Pakistan, South Africa, and Spain. Countries classified with having low-impact from regulatory pressure in response to climate change, energy security, and economic factor include Germany, Switzerland, Belgium, Czech Republic, and Finland.

The ideal types were constructed and was followed by a subsequent evaluation regarding policy changes of respective countries categorized within each ideal type

CONSUMER ATTITUDE AND BEHAVIOR TOWARD SUSTAINABLE PRODUCTS

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ABSTRACT

Abstract— Although many consumers had positive attitudes toward sustainable products, they often ended up not purchasing them. This study is to explain the purchase gap between purchase intention and purchase experience of these sustainable fashion products. This study focuses on exploring this attitude-behavior gap of consumers with regards to both recycled and upcycled fashion products. The results indicate that antecedents of purchase intention were different from those of purchase experience and that influencing factors for recycled products were different from those for upcycled products. This study provides insights into understanding consumers and developing effective strategies to encourage sustainable consumption.

Keywords— Consumer behavior, Purchase gap, Sustainable products

A FACULTY DEVELOPMENT MODEL: MOVING FROM "DOING FOR" TO "DOING WITH".

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ABSTRACT

Institutions of higher education globally have professional development programmes for faculty members, usually coordinated and initiated by a central teaching-learning centre. Although these programmes do have an influence in improving the quality of teaching and learning, many faculty members are discipline experts that lack respect for and knowledge of pedagogy or do not attend generic professional development opportunities organised by teaching-learning centres. Literature suggests moving from doing things for faculty approach to a working with faculty approach. The aim of a team of academic developers and a lecturer at the Centre for Teaching and Learning at a South African University was to develop a framework for faculty based support and development that would be acceptable to all stakeholders. A collaborative approach was followed by investigating current faculty approach practices and challenges experienced. Themes were identified by analysing the data using manual coding. A creativity activity to spark new ideas rendered innovative thoughts that were categorised into more themes. This was followed by a literature search and main ideas that emerged were noted. Five main models of professional development emerged, namely an academic development led approach, a faculty led model, a top-down institutional approach, community building model and a research based model. The main characteristics of each model corresponding with the previously identified themes were noted and the team decided to follow an assimilated approach in developing the Integrated Faculty Development model. The model that will be discussed in more detail during the presentation is underpinned by six principles: faculty directed, collaborative, developing teaching-learning communities, research based, strategically driven and fundamental academic development. Cultural Historical Activity Theory was used as theoretical framework for the Integrated Faculty Based model. The model was shared with institutional management and some faculty members as a pilot and feedback received was very encouraging.

Key words: professional development, faculty based model, teaching-learning

INDUCTION PROGRAMME FOR FACULTY: DOES IT ADD VALUE?

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ABSTRACT

An ever changing higher education landscape, brings about new challenges regarding teaching-learning in preparing students for the twenty-first century society. Institutions preparing faculty members to ensure high quality teaching-learning use induction programmes to address this need. An induction programme at a South African higher education institution included a three day workshop, lesson observations and submission of a portfolio of evidence. A crucial aspect of professional development programmes is the evaluation of the effectiveness of such programmes. A three year longitudinal study, where Guskey's model was applied, was conducted to determine the value of the induction programme. Data was collected from 164 newly appointed academics from various faculties as well as their students. Data collection instruments included questionnaires, lesson observations and document analysis. Findings indicate that the participants found the programme relevant, applicable and useful. The average satisfaction rate of the three day workshops was 91%. Participants also indicated that they had the opportunity to network and reflect on their own practice. Lesson observations and student responses after the intervention showed that participants were well prepared, catered for different learning styles, applied various technologies in their teaching-learning and encouraged student engagement. Challenges identified were heavy workloads affecting planning, inadequate resources hindered integration of technology and management of large classes remained a problem. In conclusion we found that induction programmes do add value to the design and implementation of meaningful teaching-learning experiences, but that they should be evaluated regularly to stay relevant and address challenges.

Keywords – Effectiveness, Evaluation, Induction programmes, Professional development

DISTRIBUTION-FREE EWMA CONTROL CHARTS FOR MONITORING PROCESS VARIABILITY

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ABSTRACT

Abstract—Distribution-free control chart is an oncoming area from the statistical process control charts in recent years. Some researchers have developed various nonparametric control charts and investigated the detection capability of these charts. The major advantage of nonparametric control charts is that the underlying process is not specifically considered the assumption of normality or any parametric distribution. In this paper, two nonparametric exponentially weighted moving average (EWMA) control charts based on nonparametric tests, namely NE-S and NE-M control charts, are proposed for monitoring process variability. Generally weighted moving average (GWMA) control charts are extended by utilizing design and adjustment parameters for monitoring the changes in the process variability, namely NG-S and NG-M control charts. Statistical performance is also investigated on NG-S and NG-M control charts with run rules. Moreover, Sensitivity analysis is performed to show the effects of design parameters under the nonparametric NG-S and NG-M control charts.

Keywords- ***Distribution-free control chart; EWMA control charts; GWMA control charts.***

I. INTRODUCTION

he exponentially weighted moving average (EWMA) chart was first introduced by Roberts [1] and has been Twidely used to improve the quality of a product or a manufacturing process when small process shifts. As a rule, most control charts assume processes follow a normal or specified probability distribution. However, in reality there is often limited or no information about the underlying process distribution. Hence, applying a nonparametric approach to establish control charts seems a reasonable alternative when the distribution of observations is non-normal or unknown.

The main advantage of a nonparametric control chart is that it does not assume any probability distribution for the characteristic of interest. Chakraborti et al. [2] gave a formal definition of nonparametric or distribution-free control chart is given in terms of its in control run length distribution. Subsequently, many nonparametric control charts are based on sign and/or rank statistics for monitoring process mean (location). Some of nonparametric control charts are based on either Wilcoxon signed-rank or rank-sum of the observations, such as Bakir [3-4], Chakraborti and Eryilmaz [5], Balakrishnan et al. [6], Li et al. [7], Graham et al. [8], Ghute and Shirke [9]. They showed that the charts perform well in detecting mean shifts and perform better than parametric counterparts when the process output is nonnormal. The case of nonparametric control charts based on the sign statistics includes Amin et al. [10], Amin and Widmaier [11], Khilare and Shirke [12], Human et al. [13], Graham et al. [8]. They showed that the proposed sign chart has superior performance when the underlying process distribution is heavy tailed or highly right skewed.

With respect to monitoring unknown distribution process variability, Lehmann [14] suggested using non-parametric tests for the equality of two variances for use as control statistics in nonparametric control charts. Control charts using tests statistics for comparing two variances would require obtaining an initial sample size m when the process is in-control. Then at each sample time i, a sample of size n is obtained from the process, and the pooled sample of size $(m + n)$ is obtained. The observations in the pooled sample then are ranked from smallest to largest, and the statistic based on the ranks of the observations is calculated. Das [15] studied the efficiency of nonparametric control charts using a two-sample variability study. Das and Bhattacharya [16] developed a nonparametric control chart based on Conover's squared rank test for controlling variability. They were able to show that the chart was more efficient than the Shewhart S^2 chart in detecting process variability. Murakani and Matsuki [17] proposed a nonparametric control chart for dispersion based on the rank sum statistic. Later, Shirke and Khilare [18] presented nonparametric synthetic control charts for process variation. They compared their statistical performance with the Shewhart sign and S^2 charts and proved that the proposed charts were better equipped to detect out-of-control signals.

Recently, Ghute [19] proposed the nonparametric control chart (NP-S chart); similarly, Zombade & Ghute [20] introduced the NP-M chart for monitoring process variability. These two charts are established at two sample nonparametric tests and usually location parameter is under control. Numerical simulation indicates that the NP-M control chart is more efficient than NP-S control chart for detecting shifts in process variability for different process distributions. Both NP-M and NP-S control charts perform better when underlying process distribution is light tailed.

To improve the detection ability of process variability, the nonparametric EWMA control chart based on Sukhatme [21] (namely, NE-S) and Mood [22] (namely, NE-M) statistics are presented respectively in this paper. In addition, the proposed charts are maintained at near in-control ARL and then assessed the out-of-control ARL under different underlying distributions including normal, double exponential and uniform with mean zero and variance one. The uniform distribution is considered to see the effect of a light tailed distribution and double exponential distribution is considered to see the effect of heavy tailed distribution on the performance of proposed nonparametric control charts.

The rest of this paper is structured as follows. Section 2 proposes the nonparametric NE-S chart. In Section 3 introduces the nonparametric NE-M chart. The results of a simulation study are presented in Section 4 to compares the performance of the nonparametric NE-S and NE-M charts in terms of their average run lengths (ARLs) and conclusion is provided in Section 5.

II. NONPARAMETRIC NE-S CHART

Sukhamte [23] proposed a nonparametric test for two independent samples variance. According to Sukhamte's introduction, one wants to compare two independent random samples $X=(X_1,X_2,...,X_m)$ and $Y=(Y_1,Y_2,...,Y_n)$ which are drawn from only scale shifts of absolute continuous distributions. Let σ_X and σ_Y be the arbitrary measures of dispersion of X and Y respectively. The Sukhamte test statistic for testing null hypothesis ($H_0:\sigma_X=\sigma_Y$) is defined as,

$$S=\frac{1}{mn}\sum_{i=1}^{m}\sum_{j=1}^{n}D(X_i,Y_j), \qquad (1)$$

where $D(X,Y)=\begin{cases}1, & if\ 0<X<Y\ or\ Y<X<0\\ 0, & otherwise\end{cases}$

The mean and variance of the statistic S is given by

$$\mathrm{E(S)}=\frac{1}{4}$$

$$Var(S)=\frac{(m+n+7)}{48mn}$$

The statistic of the nonparametric EWMA control chart (NE-S) for monitoring process variability is defined as:

$$Z_t=\lambda S_t+(1-\lambda)Z_{t-1} \qquad t=1,2,3,... \qquad (2)$$

Where S_t is the Sukhamte statistic at time t and λ is the smoothing constant satisfying $0<\lambda\le 1$. Generally, we set Z_0 be the target value of process. Hence, the mean and variance of the statistic Z_t are respectively,

$$\mathrm{E}(Z_t)=\frac{1}{4}, \qquad (3)$$

$$\mathrm{Var}(Z_t)=\frac{\lambda(1-(1-\lambda)^{2t})}{2-\lambda}\cdot\frac{(m+n+7)}{48mn}, \qquad (4)$$

Note that the term $\left[\,1-(1-\lambda)^{2t}\right]$ in Eq.(4) approaches unity as t gets larger. Assuming that L denotes the width of the control limit, the NE-S chart can be written as

$$UCL=\frac{1}{4}+L\sqrt{\frac{\lambda}{2-\lambda}\cdot\frac{(m+n+7)}{48mn}}$$

$$CL=\frac{1}{4} \qquad (5)$$

$$LCL = \frac{1}{4} - L\sqrt{\frac{\lambda}{2-\lambda}\cdot\frac{(m+n+7)}{48mn}}$$

Since the process has shifted, some adequate action should be taken whenever statistic Z_t falls outside the control limits.

Sheu and Lin [23] first proposed the generally weighted moving average (GWMA) control chart. The method of GWMA control chart is applied, which has been used in Sheu and Griffith [24], to the EWMA control charts to enhance the detection ability of control charts. Next, we will introduce the GWMA control chart briefly.

Let $\bar{P}_t = P(H > t)$ and $p_t = P(H = t) = \bar{P}_{t-1} - \bar{P}_t$. Note that H is a random variable and satisfies $P(H = t) \geq 0$ and $\sum_{t=1}^{\infty} P(H = t) = 1$. In this case, $P(H = 1)$, $P(H = 2)$,……, $P(H = t)$ can be regarded as the weights in the weighted moving average and be the weights of the current sample, the second updated sample,……,the remote sample, respectively. If $0 < \alpha \leq 1$ and $0 < q < 1$, then the weights decrease with the age of the samples.

The statistic of the nonparametric GWMA control chart (NG-S) for monitoring process variability is defined as:

$$GS_t = \sum_{j=1}^{t} P(H = j)T_{t-j+1} + P(H > t)GS_0 , \qquad (6)$$

Where T_t is the Sukhamte statistic at time t . In general, we set GS_0 be the target value of process, that is $GS_0 = \frac{1}{4}$. Hence, the mean and variance of the statistic GS_t are respectively,

$$\begin{aligned} E(GS_t) &= E[P(H = 1)T_t + P(H = 2)T_{t-1} + \cdots \\ &\quad + P(H = t)T_1 + P(H > t)GS_0) \\ &= \frac{1}{4} \end{aligned} \qquad (7)$$

$$\begin{aligned} Var(GS_t) &= Var\left(P(H = 1)T_t + P(H = 2)T_{t-1} + \cdots \right. \\ &\quad \left. + P(H = t)T_1 + P(H > t)GS_0\right) \\ &= \sum_{j=1}^{t} P^2(H = j)\cdot Var(T_j) \\ &= Q_t \cdot \frac{\lambda(1-(1-\lambda)^{2t})}{2-\lambda}\cdot\frac{(m+n+7)}{48mn} \end{aligned} \qquad (8)$$

where, $Q_t = \sum_{j=1}^{t} P^2(H = j)$ as t increases to infinite. Supposing L denotes the width of the control limits, the NG-S chart can be written as

$$\begin{aligned} UCL &= \frac{1}{4} + L\sqrt{\frac{(m+n+7)}{48mn}\cdot Q_t} \\ CL &= \frac{1}{4} \\ LCL &= \frac{1}{4} - L\sqrt{\frac{(m+n+7)}{48mn}\cdot Q_t} \end{aligned} \qquad (9)$$

When statistics GS_t falls outside the range of control limits, it indicates that the process is out of control and some actions should be taken adequately.

III. NONPARAMETRIC NE-M CHART

Mood (1954) proposed a nonparametric test for equality of sample variance. Consider the two independent random samples $X = (X_1, X_2, ..., X_m)$ and $Y = (Y_1, Y_2, ..., Y_n)$. Let σ_X and σ_Y be the arbitrary measures of dispersion of X and Y , respectively and $R_1 < R_2 < .... < R_m$ be the combined samples ranks of the X-values in

increasing order of magnitude. The Mood test statistic for testing null hypothesis ($H_0 : \sigma_X = \sigma_Y$) is defined as,

$$M = \sum_{i=1}^{m} \left(R_i - \frac{N+1}{2} \right)^2 \qquad (10)$$

where $N = m + n$

The mean and variance of the statistic M is given by

$$\mathrm{E(M)} = \frac{m(N^2-1)}{12}$$

$$Var(M) = \frac{mn(N+1)(N^2-4)}{180}$$

The statistic of the nonparametric EWMA control chart (NE-M) for monitoring process variability is defined as:

$$Z_t = \lambda M_t + (1-\lambda) Z_{t-1} \qquad t = 1, 2, 3, \ldots \qquad (11)$$

Where M_t is the Mood statistic at time t and λ is the smoothing constant satisfying $0 < \lambda \leq 1$. Generally, we set Z_0 be the target value of process. Hence, the mean and variance of the statistic Z_t are respectively,

$$\mathrm{E}(Z_t) = \frac{m(N^2-1)}{12}, \qquad (12)$$

$$\mathrm{Var}(Z_t) = \frac{\lambda(1-(1-\lambda)^{2t})}{2-\lambda} \cdot \frac{mn(N+1)(N^2-4)}{180}, \qquad (13)$$

Note that the term $\left[1-(1-\lambda)^{2t} \right]$ in Eq.(4) approaches unity as t gets larger. Assuming that L denotes the width of the control limit, the NE-M chart can be written as

$$UCL = \frac{m(N^2-1)}{12} + L\sqrt{\frac{\lambda}{2-\lambda} \cdot \frac{mn(N+1)(N^2-4)}{180}}$$

$$CL = \frac{m(N^2-1)}{12} \qquad (14)$$

$$LCL = \frac{m(N^2-1)}{12} - L\sqrt{\frac{\lambda}{2-\lambda} \cdot \frac{mn(N+1)(N^2-4)}{180}}$$

Since the process has shifted, some adequate action should be taken whenever statistic Z_t falls outside the control limits.

The statistic of the nonparametric GWMA control chart (NG-M) for monitoring process variability is defined as:

$$GM_t = \sum_{j=1}^{t} P(H = j) M_{t-j+1} + P(H > t) GM_0, \qquad (15)$$

Where M_t is the Mood statistic at time t. In general, we set GM_0 be the target value of process, that is $GM_0 = \frac{m(N^2-1)}{12}$. Hence, the mean and variance of the statistic GM_t are respectively,

$$\begin{aligned} E(GM_t) &= E[P(H=1)T_t + P(H=2)T_{t-1} + \cdots \\ &\quad + P(H=t)T_1 + P(H>t)GS_0) \\ &= \frac{m(N^2-1)}{12} \end{aligned} \qquad (16)$$

$$\begin{aligned} Var(GM_t) &= Var\left(P(H=1)T_t + P(H=2)T_{t-1} + \cdots \right. \\ &\quad \left. + P(H=t)T_1 + P(H>t)GM_0 \right) \\ &= \sum_{j=1}^{t} P^2(H=j) \cdot Var(T_j) \\ &= Q_t \cdot \frac{\lambda(1-(1-\lambda)^{2t})}{2-\lambda} \cdot \frac{mn(N+1)(N^2-4)}{180} \end{aligned} \qquad (17)$$

where, $Q_t = \sum_{j=1}^{t} P^2(H = j)$ as t increases to infinite. Supposing L denotes the width of the control limits, the NG-S chart can be written as

$$UCL = \frac{m(N^2-1)}{12} + L\sqrt{\frac{mn(N+1)(N^2-4)}{180} \cdot Q_t}$$
$$CL = \frac{m(N^2-1)}{12} \qquad (18)$$
$$LCL = \frac{m(N^2-1)}{12} - L\sqrt{\frac{mn(N+1)(N^2-4)}{180} \cdot Q_t}$$

When statistics GM_t falls outside the range of control limits, it indicates that the process is out of control and some actions should be taken adequately.

IV. Performance Measurement and Comparisons

Measuring statistical performance of proposed NE-S and NE-M charts is typically assessed in terms of its average run lengths (ARL). The ARL should be sufficiently long to avoid false alarms when the process is under control, and it should also be sufficiently short to detect shifts rapidly when the process is out of control. To compare the performance of the control charts, first, charts with the same in-control ARL (ARL_0) are designed. Then, a shift is introduced during the process, and the out-of-control ARLs (ARL_1s) of these charts for this shift are compared.

We consider underlying process distributions as normal, double exponential and uniform with mean zero and variance one. Consider the quality characteristic X and Y are distributed with mean μ and standard deviation σ. Let μ_0 and σ_0 be the in-control values. An assignable cause only affects process dispersion is considered in this paper. Therefore, when an assignable cause appears in a process, the process is shifted from the in-control value σ_0 to the out-of-control value $\sigma_1 = \delta\sigma_0$ ($0 < \delta \neq 1$). When $\delta = 1$, the process is considered to be in-control. For $\delta > 1$, a process shifts upward, otherwise, a process shifts downward when $\delta < 1$.

A Monte Carlo simulation is performed using statistical software R to compute the ARL profile for the NE-S and NE-M charts, where each of these values is an average of 100,000 simulation trials. The desired in-control ARL is chosen, sample sizes m={5,10} for random variable X and n={10,20} for random variable Y, and the steady state limit are considered in the simulation study. Various standard deviation shifts $\delta \in \{0, 1.05, 1.1, 1.15, 1.2, 1.25, 1.5, 2, 2.5, 3, 4, 5\}$ with different smoothing constant $\lambda \in \{0.05, 0.1, 0.2, 0.3, 0.5, 1.0\}$ in both charts are also considered.

Table 1 presents the algorithmic description used to solve the optimal process parameter (λ^*, L^*) of the nonparametric NE-S (NE-M) chart.

Table 1. The procedure of optimal process parameter for nonparametric NE-S (NE-M) chart

Input:
smoothing constant λ ; sample size m and n
shifts $\delta = \{1.05, 1.1, 1.15, 1.25, 1.5, 1.75, 2, 2.5, 3, 4, 5\}$
Output:
Out-of-control ARL (ARL_1)
1: Set the desired ARL_0^*
2: Generate the random samples X and Y
3: Calculate statistic Eq. (2) or Eq. (11)
4: Calculate the control limits Eq. (5) or Eq. (14) at L =0.001
5: Increase 0.001 in L to achieve the desired ARL_0^*
6: Calculate ARL_1 under various process variance shifts
7: Choose different λ , repeat steps 2 to 7
8: At specific shifts to obtain minimum ARL_1

9: Return optimal process parameter (λ^*, L^*)

Tables 2 to 5 provide the ARL values of the proposed nonparametric NE-S control charts when the underlying process data actually follows normal distribution with sample sizes m=5, 10 and n =10, 20, respectively.

Table 2. (λ , L) combinations for nonparametric NE-S chart with sample sizes m=5, n=10.

	λ	0.05	0.10	0.20	0.30	0.50	1.00
δ	L	2.56	2.75	2.90	2.98	3.05	3.03
1.00		412.99	412.92	413.31	412.76	413.04	413.26	412.99
1.05		264.36	264.36	289.11	308.36	314.14	323.91	351.98
1.10		137.04	137.04	168.13	202.49	222.80	249.58	303.09
1.15		79.75	79.75	101.53	134.64	158.84	194.70	263.80
1.25		37.61	37.61	47.29	67.07	85.96	123.01	205.35
1.50		14.23	14.23	16.60	21.90	29.02	49.66	123.41
1.75		8.60	8.60	9.78	11.96	15.07	26.23	84.00
2.00		6.27	6.27	7.07	8.28	9.91	16.54	62.49
2.50		4.29	4.29	4.81	5.43	6.13	9.20	40.47
3.00		3.43	3.43	3.84	4.29	4.70	6.53	29.88
4.00		2.68	2.68	2.99	3.31	3.54	4.51	20.38
5.00		2.35	2.35	2.61	2.88	3.04	3.72	16.14

Table 3. (λ , L) combinations for nonparametric NE-S chart with sample sizes m=5, n=20.

	λ	0.05	0.10	0.20	0.30	0.50	1.00
δ	L	2.58	2.77	2.91	2.96	3.00	2.94
1.00		431.99	431.45	432.15	432.35	432.25	431.52	431.99
1.05		249.22	249.22	285.05	316.16	330.37	343.93	367.14
1.10		115.81	115.81	148.49	193.07	222.20	257.42	313.09
1.15		64.23	64.23	83.99	118.75	147.70	190.61	268.71
1.25		29.57	29.57	36.91	53.52	71.64	109.20	201.28
1.50		11.07	11.07	12.75	16.22	21.29	36.79	110.25
1.75		6.68	6.68	7.55	8.88	10.77	17.64	68.97
2.00		4.86	4.86	5.46	6.20	7.13	10.71	47.49
2.50		3.34	3.34	3.71	4.09	4.48	5.85	27.13
3.00		2.69	2.69	2.97	3.25	3.49	4.20	18.20
4.00		2.13	2.13	2.33	2.52	2.67	2.98	10.75
5.00		1.88	1.88	2.05	2.20	2.32	2.51	7.68

Table 4. (λ , L) combinations for nonparametric NE-S chart with sample sizes m=10, n=10.

	λ	0.05	0.10	0.20	0.30	0.50	1.00
δ	L	2.63	2.81	2.96	3.03	3.09	3.07
1.00		486.01	485.92	486.17	486.55	486.18	485.54	486.27
1.05		246.33	246.33	284.66	322.42	341.83	361.07	393.96
1.10		106.05	106.05	135.79	180.01	211.17	254.99	321.79
1.15		57.38	57.38	74.10	104.91	132.36	178.92	265.15
1.25		36.77	36.77	46.30	66.28	86.84	128.00	220.80
1.50		26.14	26.14	31.99	45.14	60.12	94.33	185.69
1.75		19.94	19.94	23.81	32.64	43.56	71.09	157.66
2.00		13.20	13.20	15.29	19.71	25.74	43.45	116.54
2.50		9.77	9.77	11.15	13.68	17.23	28.92	89.26
3.00		4.33	4.33	4.84	5.42	6.04	8.44	33.41
4.00		2.99	2.99	3.34	3.65	3.91	4.85	17.97
5.00		2.42	2.42	2.70	2.94	3.08	3.60	11.74

Table 5. (λ , L) combinations for nonparametric NE-S chart with sample sizes m=10, n=20.

	λ	0.05	0.10	0.20	0.30	0.50	1.00
δ	L	2.56	2.75	2.90	2.96	3.00	2.98
1.00		409.42	409.08	408.74	409.12	408.64	408.62	408.98
1.05		183.28	183.28	219.88	261.54	283.26	307.31	344.39
1.10		73.54	73.54	95.22	131.87	159.72	203.29	279.41
1.15		39.58	39.58	50.03	71.69	93.08	133.06	223.76
1.25		18.09	18.09	21.49	29.18	38.67	62.41	145.71
1.50		6.84	6.84	7.73	9.05	10.77	16.77	58.72
1.75		4.17	4.17	4.68	5.22	5.80	7.83	29.23
2.00		3.07	3.07	3.44	3.76	4.05	5.00	17.02
2.50		2.15	2.15	2.40	2.58	2.71	3.05	7.93
3.00		1.75	1.75	1.96	2.08	2.17	2.35	4.78
4.00		1.40	1.40	1.56	1.63	1.70	1.80	2.66
5.00		1.25	1.25	1.37	1.43	1.48	1.55	1.95

The following findings from Tables 2 to 5:

□□Smaller smoothing constant λ has better detection ability in process variability.
□□Control limit constant L increases as λ increases. Different sample sizes get near control limit constant L.
□□Larger sample size n has smaller ARL_1 values at small λ values, the outcome is same as sample size m.
□□In-control ARL values of the proposed NE-S control charts for different process distributions are approximately same.
□□Out-of-control ARL values of NE-S chart are smaller than that of the NP-S chart ($\lambda = 1$). Therefore, NE-S chart is more efficient than NP-S chart for normal, light tailed uniform and heavy tailed double exponential distributions.
□□For normally distributed data, the NE-S chart performs better than double exponential data.
□□For uniformly distributed data, the NE-S chart perform better than normally and doubly exponential data.

V. Conclusions

This study investigates the effectiveness of the NE-S and NE-M charts in detecting increased process variability shifts. The simulation results show that the NE-S control chart is more efficient than Shewhart-type (NP-S) control chart for detecting shifts in process variability, the counterpart of NE-M has the same results in detecting process variability. Both NE-S and NE-M control charts perform better when underlying process distribution is light tailed.

Further recommended work is to investigate the design and adjustment parameters in nonparametric NG-S and NG-M charts. In addition, when designing control charts from a statistical perspective, other viewpoints, such as the costs of sampling, inspection, and defective products when using the nonparametric control chart should be consider in future studies.

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