PROPOSED POLICY FOR ACADEMIC DEVELOPMENT IN HIGHT EDUCATION: A CASE STUDY OF CHAIYAPHUM RAJABUT UNIVERSITY (CPRU)

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ABSTRACT

The Purpose of this study was to analyze, develop and propose policies for academic development at Chaiyaphum Rajabhat University (CPRU) based on specially designed, feasible criterion. Variable methodologies was used, applied in two stages. The first stage researched policy options with local and foreign universities using multiple case studies and institutional surveys. The second stage developed proposed policy, analyzed suitability and efficacy of policy options via in-depth interviews with subject-matter-experts, stakeholder focus-group discussions and a public hearing of stakeholders.

The outcome of the study resulted in eight policy objectives for academic development at CPRU. These included aspects of learning and teaching, research, students, faculty, academic management, learning resources, curriculum, plus material and innovation. Forty-two goals and eighty-four policy initiatives were initially proposed. Of these, thirty-four goals and eighty-one policy directives were considered feasible for implementation.

The proposed policy for the CPRU resulted from a process of policy research that used mixed methodology research. Various sources of information were used for data triangulation in the first stage. Stakeholders of academic development proposals at CPRU further developed the policies in the second stage. As a result, it is believed that the proposed policies have achieved wide-spread acceptance, thereby enhancing implementation initiatives.

Keywords: Academic Development, Higher Education, Policy Research, Educational Administration and Chaiyaphum Rajabhat University

Introduction

Throughout the past two decades and various operational methodologies, educational institutes were compelled to focus more effectively on future realities. Within a rapidly changing world of economic growth, scientific progress, communication and computer technological advancements, adjustments were deemed necessary. These technological changes needed to be incorporated and utilized continuously. There was development of access to modern information and technology in order to keep pace with changing situations, thereby ensuring future survival. (Kriengsak Jaroenwongsak, 2006). According to faculty members of Chulalongkorn University (2006), higher educational institutions have recently adapted to the direction taken by educational management amidst rapid societal changes and instability such as: the impact on economics and society as a result of free trade, mechanisms of global free trade such as mobility of investment and international labor, enlightened leadership with respect to the global power crisis, decentralization, and International management of higher educational institutions.

Adjustments were made in policy development, strategy and practice with respect to ensuring that the Mission Statement incorporated the changing context. In addition, the educational capacity needed to be developed in order to compete at the international level.
In addition, The Rajabhat Universities have a shared Mission Statement in accordance with Section 8, designed to achieve human resource development at both the national and local level. Section 7 of the Rajabhat Universities Act 2004 incorporated development at the local level as part of its’ institutional philosophy (The Ministry of Education, 2004). The objective was to deliver educational programs that would promote a high level of academic standing for the profession of teaching, conducting research, providing academic service to society plus improving, transferring and developing technology.

CpRU reached its’ 6th anniversary on July 12th, 2006. It was still a new University. Its’ organizational size was not complex. Therefore it was necessary to conduct policy research, including the education process, in order to develop action -oriented recommendations going forward, for consideration by executive levels (Wirot Sanrattana, 2007). Every stakeholder was involved in brainstorming their opinions regarding academic development, for the purpose of making suggestions regarding the development of strong guidelines, qualitative criteria, standards, enhancing international competitiveness and increased quality of higher education at the local level. Therefore, in order to assist CpRU to be able to provide enhanced educational service for local development, academic excellence, application of appropriate technology, efficient educational management plus contribute toward continuous local educational development, it is proposed that the researcher study and critique the recommended policy for academic development of CpRU.

**Research Questions**

1) Tentative proposed policy for academic development in CpRU were analyzed from an institutional survey study and multi-case study consisting of eight components; learning & teaching, research, students, lecturers, academic management, learning resources, curriculum, material & innovation based on appropriate and feasible criterion. These needed to be identified.

2) Proposed policy for academic development in CpRU, was based on research analysis that suggested 2 stages – stage one was conducting expert in-dept interviews – stage two was holding a stakeholder group operational seminar workshop to develop objectives & policy directions. These also needed to be identified.

**Objective**

To outline, analyze, develop & propose policy for academic development at CpRU, including aspects of learning & teaching, research, student, lecturer, academic management, learning resources, curriculum, material and innovation.

**Review of Related Literature**

**Part 1:** Conducting policy development and research; The definition of policy, importance of policy, types of policy, components of policy, process of policy development, characteristics of good policy and policy research.

**Part 2:** Conducting higher education & academic trends in higher educational institution.

**Part 3:** Best practices, approach and basic understanding of academic development; The research was within the context of academic work and structure of academic administration in higher educational institutions, academic standards and quality assurance of higher education for eight aspects.

**Part 4:** Within the context of Chaiyaphum Rajabhat University, the following was considered: history and background, philosophy, academic vision and mission as outlined in the National Act of Rajabhat Universities, office arrangement, academic management structure, educational management plus the basic academic structure of CpRU.
Methods and Procedures

The design of this study involved policy research with two stages of implementation, including: tentative proposed policy development and proposed policy development utilizing the following research methodology: Stage 1: The development of proposed policy, including: 1) institutional survey was conducted to study current conditions and academic development guidelines of Chaiyaphum Rajabhat University. 2) multi-case study was a study of academic development at three places inside the country: Chulalongkorn University, Mahidol University and Nakhon Ratchasima Rajabhat University, and two places outside the country: University of Maryland and Washington State University. Stage 2: The proposed policy from the 1st stage in research implementation included: 1) subject-matter-expert interviews of ten persons. 2) focus group discussion with fifteen persons. 3) operational seminar workshop of stakeholders, approximately forty persons.

The stages of policy research noted above are depicted in illustration.

Figure Stages of Conducting Research

Findings and Conclusion
The Purpose of this study was to analyze, develop & propose policies for academic development at Chaiyaphum Rajabhat University (CpRU) based on appropriate and feasible criterion. A variable methodology was used, consisting of two stages. The first stage researched policy options through multiple case studies and institutional surveys. The second stage developed proposed policy, analyzed suitability and efficacy of policy options via expert in-depth interviews, stakeholders focus-group discussions and a public hearing of stakeholders.

The outcome of the study resulted in eight policy objectives for academic development at CpRU. These included aspects of learning and teaching, research, students, faculty, academic management, learning resources, curriculum, plus material & innovation. Forty-two goals and eighty-four policy initiatives were proposed. Of these, thirty-four goals and eighty-one policy directives were considered feasible for implementation.

Eight study resultant policy objectives for academic development including:

1. **Learning and Teaching**: The intent of this policy objective is to develop the learning process and to focus it on enhancing student knowledge, academic and vocational skill development plus increased moral and spiritual integration in society. This focuses on four goals as follows: 1) Enable students to conduct self-study in or out of University, utilizing real-life sources. 2) Increased innovative teaching methods. 3) Qualitative enhancement of instructional techniques, skills and methodologies with creative transference of learning evaluation. 4) Enable professors to structure curriculum and content unique to their subject-matter. This is applicable in the following eight aspects: 1) Encourage study activities that facilitate out-of-university learning. 2) Individual faculty and subjects incorporate all media, innovation and technology. 3) Regularly scheduled seminars designed to increase learning and methodologies of professors. 4) Establish standards to ensure that Professorial expertise is most closely aligned with their teaching subject-matter. 5) Workshop seminar development which validates professorial authenticity. 6) Workshop seminar development to familiarize the President and secretarial element of each subject-matter. 7) Seminars for development of skills, techniques and creative teaching methodologies designed specifically to focus on transferal of learning strategies. 8) Establish systemic evaluative practices to measure learning.

2. **Research**: Objectives in this element are geared to producing high quality and quantity research projects. This focuses on six goals as follows: 1) Acquired faculty demonstrate excellent research potential. 2) Encourage student sourced research in all subjects. 3) Establish one research project per person, per year as a measurable standard. 4) Research to be qualitatively suited to widespread application and utilization. 5) Ensure adequate budgetary provisions to achieve research expectations. 6) Establish a management system to control all research activities. This is applicable in the following nine aspects: 1) Development and support of faculty research potential. 2) Conceiving and supporting student-based research. 3) Incorporate in the mission statement of every faculty member the expectation of at least one research project per year. 4) Publicize and promote application of research results domestically and internationally. 5) Create an environment that promotes increased quality and quantity of research. 6) Establish initiatives geared to increase budgetary provisions for conducting domestic and international research. 7) Establish budgetary controls to monitor and manage research project costs. 8) Plan activities to encourage research by administrative components of the University. 9) Establish quality control practices to monitor research activities.

3. **Students**: Objectives in this category relate to developing the “person” as well as academic achievement. Elements involved here include encouragement to adopting moral ethics which contribute to good citizenship and effective functioning within societal norms. This focuses on seven goals as follows: 1) That graduates gain access to suitable employment. That they acquire independence. That they are positioned
to assume higher education initiatives and have acceptance within peer level groups. 2) That admission standards result in acquiring high quality students. 3) That university facilities are adequate to student needs. 4) That support mechanisms for students are of high quality. 5) Insure that extra-curricular activities, clubs, projects and budgets increase according to student needs. 6) Develop activities that encourage student participation in student related programs. 7) Enhance student through academic skills development. This is applicable in the following eleven aspects: 1) Employment acquisition support. Positioning them to pursue higher education plus influencing the post-educational acceptance by authority and society. 2) Maximize admission system efficiency. 3) Provide additional campus services such as banking, postal, retail, restaurants, pharmacy, related co-operative retail outlets, gymnasiums, clinics, beauty salons, etc. 4) Provision of scholarship plus other financial assistance and security programs. 5) Ensure budgetary growth to support Student activities and projects. 6) Conceive and supporting activities that serve to develop student character, personal growth and satisfaction. 7) Programs that enhance student expertise in academic research and favorable competitive skills in all fields. 8) Manage participatory activities and provide outlets for student opinions and input. 9) Adapt basic knowledge and characteristics of junior students to the University environment. 10) Develop plans to systematically enhance student societal functionality. 11) Establish private facilities and have specialized counseling staff for the benefit of students.

4. Faculty: This objective focuses on enhancing professorial qualities that lead to advanced academic standing and serves as a model for high moral ethics and exemplary characteristics for students to emulate. This focuses on five goals as follows: 1) Professors have the potential to be leading experts in their field. 2) Professorial advice and counseling be highly efficient and authoritative. 3) Professors possess a high degree of specialization and acknowledged subject-matter-expertise. 4) The university to have a merit-based professor selection system. Also a highly developed evaluative process of teaching practices and moral integrity. 5) Professors to have strong motivational characteristics exemplified. This is applicable in the following eight aspects: 1) Effective management of their position and curricular area based on advanced qualifications and experience. 2) Develop their advisory role in keeping with position expectations. 3) Plan and manage factors related to increasing recognition of expertise and promoting their academic standing within their discipline. 4) Ensure a close link of professor qualification to their assigned area of specialized expertise and scientific knowledge. 5) Develop a professorial selection process that maximizes levels of knowledge within any given field of expertise. 6) Establish an instructional performance monitoring system measuring transference of learning. 7) Provide motivational services to faculty that highlights their achievements and serves to gain recognition for them in their area of expertise. 8) Ensure budgets are sufficient to provide developmental educational experiences and provision of academic seminars.

5. Academic Management: This objective focuses on the staff programs which support the delivery of primary academic functions of the University. This focuses on seven goals as follows: 1) Provision of Management Information Systems supportive of management and academic services. 2) Human Resource Management programs enhancing academic standards and development. 3) Administrators in every support function to be knowledgeable and accessible. 4) Effectively manage property, budgets and systems to promote academic development. 5) Ensure the University meets and exceeds national standards of institutional management. 6) As well as expectations from academic elements, administrators also to strive to be recognized as leaders in academic administration. 7) Control outside influences on the University in such a way that it enhances institutional functioning. This is applicable in the following fourteen aspects: 1)
Using advanced technological tools for efficient student registrations. 2) Develop professional Human Resource Management practices. 3) Establish a “merit based” selection process for academic administrators – based on “What they know” and not “who they know”. 4) Reduce wherever possible, complexities of academic management. 5) Maintain Up-to-date Management Information Systems in support of academic programs. 6) Maintain budgetary formulation and development according to academic needs. 7) Effectively promote budgetary adaptations according to changing needs. 8) Maintain efficient management practices in accordance with Government policies. 9) Conceive and implement advanced academic and administrative management programs placing the university in a leadership position at every level. 10) Regularly engage in seminar development introducing up-to-date technological and administrative services to maintain efficiency at the highest level. 11) Develop management control and evaluation systems for academic program delivery measurement. 12) Implement evaluative programs measuring effectiveness of administrative programs. 13) Efficiently manage special project study programs outside the institution. 14) Closely align hiring practices to position profiles and requirements, selecting the most qualified according knowledge and experience as opposed to “who they know”.

6. Learning Resources: This objective relates to the provision of learning support services that offers resources to assist professors and students plus the local community. This focuses on four goals as follows: 1) Provision of facilities such as libraries, study centers, technology and computer services that are comfortable and up-to-date. 2) Arrange work-training experiences for students both within and outside the University. 3) Provide access to mass media and technological services as required. 4) Provide library and other resources, specifically focused on individual science and faculty specializations. This is applicable in the following thirteen aspects: 1) Library units, specific study centers and mass media technology to incorporate knowledge specializations. 2) Develop work training experiences within the University prior to accessing them outside. 3) Research and locate mass media resources outside the University. 4) Solicit cooperation from outside resources conducive to work training activities. 5) Expand computer services as needs increase. 6) Provide and develop faculty-specific library services. 7) Increase provision of library services for extended hours as the need requires. 8) Incorporate technological services inside classrooms as required. 9) Provide special laboratory services according to the needs of bachelor degree programs. 11) Manage cooperative practices between learning centers and users. 12) Establish the interface between knowledge service centers and community based human resources. 13) Create and maintain a resource center of local culture and royal projects associated with Chaiyaphum Province and the North-east.

7. Curriculum: This objective deals with development and management of curriculum and application within the University and local community. To ensure high quality and academic standards are achieved. This focuses on five goals as follows: 1) All curriculum meet student body needs and standards, thereby being attractive to students from a University marketing perspective. 2) Meet all standards expected in a vocational setting. 3) Curriculum development to occur systematically and updated at all times. 4) Professors expected to apply a high degree of scientific expertise, knowledge and ability ensuring that the curriculum development at CpRU keeps it at the forefront of University teaching standards. 5) Handbooks and all documents derived from curriculum sources to meet high standards. This is applicable in the following twelve aspects: 1) Subject matter to reflect current employment market realities and be applicable accordingly. 2) Ensure curriculum development meet stringently high standards. 3) Development of directly applicable curriculum modified to an abbreviated vocational certificate program that meets all assessment standards. 4) Thorough review of all curriculum in its entirety repeated within regular five-year timeframes. 5) Enhance professorial status according to
curriculum excellence. 6) Provision of workshop seminars to professors in curriculum management. 7) Provide sufficient budgetary support for development of required documents and handbooks. 8) Plan activities that promote the analysis and development of curriculum. 9) Prepare activities to transition curriculum development to the learning and teaching mode. 10) Support the development and retention of teaching documents in every discipline. 11) Enhance curriculum development efficiency on a systemic basis. 12) Circulate information about curriculum development and outcomes to promote study at the university and local community where applicable.

8. Material and Innovation: This objective concerns the quality of learning as it is affected by material and technology innovations. This focuses on five goals as follows: 1) Continually upgrading data bases and computer capabilities. 2) Production, development and management of material innovations and learning technologies. 3) Initiate updating of all material, documents, books and research results to keep up to professor and student progression. 4) Promote E-Learning activities, utilizing them efficiently. 5) The above material and innovative initiatives can be achieved through the application. This is applicable in the following ten aspects: 1) Employ periodic data base update projects and services. 2) Expanding wireless internet connectivity to all university buildings. 3) Produce plans to systematically develop and manage materials innovation and learning technologies, plus promote actions in this regard to enhance trust in such updated support. 4) Manage budgets to increase quantities of updated documents, books and research papers. 5) Manage materials as required by the needs of professors, students and the local community. 6) Efficiently manage E-Learning. 7) Acquire specialized publications suitable for certificate students. 8) Acquire library materials focused on seminar development and presentation skills. 9) Manage all services related to copying, publishing and related matters. 10) Ensure membership and contributions to the local public library.

Discussion and Implication

At each level of educational administration, the most important component in academic development was students. Generally, educational institutions would consider the products as the most important element, plus consider the impact of the educational administration system as well. This should assure that academic development would reflect on student quality both directly and indirectly.

The aspects of teaching, learning and research were the main mission of institutions (Hoy & Miskel, 2005). Contrarily, it was a weak point for the newly born university, lacking faculties both in terms of quantity and quality possessing the following components: educational level, ability, experience, academic position or level of expertise, plus being academically minded. In this aspect, it was unusual if problems were not identified (Wirot Sanrattana, 2003). The way to solve problems or develop this aspect needed larger budgets and a long period of time. All educational institutions had to manage this aspect continually because it was an important factor that affected the quality of teaching, learning and research. It affected student development in all areas; teaching and learning, offering experience, learners development, evaluation, research, knowledge concept construction, making materials and innovations, products, honors and recognition.

The aspect of academic administration was important as it related to administration, educational control and quality assurance plus the management of supportive factors. The leadership of administrators remains an important topic for students of educational administration (Hoy & Miskel, 2005) and (Ubbe & others, 2004). If the administrators had wider visions, all factors in educational administration would be managed to reach the set goal. It also depended on the leadership of administrators, their administrative performance, the management of change and establishment of traditions. Organizational
Development should incorporate life-long learning, the administration of contrast, appropriate political engagement and other administrative factors.

In the aspect of curriculums, learning places and materials & innovations, these were essential components. They were necessary to teaching and learning processes. They must focus on social benefits and development. They had to be consistent with the employment market and social conditions. The curriculum needed to be standardized, international and up-to-date. This allowed it to remain consistent with printed documents that required constant adaptation to a changing world, plus fulfill social needs (Marsh and Willis, 2003). There should be a system to manage various curriculums. The most important thing is investing in the development of the lecturers. This will greatly assist CpRU to provide enhanced educational service for local development, academic excellence, application of appropriate technology, efficient educational management plus contribute toward a continuous local educational presence. Learning places, materials and innovations were the supportive factors in developing learning processes, especially information technology skills.

In conclusion, it was necessary to conduct policy research, including analysis of the education process, in order to develop action oriented recommendations going forward, for consideration by executive levels (Wirot Sanrattana, 2007). This will greatly assist CpRU to provide enhanced educational services for local development, academic excellence, application of appropriate technology, efficient educational management plus contribute toward a continuous local educational presence. To be useful to CpRU, especially for Academic development, recommendations should be in line with the results from the research of The Office of Secretariat Educational Council (2001). This research found that reforming academic management plus learning and teaching requires the updating of curriculum regularly in order to remain current. There should be a system to manage various curriculums to make them responsive to the various learners and realities of a developing country (Jaras Suwanawela, 2002) (The theory that is postulated is that the institute has the duty to survey, research and analyze local problems, social conditions and relationships, according to the theory of Pateep Methakunavudhi (2001) and Sukanya S. Kovilakool (2004) They recommend that people who use mass media technology are very useful and are advanced. Also, investing in hardware and software is important. The most important consideration however, is investing in the development of the lecturers.

Research results regarding academic policy development at CpRU can be summarized as showing the need of faculty and other stakeholders to remain focused on the intricacies of a Learning organization. This is noted in the learning organizational theory discussed by Wirot Sanrattana (2005) in which he stressed that any academic organization must be focused in order to remain a committed learning organization. Key factors involved in this focus come in part from curriculum, teaching and personal mastery of learning and inquiry. Faculty must exercise leadership to create knowledge-based learning and progress. This was summarized as ‘knowledge management’ being an attitude by Sallies & Jones (2002). They continued to emphasize that in addition to knowledge management, encourage active application of it as a way of begetting additional new knowledge. With respect to Human Resource Development, the main point in academic development was to consider at all times its’ effect on vocational development. As emphasized by Ubben, Hughes & Norris (2001), Sergiovanni (2001), Hoy & Miskel (2005), Owens (2001), Sallies & Jones (2002), vocational development requires that faculty incorporate more content. This has the potential of increasing teaching efficiency and make the learning more applicable to the student. A focus on the learning environment and University surroundings also contrasts technology and pure knowledge. In the opinion of Sallies & Jones (2002), Nonaka (1994), Nonaka & Takeuchi (1995), good knowledge management including “human management” is at the heart, augmented by technology. Nowadays it is a vital truth that no organization can manage knowledge.
without using technology. Especially computers are essential to search information affecting vocational realities which in turn can lead to an updated approach to working. They also contribute massively to understanding cooperative approaches to knowledge sharing domestically and internationally. Such assistance helps to study correct work practices anywhere, anytime (Wirot Sanrattana, 2006)

**Recommendations**

1) The recommendations from research results; Practical planning, action, valuation and reflection should be done as synthesis, not separately. Academic development needs to be a continuous process, without specified timeframes. The institute that had faculty problems or low-educational level of faculties, might decide that faculty development was the most urgent component.

2) The recommendations for further studies; The administrators needed to balance both main and support functions to encourage academic development rapidly and continually. Academic development needed to incorporate all eight components. The developmental evaluation should be done before, during and after development. The results should be the basis for solving problems, reviewing the direction or adjusting the strategies in each period of development. As a result, Academic Development should progress in an effective, progressive and consistent direction.
Appendix

Proposed Policy for Academic Development at Chaivaphum Rajabhat University (CpRU)

Figure: Outline Policy for Academic Development at CpRU
References


Journal of Educational Administration, Khon Kaen University . 3(2), 12-24.


EFFECT OF CROSS-INOCULATION OF RUMEN CONTENTS BETWEEN SHEEP AND GOAT ON RUMEN FUNCTION

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ABSTRACT

This study was conducted to determine the effects of cross-inoculation (CI) of rumen contents between sheep and goat on rumen microbial population, fermentation characteristics and ruminal dry matter (DM) and crude protein (CP) digestibility of leucaena and paragrass. Five mature male native sheep and goats fitted with permanent rumen cannula were used. The animals were fed with 30% concentrate and 70% forage (80% paragrass and 20% leucaena) at 2.5%DM basis of liveweight. The CI of rumen contents between sheep and goats was done in pairs. Changes in microbial population, fermentation characteristics and ruminal DM and CP digestibility of leucaena and paragrass before and after CI were analyzed using t-test. Results showed that the CI of rumen contents between sheep and goat did not affect the total count of protozoa, bacteria and fungi in the rumen of both sheep and goats after CI. The mean pH values decreased while the rumen ammonia nitrogen NH$_4$-N concentration increased significantly ($\alpha$<0.05) in both sheep and goats. However, the total volatile fatty acids (VFAs) was not affected. The rumen digestibility of DM and CP in leucaena and paragrass was improved in both sheep and goats after CI of rumen contents. This study revealed that the CI of rumen contents between sheep and goats can enhance the rumen digestibility of feeds.

Keyword: Cross-Inoculation, rumen contents, Rumen Function

Introductions

The rumen is a very complex ecosystem and an efficient biological fermentation vessel for forages essential for growth and productivity of the ruminants. (Hobson and Stewart, 1997). These rumen microorganisms, consisting of bacteria, protozoa and fungi, are responsible for the digestion of feed materials into major fermentation end-products for energy and protein for the host ruminant. The more efficient the rumen is the better the fermentation end-products being synthesized. The ruminant diets should first aim to provide adequate nutrients for the microorganism involved (Hogan, 1996) and to match the requirements of the animals at various stages of production (Preston and Leng, 1987). However, in the tropics, ruminants are normally fed on low quality roughages and agricultural by-products. Also, these feeds are low in readily degradable carbohydrates and minerals (Abdullah et al., 1990; Leng, 1990; Weston, 1996; Bhat and Bansil, 1999). In addition, long dry season, high temperature and low soil fertility influence remen microbes and fermentation (Wanapat et al., 2000). An alternative way to improve rumen function in an animal is to introduce digestion-enhancing microbial species from other animals or to selectively increase populations of beneficial species present at low levels (MacMillan, 1996). Bacteria from one ruminant species have experimentally been shown to colonize others successfully (Jones and Megarry, 1986; Quirk et al., 1988). Further, cross-inoculation of rumen fluid from wild to domestic ruminants alleviates tannin toxicity and enhances the productivity of livestock.
browsing tannin-containing shrubs. The transfer of microbes between animal species is being facilitated by the precise molecular methods now available to track individual organisms within complex mixtures (MacMillan, 1996; Wirwayan et al., 1999). The introduction of rumen microorganisms from one ruminant species to another to improve rumen fermentation is worth looking into (Winugroho et al., 1994; Winugroho and Widiawati, 1994; Sevilla, 2000). However, there have been limited works done on the rumen ecosystem and biology of the rumen microorganism of small ruminants, regarding the enhancement of rumen fermentation and microbial growth, as well as the factors that affect the improvement of feed digestibility.

Hence, this present study was undertaken to determine changes in rumen fermentation, microbial population and ruminal dry matter (DM) and crude protein (CP) digestibility by manipulating the balance of microorganisms in the rumen through the cross-inoculation of rumen contents between sheep and goats.

Materials and Methods

Animals and Feeding

Five male native sheep with an average of 25-30 kg liveweight and five male goats with an average of 25-30 kg liveweight, fitted with permanent rumen cannulae were used. The cannulated animals were placed in individual pen and maintained in good body conditions prior to and throughout the duration of the study. They were offered diet at 2.5% DM of body weight comprising of 70% forage and 30% concentrate. The forage was composed of paragrass (Brachiaria mutica) and leucaena (Leucaena leucocephala) at 80:20 ratio. Feeding was done twice daily at 0800h and 1400h. The animals were provided with clean water at all times.

Experimental Procedure

The experiment consisted of pre-inoculation, cross-inoculation and post-inoculation periods.

Pre-inoculation period. The pre-inoculation period lasted for 17 days. On day 14, samples of rumen fluid were taken for microbial population counts before morning feeding. The other samples of rumen fluid were also taken at 0600, 0900, 1200, 1500 and 1800 h via rumen cannula for ammonia nitrogen (HN3-N) and total VFA determination. The pH of the rumen fluid was immediately measured, while samples for NH3-N and total VFA determination were kept in freezer until these were ready for analysis. The nylon bags containing paragrass hay samples were suspended for 24 h in the rumen and enumeration of sporangial colonies on the leaf blades were made (Bauchop, 1979). The last three days of pre-inoculation period (day 15, 16, 17), in situ DM and CP digestion was conducted. The feed samples were incubated for 6, 12, 24, 48 and 72 h in the rumen of the experimental animals.

Leucaena and paragrass were incubated separately in the nylon bags to determine ruminal DM and CP digestibilities.

Cross-inoculation period. Cross-inoculation (CI) was conducted before morning feeding. The transfer of rumen contents from sheep to goats and vice-versa was done as quickly as possible to avoid extended exposure of rumen contents to the air for each pair of animals.

Post-inoculation period. Samples of rumen fluid after CI were taken on day 14 before morning feeding for microbial analysis. The pH of the rumen fluid was immediately measured, while the samples of rumen fluid for NH3-N and total VFA determination were kept in the freezer until they were ready for analysis. The nylon bags containing paragrass hay samples
were also suspended for 24 h in the rumen for enumeration of fungal population. During the last three days of post-inoculation period (day 15, 16, 17), in situ DM and CP digestion trial similar to the pre-inoculation period was conducted. Paragrass and leucaena were used as feed samples.

**Enumeration of Microbial Population**

The determination of protozoal, bacterial and fungal counts followed the procedure described by Navas-Camacho et al. (1993). Estimation of protozoa population in the rumen fluid was done by diluting 8 ml of rumen fluid with 16 ml of a formal saline solution (1 part of formol 37% and 9 parts of saline 0.9% solution) and counting protozon under light microscopy (10X) using a Neubauer Counting Chamber. To assess bacterial population, samples of rumen fluid were diluted 1:3 in formal saline solution and again diluted to 10^3 ml in formal saline solution. Crystal violet (20 ml) was added to 200 ml of this solution and the stained bacteria were read under light microscopy (40X) using a Neubauer Counting Chamber. Rumen fungi population was estimated by incubating for 24 h in the rumen strips of paragrass hay put into nylon bags. After taking out the bags from the rumen, they were carefully washed with tap water and stained for two minutes with lactophenol cotton blue (Gurr, 1965); sporangia were counted under light microscopy (20X).

**Ruminal Digestibility**

Dry matter (DM) and crude protein (CP) digestion of leucaena and paragrass in the rumen were determined by using the nylon bag technique. The nylon bags of 6 x 9 cm, with average pore size of 50 μm (+/- 10) were filled with about 5 g of ground sample. Two bags per sample were placed into the rumen of each cannulated animal per incubation period. The samples were incubated in the rumen for 6, 12, 24, 48 and 72 h. After incubation, all the bags were simultaneously taken out of the rumen then Immediately washed under cold running water to stop fermentation and remove feed materials that adhered to the bags. Then, the bags were washed in running water till the fluid was cleared and gave gentle squeeze and dried at 60°C until the constant weight was attained. Samples in bag without incubation (0 h) were washed and dried in the same manner as the above. The ruminal digestibility of leucaena and paragrass were estimated by using the method of Orskov and McDonald (1979).

**Chemical Analysis**

Dry matter (DM) and crude protein (CP) of the feed samples and ruminal residues were determined by the AOAC (1993) procedure. The determination of rumen NH3-N and total VFA concentration followed the methods of Abdulrazak and Fujihara (1999). Rumen fluid pH was determined by using a pH meter.

**Calculation and Statistical Analysis**

The DM and CP degradation residues were fitted to an exponential equation developed by Orskov and McDonald (1979) to calculate the rate and extent of rumen digestion. The equation was, \( D = a + b \left(1 - e^{-ct}\right) \), was used to calculate the rate and extent of rumen digestion, wherein, \( D \) is the degradability of DM or CP at time \( t \), \( a \) is readily soluble fraction or solubility (the intercept with the y-axis = zero time intercept), \( b \) is slowly soluble fraction (insoluble potential), and \( c \) is the rate of degradation of \( b \). The coefficients \( a, b \) and \( c \) are constant in the equation (Orskov and Ryle, 1990; Kibon and Orskov, 1993). The effective degradability (%) where fraction outflow rates of 0.02, 0.04, 0.06 and 0.08/h was also
estimated by the equation, \( ED = a + \frac{(b+c)}{(k + c)} \), wherein, \( k \) is the outflow rate (Orskov and McDonald, 1979; ARC, 1984; Madsen and Hvelplund, 1994).

The means of each parameter measured in this study (pH, NH\(_3\)-N concentration and total VFA concentration), ruminal DM and CP digestibility, effective DM and CP degradability and microbial population was analyzed using t-test.

**Results and Discussion**

**Rumen Microbial Population**

After CI of rumen contents, the total numbers of protozoa, bacterial and fungal sporangia seemed to decrease in both sheep and goats had no effect on the total counts of microorganisms. In this study, the total counts of protozoa, bacteria and fungi were not classified according to type and species

<table>
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<th>MICROBIAL POPULATION</th>
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<th>AFTER CI</th>
<th>% CHANGE</th>
<th>t-test</th>
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<tr>
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<td>1.76 ± 0.51</td>
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<tr>
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<td>0.56 ± 0.32</td>
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<tr>
<td>Goat</td>
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<tr>
<td>Protozoa, x 10(^4) cells/ms</td>
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<tr>
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<td>0.25 ± 0.48</td>
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</table>

+ increase  
- decrease  

(Navas-Camacho et al., 1993). The rumen microbial population is relatively stable and changes only with changes in nutrients availability (MacMillan, 1996). It was also found that an established rumen was affected by types of feeds and roughages to concentrate ratios and these consequently influenced the population of microorganisms and fermentation characteristics (Hogan, 1996; Wanapat, 2000).

**Rumen Fermentation Characteristics**

The transfer of rumen contents from sheep to goat and vice-versa affected the rumen fermentation characteristics in both sheep and goat (Table 2.). The pH values in the rumen fluid of goats and sheep decreased but were within the physiological range of 5.92-7.04 which may have not affected the microbial growth and rumen function (Hoover, 1986). The decrease in pH values may be due to the newly-ingested feed fermentation, wherein readily
degradable carbohydrate would be rapidly fermented by the rumen microbes (Jetana et al., 1998). However, this low pH was maintained for less than 3 h after which the pH rose to 6.0.

The rumen NH$_3$-N concentration increased ($\alpha$<0.05), especially in the rumen fluid of goats after CI. This may be due to the effects of the rumen contents transfer, increase in total dry matter intake and ruminal CP digestibility (Table 3). The CI of rumen contents from sheep to goats and vice-versa may have increased the populations of same microbial species as shown by Wiryawan et al. (1999) for DHP-degrading bacteria. These microorganisms can compete with native microflora or fill those few niches not already occupied (Weimer, 1998). Pamungkas (2003) also observed that the transfer of rumen contents from goat to sheep and vice-versa increased the ruminal NH$_3$-N concentration of the rumen fluid of sheep and goats. The supplementation of leucaena increased feed intake, rumen NH$_3$-N levels and animal performance (Abkulrazak and Ondienk, 1998; Chowdhury, 1997; Goodchild and McMeniman, 1994; Nguyen Thi Hong Nhan and Nguyen Trong Ngu, 1998). However, the ruminal NH$_3$-N concentration in sheep and goats in this study were within the physiological range for microbial growth. The NH$_3$-N is the major nitrogen source for microbial protein synthesis and growth (Bryant and Robinson, 1962). The optimum concentration of ruminal NH$_3$-N for maximum rate and extent of fermentation has been reported to be in the range of 50-250 mg/l in the rumen of forage-fed sheep (Kanjanapruthipong and Leng, 1998). However, the optimum concentration of NH$_3$-N for efficient microbial growth and maximum digestibility of forage-based diets varied from 50 mg/l (Russell and Strobel, 1987; Satter and Slyter, 1974) to 238 mg/l (Miller, 1973). Leng (1990) also stated that the optimum concentration of NH$_3$-N required for microbial growth was around 100 mg/l. Therefore, it can be assumed that the ruminal NH$_3$-N required for microbial growth was around 100 mg/l were adequate for an optimal rumen fermentation in both sheep and goats in the study.

The total rumen VFA concentration did not change in the rumen fluid of both sheep and goats after CI of rumen contents, except in sheep at 0600 h. The total rumen VFA concentration observed in this study were with the range of those reported by Pamungdas (2003). Baldwin et al. (1979) and Leng (1982) found that an increase in efficiency of net microbial growth in the rumen was associated with decreasing total VFA, CO$_2$, CH$_4$ and heat production.
Table 2. Ruminal pH, ammonia nitrogen (NH3-N) and total volatile fatty acid (VFA) in sheep and goat before and after cross-inoculation of rumen contents at different time of collection.

<table>
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| t-test             | α<0.01          | ns           | ns            | ns            | ns            | ns            | ns            | ns            | ns            | ns
Rumen Digestibility

The ruminal DM and CP digestibility of leucaena and paragrass increased in both goats and sheep after CI (Tables 3, 4, and 5). The increase in rumen DM and CP digestibility may be due to the increase in microbial activity. Wang and McAllister (2003) stated that the digestion of the feed material is the net result of the interaction among rumen microbes. They also suggested that the synergetic effects of microbial interaction in feed digestion are greater than the existing antagonistic effects. The potential DM digestibility of leucaena and paragrass also improved in both goats and sheep. The effective DM degradability of leucaena in both goat and sheep increased after CI. There were no significant differences in the effective DM degradability of paragrass in all outflow rates but there was an increasing trend in values after CI.

In this study, the ruminal DM digestibility of leucaena in sheep and goat after CI at 72 h of incubation period were 64.24\% and 63.81\%, which were less than the values of 74\% (Huq and Saadullah, 1987), 78\% (Sampath et al., 1988), 70\% (Jong Ho Ahn et al., 1989). The variation of ruminal DM digestibility of leucaena may be attributed to its tannin-contents. These compounds have been shown to decrease microbial metabolism, inhibit enzymes including cellulases and DM digestion in grain and forages (Hoover, 1986). The variation on ruminal DM digestibility of leucaena is also affected by various interacting factors, e.g. species differences, cultivar differences, plant parts, stage of growth, soil fertility, climate, processing and detrimental factors. (Minson, 1990). The rumen DM digestibility of paragrass in sheep and goat after CI were 61.00\% and 61.5\%, which were less than 79.3\% (Serra et al., 1997) and 65\% (Orden et al., 1990). However, the rumen CP digestibility of leucaena in both sheep and goats were within the range of 47.9-67.0\% CP digestibility as reported by Khamseekhiew et al. (2001) using different varieties of leucaena. In another study, Negi et al. (1989) reported a much higher rumen degradable CP content in leucaena (69\%). Bejo (2001) also reported the ruminal CP digestibility of leucaena within the range of 52.7-57.2\% during the 48 h to 72 h incubation period. The differences in results of CP degradation in leucaena could be due to varietal differences and the presence of other plant complexes like tannin and lignin. The potential degradable CP fraction of paragrass in both sheep and goats after CI were 58.03\% and 59.51\%, which were less than the value of 97.1\% (Serra et al., 1997).
Table 3. Ruminal DM and CP digestibility (%) of feeds before and after cross-inoculation of rumen contents in sheep and goats at different time of incubation.

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Table 4. Ruminal DM degradation characteristics of feeds before and after cross-inoculation of rumen contents in sheep and goats.

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<td>36.81</td>
<td>63.81</td>
<td>0.044</td>
<td></td>
<td></td>
<td>52.22</td>
<td>46.18</td>
<td>42.48</td>
<td>40.21</td>
</tr>
<tr>
<td>t-test</td>
<td>ns</td>
<td>α&lt;0.05</td>
<td>α&lt;0.05</td>
<td>α&lt;0.01</td>
<td></td>
<td>α&lt;0.01</td>
<td>α&lt;0.01</td>
<td>α&lt;0.01</td>
<td>α&lt;0.01</td>
<td>α&lt;0.05</td>
</tr>
<tr>
<td>Paragrass</td>
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<td></td>
<td></td>
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</tr>
<tr>
<td>Before CI</td>
<td>26.00</td>
<td>32.77</td>
<td>58.77</td>
<td>0.045</td>
<td></td>
<td></td>
<td>48.60</td>
<td>43.25</td>
<td>39.96</td>
<td>37.93</td>
</tr>
<tr>
<td>After CI</td>
<td>25.90</td>
<td>35.69</td>
<td>61.59</td>
<td>0.045</td>
<td></td>
<td></td>
<td>50.05</td>
<td>44.27</td>
<td>46.75</td>
<td>38.38</td>
</tr>
<tr>
<td>t-test</td>
<td>ns</td>
<td>ns</td>
<td>α&lt;0.05</td>
<td>ns</td>
<td></td>
<td>ns</td>
<td>ns</td>
<td>ns</td>
<td>ns</td>
<td>ns</td>
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</tbody>
</table>

443
Table 5. Ruminal CP degradation characteristics of feeds before and after cross-inoculation of rumen contents in sheep and goats.

<table>
<thead>
<tr>
<th></th>
<th>DEGRADATION, %</th>
<th>EFFECTIVE DEGRADABILITY, %</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>a</td>
<td>b</td>
</tr>
<tr>
<td><strong>Sheep</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Leucaena</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Before CI</td>
<td>7.00</td>
<td>49.96</td>
</tr>
<tr>
<td>After CI</td>
<td>7.60</td>
<td>50.60</td>
</tr>
<tr>
<td>t-test</td>
<td>ns</td>
<td>ns</td>
</tr>
<tr>
<td><strong>Paragrass</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Before CI</td>
<td>17.80</td>
<td>39.57</td>
</tr>
<tr>
<td>After CI</td>
<td>19.60</td>
<td>38.43</td>
</tr>
<tr>
<td>t-test</td>
<td>ns</td>
<td>ns</td>
</tr>
<tr>
<td><strong>Goat</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Leucaena</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Before CI</td>
<td>7.15</td>
<td>50.06</td>
</tr>
<tr>
<td>After CI</td>
<td>7.10</td>
<td>51.84</td>
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<tr>
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<td>Paragrass</td>
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<tr>
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<td>After CI</td>
<td>19.60</td>
<td>39.91</td>
</tr>
<tr>
<td>t-test</td>
<td>ns</td>
<td>ns</td>
</tr>
</tbody>
</table>

a = soluble fraction  
b = slowly degradable fraction  
(a+b) = potential degradable fraction  
c = rate of degradation of b (/h)
Conclusions

The CI of rumen contents between sheep and goat resulted in enhanced rumen ecosystem and better DM and CP digestibility. However, longer periods of study and extensive work on rumen microorganisms should be conducted to elucidate the details for possible recommendation and implementation.

References


READING INSTRUCTION MODELS OF TEACHER TRAINEES AT RAMBHAI BARNI RAJABHAT UNIVERSITY: THEORY INTO PRACTICE

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ABSTRACT

The major purpose of this study was to investigate the reading instruction models of teacher trainees at Rambhai Barni Rajabhat University. The sample of this study were 30 English Education students. The research instrument was a questionnaire – the DeFord Theoretical Orientation to Reading Profile. Data collection was done at the end of the last semester the sample’s enrolment in their bachelor degree when they had completed their entire course and teaching professional internship. Statistical analysis was employed for percentage. Their practices of reading instruction models were classified.

The findings revealed the students’ beliefs on theories and practices for the reading models that reflected their reading instruction as well as their students’ learning processes. The skills, whole language, and phonics approaches were practiced. The findings predict the teachers’ reading instruction and students’ further practices.

Key Words: phonics approach, skills approach, whole language approach, theoretical reading instruction

Background of the Study

It is generally expected that a teacher is an important factor of the success in learning to read. A teacher trainee who graduates from a university will later become a key person who shapes and forms their students’ learning. This will be done in accordance with the teacher’s theoretical orientation in reading instruction.

Previous researchers reported on investigations into the influence of instruction on learning to read (Mitchell, 1980; Gove, 1981; Shavelson, 1983). These studies examined how teachers or learners act or perform. The conclusion points out that teachers are decision makers who process information and act upon these decisions within complex environments. These investigations have found that research on teaching must examine not only teachers’ behavior but also their judgments, plans and decisions in relation to their behavior.

The study of reading instruction models of teacher trainees at Rambhai Barni Rajabhat University investigates teacher trainees’ theoretical orientation in reading instruction in order to find out theories and belief they hold. Expectancies can be made how they will practice their reading instruction in the near future.
Related Theories

Roles of Reading

Reading is the process of constructing meaning from written text. The text may be wholly print as in novels, or contain visual elements such as illustrations, diagrams, maps, and graphs as in children’s books and many information books, magazines, and newspapers. Increasingly, the texts we read are presented electronically, and often interactively, and contain a mixture of screen print, graphic or visual elements, and even sound. The core of reading is meaning. Meaning is what we search for as we read and it is also part of what we use to reach that goal. In constructing meaning from text, readers combine what they know about the world, the topic of the text, the grammatical structure of the language in which the text is written, and the way spoken language relates to the letters, words, visual elements, and symbols on the page.

Because reading is essentially a purposeful act, a reader seeks to fulfill some individual purpose by reading a text. Perhaps it is to enjoy a novel, or to find some information about plants for the garden, to purchase a new car or to plan a holiday. Whatever the purpose, readers will bring to the reading task the skills and knowledge they have to fulfill that purpose. In the process they will learn more about what it means to be a reader. (Winch et al 2001: 7).

Because reading is primarily a thinking task, readers relate what they draw from the text to what they already know about the topic, about texts of this type, and about the context. Reading teachers play crucial roles to fulfill the reading success. Students’ reading achievement relies much on reading instruction approaches.

Reading Instruction Models

Models of reading have been classified roughly into three main categories. They are the phonics, skills and whole language approaches (DeFord, 1994: 3-4; Goodman, Watson and Burke, 1987: 131-133).

DeFord (1994: 3) explained. One grouping initially emphasizes smaller than word level language units, with gradual movement toward word units and attention to comprehension. The texts used in these programs are controlled for phonemic consistency and systematic introduction of consonant-vowel combinations. The teachers’ manuals suggest large segments of time for the practice of decoding isolated letters and letter combinations. Once a foundation in sound/letter correspondence is built, texts become more complex and instructional activities centering around fluency and comprehension are increased. “Sight word” instruction is utilized only for those words which do not lend themselves to use of phonics. This cluster of programs is labeled phonics.

Similar to the above idea, Goodman, Watson, Watson and Burke, 1987: 132-133) discussed. The subskills model of reading instruction is based on behaviorist learning theory. The underlying assumptions include that reading must be taught in an explicit way, that reading is learned from parts to wholes through a carefully worked-out sequential hierarchy of skills; and that each skill must be taught, positively reinforced, mastered, and tested before the next appropriate skill in the hierarchy is presented. The simplest units of language are assumed to be letters and sounds. These smallest units of language are carefully introduced one at a time before the teaching of word-recognition skills. Generally, consonants are introduced first, followed by long vowels and short vowels. Practice leads to mastery of the hierarchically arranged skills. Errors are unacceptable because they become learned responses. To discourage errors, reading instruction is carefully organized and directed to ensure exact responses. The teacher monitors the reader’s progress and uses a test-teach-test curriculum model. This model of teaching is
strong base of letter-sound relationships, which supports the next hierarchical level of word recognition, which in turn supports the top tier: word meanings or vocabulary.

DeFord (1994: 3) pointed out the second cluster of initial programs. They place their emphasis on building an adequate sight word vocabulary for the learners to use in reading. These vocabulary items are usually introduced in context with multiple opportunities provided for practice. Instruction in sound/letter correspondence is also found in these materials, but seems to concentrate on initial and ending consonant sounds from the vocabulary items that have been introduced. Exercises on short and long vowel sound distinctions are dealt with in a less systematic manner than in the phonics programs.

Goodman, Watson and Burke (1987: 133) stated that the skills model of reading instruction represents the most common view held and is reflected in most basal readers – the most prevalent reading-instructional tool. The proponents of this view often claim that they are eclectic, using what they believe represents the best insights form all views of reading. Beginning reading instruction includes the teaching of relationships between letters and sounds. In many programs, irregular words are taught as whole units through flash cards or games focusing on words in isolation. In addition to the teaching of phonics, word recognition, and vocabulary, instruction may include the reading of children’s literature and the integration of the other language arts (writing, speaking, and listening) with reading instruction. All three language cueing systems (graphophonics, syntax, and semantics) are taught, although each is usually presented in separate lessons using prescriptive language rules. Basal readers are written to reflect control of letter-sound relations, word frequency, spelling patterns, and grammatical structures. Meaning is important to this view but is often organized as a hierarchical set of comprehension skills. Those who support this view think of reading as a set of hierarchical skills and believe that the teaching of language must be simplified in order for children to learn to read. This model can shown with equal divisions provided for comprehension, phonics, and vocabulary skills.

DeFord (1994: 3-4) explained the third group. The third orientation finds instructional programs provides readers with quality literature from the outset of instruction. Initially, the emphasis is on developing sense of story/text as a framework for dealing with smaller units of language. Activities that focuses on words or letters are integrated into the reading experiences, with student/group generation of stories strongly recommended. Student writing and shared reading experiences are integral to these instructional programs.

Similar to the above orientation, Goodman, Watson and Burke (1987: 133) explained concerning a whole language curriculum. Although whole language programs may mean different things to different people, one essential attribute provides the foundation for all such programs - students must be involved in a literacy curriculum that keeps the systems of language unified in a mutually supportive way. When language systems are kept whole, as they are naturally integrated in real reading and writing, students are never given instructional materials that fragment the systems into small, abstract, and isolated units. Rather, students are invited to participate in a program that is meaningful - a program in which they learn their language by using it. Instructional experiences are based on the belief that in using all the available linguistic cues, readers have the opportunity through their active involvement to select the information they need in order to construct personal meaning.

Experiences that are essential to a whole language curriculum should be part of every student’s reading program: listening to literature, reading, writing, integrating past experiences, knowledge and language with life and learning in the classroom; and becoming consciously aware of reading and the reading process.
**Reading Instruction Models**

This can be concluded that teachers make decisions about reading instruction in light of the theory, or assumptions they hold about reading and learning. They propose that teachers’ theoretical orientation establishes expectancies and influences goals, procedures, materials and classroom interaction patterns. However, the extent to which teachers’ behaviors are influenced by their theoretical orientations has been difficult to demonstrate.

**Objective of the Study**

The main objective of the study was to investigate reading instructional models of teacher trainees of English Education students at Rambhai Barni Rajabhat University.

**Procedure**

**Sample**

The sample of this study included 30 undergraduate students in English Education Program who studied in the last semester of their five year program.

**Instrument**

The instrument for this study was The DeFord Theoretical Orientation to Reading Profile (TORP), the 28-item questionnaire. This questionnaire was tried out for reliability with English Education students who were in the same programs but not the sample of this study. The reliability was at 0.92.

**Data collection**

Data were collected in February 2008, by the end of the last semester of the sample’s five year program, one week before their final exam.

**Analysis**

The answers for each item of the questionnaire were analyzed and classified based upon the criteria set by The DeFord Theoretical Orientation to Reading Profile (TORP).

**Results**

The results of the study are shown in the following table illustrated by individual items. Then the theoretical orientation in reading instruction has been classified into three approaches: (1) phonics, (2) skills, and (3) whole language.
Table 1: Reading instruction models of teacher trainees classified by theoretical orientation in reading approaches

<table>
<thead>
<tr>
<th>No</th>
<th>Theoretical Orientation in Reading Instruction</th>
<th>Results to Theory</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>A child needs to be able to verbalize the rules of phonics in order to assure proficiency in processing new words.</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>An increase in reading errors is usually related to a decrease in comprehension</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>Dividing words into syllables according to rules is a helpful instructional practice for reading new words.</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>Fluency and expression are necessary components of reading that indicate good comprehension.</td>
<td>2</td>
</tr>
<tr>
<td>5</td>
<td>Materials for early reading should be written in natural language without concern for short, simple words and sentences.</td>
<td>1</td>
</tr>
<tr>
<td>6</td>
<td>When children do not know a word, they should be instructed to sound out its parts.</td>
<td>1</td>
</tr>
<tr>
<td>7</td>
<td>It is good practice to allow children to edit what is written into their own dialect when learning to read.</td>
<td>3</td>
</tr>
<tr>
<td>8</td>
<td>The use of a glossary or dictionary is necessary in determining the meaning and pronunciation of new words.</td>
<td>2</td>
</tr>
<tr>
<td>9</td>
<td>Reversals (e.g., saying “saw” for “was”) are significant problems in the teaching of reading.</td>
<td>3</td>
</tr>
<tr>
<td>10</td>
<td>It is a good practice to correct a child as soon as an oral reading mistake is made.</td>
<td>2</td>
</tr>
<tr>
<td>11</td>
<td>It is important for a word to be repeated a number of times after it has been introduced to insure that it will become a part of sight vocabulary.</td>
<td>2</td>
</tr>
<tr>
<td>12</td>
<td>Paying close attention to punctuation marks is necessary to understanding story content.</td>
<td>3</td>
</tr>
<tr>
<td>13</td>
<td>It is a sign of an ineffective reader when words and phrases are repeated.</td>
<td>2</td>
</tr>
<tr>
<td>14</td>
<td>Being able to label words according to grammatical function (nouns, etc) is useful in proficient reading.</td>
<td>3</td>
</tr>
<tr>
<td>15</td>
<td>When coming to a word that’s unknown, the reader should be encouraged to guess upon meaning and go on.</td>
<td>3</td>
</tr>
<tr>
<td>16</td>
<td>Young readers need to be introduced to the root forms of words (run, long) before they are asked to read inflected forms (running, longest)</td>
<td>2</td>
</tr>
<tr>
<td>17</td>
<td>It is not necessary for a child to know the letters of the alphabet in order to learn to read.</td>
<td>2</td>
</tr>
<tr>
<td>18</td>
<td>Flashcard drills with sightwords is an unnecessary form of practice in reading instruction.</td>
<td>2</td>
</tr>
<tr>
<td>19</td>
<td>Ability to use accent patterns in multisyllable words (pho ‘to graph, pho to’ grafy, and pho to grafic) should be developed as part of reading instruction.</td>
<td>2</td>
</tr>
<tr>
<td>20</td>
<td>Controlling text through consistent spelling patterns (The fat cat ran back. The fat cat sat on a hat) is a means by which children can best learn to read.</td>
<td>3</td>
</tr>
<tr>
<td>21</td>
<td>Formal instruction in reading is necessary to insure the adequate development of all the skills used in reading.</td>
<td>2</td>
</tr>
<tr>
<td>22</td>
<td>Phonic analysis is the most important form of analysis used when meeting new words.</td>
<td>2</td>
</tr>
<tr>
<td>23</td>
<td>Children’s initial encounters with print should focus on meaning, not upon exact graphic representation.</td>
<td>3</td>
</tr>
<tr>
<td>24</td>
<td>Word shapes (word configuration) should be taught in reading to aid in word recognition.</td>
<td>2</td>
</tr>
<tr>
<td>25</td>
<td>It is important to teach skills in relation to other skills.</td>
<td>3</td>
</tr>
<tr>
<td>26</td>
<td>If a child says “house” for the written word “home”, the response should be left uncorrected.</td>
<td>2</td>
</tr>
<tr>
<td>27</td>
<td>It is not necessary to introduce new words before they appear in the reading text.</td>
<td>2</td>
</tr>
<tr>
<td>28</td>
<td>Some problems in reading are caused by reading dropping the inflectional endings from words (e.g. jumps, jumped)</td>
<td>2</td>
</tr>
</tbody>
</table>

Note:
1: Phonics
2: Skills
3: Whole language

**Conclusion and Suggestions**

**Conclusion**

The major findings show that the teacher trainees of Rambhai Barni Rajabhat University believe in the skills, whole language, and phonics approaches respectively. These results show expectancies of their instruction models in schools where they work in the following years. Consequently, this helps predict the learning process in schools and
this becomes perception in reading of school students who form their learning processes for years afterwards.

Suggestions
The study on reading instruction models should be conducted from time to time in order to adjust and train reading teachers to the right tract in accordance with the current trends and government policy.

Acknowledgement
My deep gratitude goes to Professor Diane DeFord who kindly gave permission of using the research instrument, the “DeFord Theoretical Orientation to Reading Profile (TORP)” in Thailand.

References


EFFECT OF PRE-COOLING PROCESS ON THE STRESS RESPONSE AND BIOCHEMICAL CHANGES OF MUD CRAB, SCYLLA SERRATA (FORSKAL, 1755)

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ABSTRACT

Live holding of mud crabs is a part of the post-harvest process. After capture, crabs are kept out of water and held for a certain length of time. Animals are likely to suffer from stress. The aim of the study was to determine the effects of stress response and biochemical changes on mud crab during emersion storage by using pre-cooling process with various temperatures different periods of holding time. Muscle glycogen, muscle lactate, muscle yield, muscle pH, and chemical compositions were analyzed. The results showed that the pre-cooling could decrease stress response and delayed loss of biochemical changes. The best condition for the pre-cooling process when dipping the mud crab in 5°C seawater for 5 min. This condition extended the 100% survival rate preserved a high density of muscle glycogen, muscle yield, and chemical compositions. More than 90% of glycogen disappeared within 3 days of storage, while the percentage of muscle yield after 7 days lost to 18.13±2.65%. Lactate content increased slowly and accumulated after 3 days storage, while muscle pH of all treatments increased slowly on 5 days storage and decreased slightly on 7 days storage. None of the pre-cooling treatments resulted in any significant change in mean of moisture, protein, fat, and ash contents. However, higher protein and lower moisture contents were observed from non-precooling treatments. The result indicated that the pre-cooling process may be useful for the handling process and transport of mud crabs.

Keywords: biochemistry, emersion storage, pre-cooling, lactate, glycogen, mud crab

Introduction

Transport of live mud crab often involves lowering temperature to reduce metabolism and spoiling of the animals. The physiology of lowered temperature as a preserving effect during seafood shipment has received some limited attention (Paterson, 1993; Samet et al., 1996). The method of chilled packing has been shown to minimize respiratory requirements, anaerobiosis and to extend the duration of shipping (Morris & Oliver, 1999). Improved handling can reduce physiological changes of animals that lead to delay loss of quality. Taylor and Whiteley (1989) showed that reducing O₂ consumption of prawns by cooling which makes them less susceptible to stress. Samet et al., (1996) reported that using long pre-cooling periods will prolong the survival of prawns during transport. In addition, Paterson (1993) reported the rise of lactate concentration in live prawns stored at high temperature. Thus, the lactate concentration that occurs in prawns stored out of water can be used as an index of physiological stress.
The present study, therefore, investigated the changes in the quality of freshness as reflected by some biochemical changes and stress response during emersion storage using pre-cooling process. An increased understanding of the stress response and biochemical change in mud cabs may lead to a better commercial practice for processing.

Materials and Methods

1. Animals

Adult intermolt Scylla serrata (male) with an average body weight of 150 g (145-155 g) and an average carapace width of 9 cm (range 8-10 cm) were obtained from commercial farms in Chantaburi province, Thailand. The crabs were transported to and maintained in the laboratory of the Department of Food Science and Technology, Rambhai Bharni Rajabhat University. All crabs were acclimated for one week prior to experimentation in polypropylene tanks with aerated seawater, mean salinity of 33±2 ppt, mean temperature of 27±1°C under natural light-dark condition. During this period, the crabs were fed every day with chopped mussel tissue, and the seawater was changed every few days.

2 Experimental design and Muscle sample preparation

The experimental live crabs were divided into ten groups with three replications in each group. They were exposed to seven different methods of pre-cooling process: (1) non pre-cooling (control), (2) pre-cooling at 5°C for 5 min, (3) pre-cooling at 5°C for 10 min, (4) pre-cooling at 5°C for 15 min, (5) pre-cooling at 10°C for 5 min, (6) pre-cooling at 10°C for 10 min, and (7) pre-cooling at 10°C for 15 min. Each crab was accommodated in a styrofoam case (20 x 33 x 18 cm) and stored at 27±1°C for 7 days. Crabs were removed everyday and muscle samples were analyzed glycogen, lactate, pH, muscle yield, and chemical compositions (moisture, protein, fat, and ash).

Muscle samples were taken rapidly to avoid any muscular contraction. Samples were taken from region of abdomen and leg (pereiopods and chelipeds). They were placed on tray and then frozen by quick freezer. Frozen samples were wrapped in aluminum foil and stored in cold air at -20°C until analyzed.

3 Analyses

3.1 Muscle glycogen

Muscle glycogen was measured by the colorimetric method (Carroll et al., 1956). The frozen muscle samples from 2.2 were freeze-dried for 24 h before grinding to a power using a sterile pestle and mortar. Approximately 20 mg of freeze-dried ground muscle was added to 400 μl of 30% KOH before boiling for 10-20 min in a water bath maintained at 95-100°C. Samples were cooled and added to 700 μl absolute ethanol before being placed on ice for 2 h. Samples were then centrifuged at 14,000-17,000 rpm for 10 min and the supernatants discarded. One ml of water was added to each sample prior to sonication. Fifty μl of each sonicated sample were incubated at 95-100°C in 1 ml of anthrone reagent (Sigma, St. Louis, MO, USA) for 10 min. The absorbance of samples was measured in a spectrophotometer at 600 nm and converted to total glycogen concentrations using a series of dilutions of known concentrations. Analytical grade glycogen was obtained from Sigma, St. Louis, MO, USA.
3.2 Muscle lactate
For determination of lactate in muscle, Approximately 0.8 g of freeze muscle was homogenized in 6 ml ice-cold 0.6 M perchloric acid. The homogenates were place on ice and left to extract for 30 min, then centrifuged at 11000 rpm for 5 min. The supernatant solution was neutralized by addition of 1:10 vol. 2 M potassium bicarbonate. The solution was centrifuged for 15 min at 11000 rpm for phase separation. The 50 μl of sample solutions were added to tubes containing 5 μl of 0.06 ml/ml lactate dehydrogenase (LDH), 50 μl of nicotinamide adenine dinucleotide (NAD; 2 mg/ml) and 1 ml of 0.4 M hydrazine hydrate buffer (pH 9.5) and incubated for 2 hr at 37°C. The absorbance of sample solution was measured in a spectrophotometer at 340 nm and converted to lactate concentrations using a series of dilutions of known concentrations (Engel & Jones, 1978; Ridgway et al., 2006). All chemicals were obtained from Sigma, St. Louis, MO, USA.

3.3 Muscle pH
Solutions of homogenized muscle was prepared using distilled water at a ratio of 1:10 (w/v) (Chiou & Huang, 2004). The pH of the homogenized muscle was measured by pH meter at room temperature.

3.4 Muscle yield
Before cooking, the total body weight of crab were recorded. Crab was placed in a freezer at -10°C for 1 hr and then was cooked with stream at 100°C for 8 min. All muscles were separated from the exoskeleton and weighed. The muscle yield was calculated according to Chiou and Huang (2003) as follows:

\[
\text{Muscle yield} (\%) = \frac{\text{muscle weight}}{\text{total body weight}} \times 100%
\]

\[
\text{Muscle loss} (\%) = \frac{\text{weight loss of muscle yield}}{\text{initial weight of muscle yield}} \times 100%
\]

3.5 Chemical composition
Moisture (AOAC No. 950.46), crude protein (AOAC No. 940.25), crude fat (AOAC No. 991.36), and ash (AOAC No. 938.08) were determined. Moisture was calculated by the weight loss of sample dried at 105°C until constant weight. Crude protein was estimated from the total nitrogen by a factor of 6.25 which the muscle was analyzed by the Kjeldahl method. Crude fat was extracted with chloroform-methanol (2:1) mixture and dried in an air-oven. Ash of the muscle was determined after exposure to 500°C in an oven (AOAC, 1999).

2.4 Statistical analysis
Statistical analysis was performed using the Analysis of Variance (ANOVA) followed by Duncan’s Multiple Range Test (p < 0.05)

3. Results and Discussion
3.1 Changes in muscle glycogen and lactate
The initial glycogen content in muscle of mud crab averaged 435.56 mg/100g. Concentration of glycogen in muscle decreased on the first day of storage at all treatments, which the pre-cooling at 5°C for 5 min decreased lower than all other treatments throughout the period of storage (Figure 1). More than 90% of glycogen disappeared within 3 days of storage at pre-cooling 10°C 10 min with averaged 10.12±13.05mg/100g. While non pre-
cooling and pre-cooling 10ºC 5 min treatments, they disappeared within 4 days of storage with averaged 13.00±13.62 mg/100g and 15.25±12.17 mg/100g, respectively, they are significantly different from pre-cooling 5ºC for 5 min (48.13±12.61 mg/100g) on 4 days of storage. At the pre-cooling 5ºC for 5 min, the glycogen content remained with averaged 15.64±13.19 mg/100g on the fifth days of storage.

The change of lactate concentration, there was an increase in all treatment groups with pre-cooled temperature and duration of storage (Figure 2). The increase being greatest in mud crabs not pre-cooled in seawater with longer period of storage. At all treatments, the increase were pronounced after the first day of storage. The concentration then increased steadily during the remainder of the seventh days period of storage, which that the increased lactate (15.82±0.20 and 16.11±0.17 mmol/kg of pre-cooling at 5ºC for 5 min and pre-cooling at 10ºC for 5 min) was significantly difference from non pre-cooling throughout the period with the largest increase occurring at the non pre-cooling treatment (19.20±0.15 mmol/kg) on 7 days storage.

While the other treatments, pre-cooling at 5ºC 10 min, pre-cooling at 5ºC 15 min and pre-cooling at 10ºC 15 min, death of crabs also found approximately 100% on 3 days storage. Whereas at pre-cooling at 10ºC for 10 min, crab died approximately 100% on 4 days storage.

3.2 Changes in muscle pH

The pH in muscle of all treatments changed slowly with the initial pH averaged 6.90-6.92 (Figure 3). They increased slowly in non pre-cooling, pre-cooling at 5ºC 5 and pre-cooling at 10ºC 5 min with average of 7.18±0.02, 7.14±0.03, and 7.15±0.03 on 4 days storage, respectively, and decreased slightly average to 7.05±0.01, 7.10±0.02, and 7.10±0.02 on 7 days of storage, respectively (pre-cooling 5ºC 10 min, pre-cooling 5ºC 15 min and pre-cooling 10ºC 15 min were all dead), there were no significantly difference in pH between the treatments.

3.3 Changes in muscle yield

The effects of pre-cooling temperature and holding duration of time resulted in a decrease of muscle yield. At all treatments, the muscle yield lost as the duration of emersion storage and pre-cooling temperature were increased. At 5ºC of pre-cooling, the loss of muscle yield was less than at 10ºC of pre-cooling and non pre-cooling, which that longer pre-cooling periods resulted in loss of muscle yield higher than short duration of holding at low temperature (Figure 4). The greatest loss of muscle yield was occurred in mud crabs at non pre-cooling treatment to 28.11±2.53% on the seventh days storage, which a level significantly difference from pre-cooling 5ºC 5 min and pre-cooling 10ºC 5 min with averaged 18.13±2.65 and 20.31±2.01% on 7 days storage, respectively.

3.4 Changes in chemical composition

The chemical compositions changed with time and temperature (Table 1). The total chemical compositions changed slightly during emersion storage. Levels of the moisture content of all treatments averaged between 77.04-81.70%, protein 16.10-15.12%, fat 0.18-0.23%, and ash 1.45-1.55% on 1-7 days storage. According to pre-cooling process, the mud crabs pre-cooled at 5ºC and 10ºC maintained the chemical compositions higher than those in non pre-cooling, especially for the protein content. While the non pre-cooling treatment was significantly change of moisture higher than pre-cooling treatments. The highest change of chemical compositions was found in the non pre-cooling throughout the period of storage.
4. Discussion

The present study showed that pre-cooling process had a direct effect on stress of crabs. Glycogen is the primary fuel in muscle of crustaceans and major carbohydrate in the blood, as a source of fuel for anaerobic metabolism resulting in the production and accumulation of lactate (Morris & Oliver, 1999). The decrease of muscle glycogen in all treatments indicated the mobilization of energy stores under stressful condition of low O₂ availability during emersion storage. A rapid degradation of glycogen was found in the non pre-cooling treatment. Similar findings have also been reported for a significant reduction in abdominal tail muscle in *Nephrops norvegicus* when exposed to environmental hypoxia (Baden et al., 1994). Chiou and Huang (2004) found that glycogen of mud crab disappeared more than 90% within 4 days after storage at 25°C.

Lactate is the major end-product of anaerobic metabolism in crustaceans. The increase of lactate concentration in the hemolymph and muscle during aerial exposure indicated an anaerobic metabolism (Spicer et al., 1990; Ridgway et al., 2006; Lorenzon et al., 2007). In this study, the lactate concentration in mud crab increased progressively during emersion storage, especially in non pre-cooling, while the pre-cooling process had lower accumulated lactate levels. Which found that mud crabs exhibit higher change in lactate concentration with higher pre-cooling temperature and longer pre-cooling periods. Similar to other study on air exposure of two lobster, such as *J. edwardsii* and *H. gammarus*, which found that lobster exhibit smaller change in lactate concentration with emersion and accordingly survive longer periods of exposure to air (Taylor & Whiteley, 1989). The increase of lactate concentration related to increased metabolic activity result from anaerobic exercise of crab. Morris and Oliver (1999a) who measured lactate concentration in *J. edwardsii*, lobster was dipped in 5°C seawater for 2 min before packaged, the concentration had decreased to 0.90 mmol/kg after 10 hr emersion storage. Thus, this result indicated that the pre-cooling process could reduce accumulation of lactate and glycogen during emersion period by reducing O₂ demand and thereby delaying the onset of anaerobiosis.

Chiou and Huang (2004) also reported that the pH level of abdominal muscle of mud crab *S. serrata* increased after 2 days of storage. The changes in pH of muscle during emersion storage may result from the metabolic alkalosis and the metabolic acidosis by mechanisms enabling metabolic compensation of acidosis induced by emersion condition. An immediate metabolic compensation in emersed, non chilled animals has been observed in some crabs and lobsters, *J. edwardsii, H. gammarus* in air at 10°C (DeFur & McMahon, 1984; Burnett & McMahon, 1987; Whiteley & Taylor, 1990). In crab *S. serrata*, an increased pH during emersion resulted from changes in the conditions of the gill lamellae (Varley & Greenaway, 1992).

Loss of muscle yield may result from high metabolic rate of crabs during emersion storage and reactions that lead to chemical changes of proteins and lead to an increase in drip loss (Samet et al., 1996; Yamagata & Low, 1995), glycogen loss and lactate accumulation. It has been reported that body weight losses of prawns occurred after 18 hr of air exposure; and the prawns died when there was approximately 16% loss of the initial body weight. This loss may result from a reduction of haemolymph volume as well as a slight decrease of the muscular water content. The increase in the viscosity of the haemolymph may cause problems on circulation and oxygen delivery which result in death (Samet et al., 1996).

The change of chemical compositions were found in the non pre-cooling higher than pre-cooling process, especially the moisture and protein content. This result may be caused by loss of water-binding capacity of protein and a structural weakening of muscle fibers or connective tissue, this possibly lead to looser structure (Turan et al., 2003;
Benjakul & Suttipan, 2009). Which Loss of freshness with softer texture, loss of muscle yield, odor change to slightly ammonia, and poor appearance was also found in this study.

In conclusion, the pre-cooling process with seemed to decrease metabolic activity of crabs which resulted in longer survival and reduced changes of physiology and biochemistry of crabs. Therefore, this indicates that pre-cooling process can be used for the process of preparing live mud crab before transportation in emersion storage conditions.

References


Figure 1 Changes in content of muscle glycogen (means ± SD) in the mud crab during emersion storage at room temperature (27±1°C)

Figure 2 Changes in content of muscle lactate (means ± SD) in the mud crab during emersion storage at room temperature (27±1°C)
Figure 3 Changes in content of muscle pH (means ± SD) in the mud crab during emersion storage at room temperature (27±1°C)

Figure 4 Percentages loss of muscle yield (means ± SD) of mud crab during emersion storage at room temperature (27±1°C)
Table 1 Percentages of chemical composition (means ± SD) in muscle tissue of mud crab during emersion storage on 1-7 days at room temperature (27±1°C)

<table>
<thead>
<tr>
<th>Process</th>
<th>Percentage of chemical composition (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>moisture</td>
</tr>
<tr>
<td>Non pre-cooling</td>
<td>81.70±1.21</td>
</tr>
<tr>
<td>Pre-cooling 5°C</td>
<td>77.52±1.08</td>
</tr>
<tr>
<td></td>
<td>77.04±1.10</td>
</tr>
<tr>
<td></td>
<td>76.53±1.04</td>
</tr>
<tr>
<td>Pre-cooling 10°C</td>
<td>78.21±1.01</td>
</tr>
<tr>
<td></td>
<td>77.20±1.11</td>
</tr>
<tr>
<td></td>
<td>76.94±1.15</td>
</tr>
</tbody>
</table>

** different letters in the same column indicate significant differences (p< 0.05)

* not significantly differences (p>0.05)
DEVELOPMENT OF JELLY FROM KAI ALGAE

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ABSTRACT

Jelly Products are one of popular food. In general the jellies sold in market produce from water containing synthetic flavor, food color and sugar as the main component. Kai is the one type of algae that contains 19.44% of protein, vitamin and minerals like after vegetable and antioxidant substance especially selenium. There is a few products from Kai algae, the aim of this work is to produce jelly by using Kai algae as the raw material. Kai algae were prepared into kai solution and took 5, 10, 15 and 20% to produce jelly. The jellies were prepared as 12 formulas by the addition pectin hydrocolloid to improve the texture which varied from 0.5, 1.0, and 1.5% by weight and the lemon juice was also used as the acid adjustor. The total phenolic content, antioxidant inhibitions and selenium content were analysed in all kai jelly proucts. The results showed that, the kai jelly products contained the total phenolic content in the range of 78.43-155.44 mg/g. The products showed % antioxidising inhibitions in the range of 13.25-28.28% and the selenium was 0.016-0.029 mg/g. The total phenolic content, antioxidant inhibition and selenium increased as increasing the concentration of kai solution. However, after sensory evaluation test on color, flavors and taste of kai jelly tested by 100 volunteers using comparison with jelly produce from water. The volunteers accepted the taste and flavors of kai algae more than normal jelly but preferred the color less than normal jelly. Thus this work show that, kai algae could be processed to be the new products as jelly which containing the important nutrient as total phenolic compound and selenium metal.

Keywords: jelly, Kai algae, Total phenolic compound, antioxidant inhibition

Corresponding author

Introduction

Kai is the algae that found in the northern part of Thailand. Kai algae contains 19.44% protein as the main component and also contains many nutrient substance such as fiber, carotene, vitamin E, xanthophylls and selenium[1]. The product from Kai still a few in the market and from the above important nutritional value of kai algae, jelly is an interested product in this work. Jelly sold in the market generally made from water or fruit juices or water, sugar and gelling agent. In this research, the jelly product from kai algae was developed to prepare an antioxidant jelly product. The jelly from kai algae was analysed the total phenolic compound content, antioxidant inhibition and selenium content too. However, the pectin which was used as jelling agent [2] was varied for 0.5, 1.0 and 1.5%. Lemon juice was used as pH adjuster[3]. All treatments were prepared 4 sets of jelly formlars which varied extracted kai algae solution as 5, 10, 15 and 20% by weight.
and each set also prepare in 3 subset which varied pectin content as 0.5, 1.0 and 1.5 %. The sensory evaluation on those kai jellies were tested by 100 volunteers.

Related Literatures
Kai algae was found in Thailand as many species. The one which known as Cladophora spp. has thin hair-like threads about 10 centimeters long. These hair-like threads form slippery mats attached on the rocks and other solid objects and just below the water line[4]. Cladophora spp. has become more abundant during the past century in many areas especially in Khlong river. This algae contains many nutrients such as 19.4 % of protein, 3.12 % of lipid, 19.6 % of fiber and 30.34 % of carbohydrate by dry weight of Kai algae. Additionally vitamin B1, B2, C, folic acid, pantothenic acid and minerals are also present, especially selenium.[1]. The people collect kai algae and also cook as food. There was no report about the production of jelly from kai algae. Jelly is one of the dessert sweet product which semisolid form. Jelly may refer to one type of fruit preserve. Jelly making is a good way to preserve fruit flavors for enjoyment throughout the year.[5] In general, the component for prepare jelly are fruit flavor, pectin, sugar, acid and water. The fruit flavor is provided by the fruit juice. The jelly product sold in the market has 2 forms[6], the one use as dessert jelly contains carragenan as jelling agent, sugar, citric acid, food color and flavor. The other form use as confectionery jelly, this type of jelly contains gelatin as jelling agent and glucose syrup[6]. However, there have many reports refer about the preparation of jelly from many fruits use pectin as gelling agent[5],[7], report the result in using sorbitol to reduce the syneresis in agar jelly. Normally, Jelly give the calories as 273 kcal/100 g. Thus, some researcher tried to study the low calories as in[8] Acosta, O, et.al. evaluated three factors (sweetener, low methoxyl (LM) pectin and calcium content) at three levels each, on the overall acceptability of a tropical mixed fruit (pineapple, banana and passion fruit) jelly, determined by 100 consumers to obtain a jelly that provided less than 12 calories per serving, allowing the product to be labelled as “low calorie”.

There still has no report about the preparation of jelly from algae, so the main idea of this work is to prepare jelly from kai algae which the antioxidising power product.

Method and Procedures

Part1. Preparation of jelly
Kai algae (from Nan province) were prepared for 5%, 10%, 15% and 20% w/v of extracted solution by using kai algae 10, 20, 30 and 40 g respectively and crushed in 100 ml of water. The extracted kai solutions 20 ml were mixed with 20% sugar (Mitrapol brand) and pectin as in the following formulas, then the mixed solutions were heated at 90°C. The lemon juice was added to each formula to adjust the pH value. After the mixing process over, the jellies were poured into the block to left them cool down and pushed out of block. The jelly was stored in refrigerator for further experiment.
<table>
<thead>
<tr>
<th>set</th>
<th>Formula</th>
<th>% kai extracted solution</th>
<th>Pectin(g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Set A</td>
<td>F1</td>
<td>5</td>
<td>0.5</td>
</tr>
<tr>
<td></td>
<td>F2</td>
<td>5</td>
<td>1.0</td>
</tr>
<tr>
<td></td>
<td>F3</td>
<td>5</td>
<td>1.5</td>
</tr>
<tr>
<td>Set B</td>
<td>F4</td>
<td>10</td>
<td>0.5</td>
</tr>
<tr>
<td></td>
<td>F5</td>
<td>10</td>
<td>1.0</td>
</tr>
<tr>
<td></td>
<td>F6</td>
<td>10</td>
<td>1.5</td>
</tr>
<tr>
<td>Set C</td>
<td>F7</td>
<td>15</td>
<td>0.5</td>
</tr>
<tr>
<td></td>
<td>F8</td>
<td>15</td>
<td>1.0</td>
</tr>
<tr>
<td></td>
<td>F9</td>
<td>15</td>
<td>1.5</td>
</tr>
<tr>
<td>Set D</td>
<td>F10</td>
<td>20</td>
<td>0.5</td>
</tr>
<tr>
<td></td>
<td>F11</td>
<td>20</td>
<td>1.0</td>
</tr>
<tr>
<td></td>
<td>F12</td>
<td>20</td>
<td>1.5</td>
</tr>
</tbody>
</table>

Part 2 Study the chemical properties of kai jellies

2.1 Analysis of total phenolic content
Kai jellies were analysed total phenolic compound by method as refered in [9]. Jellies (0.250 g each) were put into 50 ml of water and crushed to finely dispersion solution. The jelly solution 0.4 ml was mixed with 2 ml of 10% folin-Ciocaltea reagent (AR grade, from Sigma Chemical), left the solution for 5 min., then 1.6 ml of 7.5% sodium carbonate (AR grade from Fluka) was added to mixing solution. After 30 min. of mixing time, the colour solutions were performed and measured an absorbance at 765 nm by Ultraviolet –Visible Spectrophometer (Shimadzu model UV100). The total phenolic acid contents were evaluated with calibration curve of standard gallic acid (AR grade, from Merck)

2.2 Analysis of antioxidising inhibition power
The kai jellies solution (500 µL each) were mixed with 500 µL of 0.1 mM DPPH (AR grade, from Fluka) in test tube and mixed with vortex mixer and left at room temperature for 30 min. The color solution was measured an absorbance at 517 nm by Ultraviolet –Visible Spectrophometer. The sample absorbance was compared with standard BHT (AR grade from Fluka). The percentage of inhibition was calculated by the equation (1)
\[
\% \text{ inhibition} = \frac{\text{control OD} - \text{sample OD}}{\text{control OD}} \times 100 \quad \ldots\ldots\ldots(1)
\]

control OD = the absorbance value of standard BHT

sample OD = the absorbance value of sample solution

2.3 Analysis of Selenium in Kai jellies

Kai jelly 5.0 g was digested with 3 ml. of 65% nitric acid (AR, grade from Acros) for 3 hours till the nitric fume was expelled out and got the clear solution. The clear solution was diluted with millQ deionised water (from Millipore Instrument) to 25 ml. and aspirated to Atomic Absorption Spectrometer (Perkin Elmer). The sample solution was calculated selenium by comparison with standard calibration curve of standard selenium (AAS grade from Fisher Chemical).

Part 3 Sensory Evaluation

The kai jellies products were evaluated the characteristics; appearance, color, odor, texture and overall acceptability by hedonic scale by 100 volunteers.

Finding and Conclusions

From part 1. The jellies were prepared for 4 sets contained 12 formulas. All formulas showed the good characteristics of jelly with pale yellow green to dark green brown color with lemonade smell and sour sweet taste as showed in table 1.

Table 1. Physical characteristics of kai jellies

<table>
<thead>
<tr>
<th>set</th>
<th>formular</th>
<th>color</th>
<th>Flavour</th>
<th>Taste</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>F1</td>
<td>Pale yellow green</td>
<td>lemon</td>
<td>Sweet with sour</td>
</tr>
<tr>
<td>A</td>
<td>F2</td>
<td>Pale yellow green</td>
<td>lemon</td>
<td>Sweet with sour</td>
</tr>
<tr>
<td>A</td>
<td>F3</td>
<td>Pale yellow green</td>
<td>lemon</td>
<td>Sweet with sour</td>
</tr>
<tr>
<td>B</td>
<td>F4</td>
<td>yellow green</td>
<td>lemon</td>
<td>Sweet with sour</td>
</tr>
<tr>
<td>B</td>
<td>F5</td>
<td>yellow green</td>
<td>lemon</td>
<td>Sweet with sour</td>
</tr>
<tr>
<td>B</td>
<td>F6</td>
<td>yellow green</td>
<td>lemon</td>
<td>Sweet with sour</td>
</tr>
<tr>
<td>C</td>
<td>F7</td>
<td>Dark yellow green</td>
<td>lemon</td>
<td>Sweet with sour</td>
</tr>
<tr>
<td>C</td>
<td>F8</td>
<td>Dark yellow green</td>
<td>lemon</td>
<td>Sweet with sour</td>
</tr>
<tr>
<td>C</td>
<td>F9</td>
<td>Dark yellow green</td>
<td>lemon</td>
<td>Sweet with sour</td>
</tr>
<tr>
<td>D</td>
<td>F10</td>
<td>Dark green brown</td>
<td>lemon</td>
<td>Sweet with sour</td>
</tr>
<tr>
<td>D</td>
<td>F11</td>
<td>Dark green brown</td>
<td>lemon</td>
<td>Sweet with sour</td>
</tr>
<tr>
<td>D</td>
<td>F12</td>
<td>Dark green brown</td>
<td>lemon</td>
<td>Sweet with sour</td>
</tr>
</tbody>
</table>

From the above results showed that kai algae could processed to jelly product with the color shade depend on the content of extracted kai algae solution. The jellies that contained the higher extracted kai algae solution showed the darker color. In part 2, after
the analysis of 3 parameters such as total phenolic content, antioxdising inhibition power and selenium as showed in figure 1-3.

**Figure 1.** The total phenolic contents in kai jellies.

**Figure 2.** % antioxidising inhibition in kai jellies

**Figure 3.** Selenium contents in kai jellies

In figure 1, the total phenolic contents in each set trend to increase as increasing the concentration of extracted kai algae solution. In each formula in one set example as in set
A, F1, F2, and F3 trend reduced as increasing the pectin content and the total phenolic content had the same trend in set B and set C as in figure 4.

Figure 4. The total phenolic contents change in each set of jelly

However in kai jelly formula F10 contained the highest total phenolic content about 160 mg/L. The result in analysis of antioxidant inhibition power as in figure 2 also showed the same trend of their value as in the changing of total phenolic contents. The kai jelly formula F10 also contained the highest antioxidant inhibition power about 28%. From the figure 3 showed the highest selenium content (0.03 mg/L) found in F10 and the selenium content had the same trend as both total phenolic content and antioxidant inhibition power. From this part of the experiment presented that jelly could be prepared as formula F10 which gave the jelly that contain the highest of total phenolic content, antioxidant inhibition power and selenium content. However, the jellies in each set that made from 0.5 g of pectin will gave the best texture than the formula contained higher pectin.

After the 100 volunteers (50 people as male and 50 people as female) tested the acceptability of those jellies that contain 0.5 g of pectin (F1, F4, F7, and F10) in appearance, color, texture, flavor and taste compare with the jelly which made from water, sugar, pectin and lemon juice. The result showed as in figure 5-7

Figure 5. Flavor acceptability in kai jellies
From each figure 5 to 7, showed that the volunteers prefer all formula of F1, F4, F7 and F10 at medium level. Kai jelly F10 was accepted at medium level by the lowest score, F7 was accepted in color, flavor and taste at better level than the others. So, the proper formula to prepare kai jelly should be prepared as formula F7 which contained 15% of kai algae extracted solution.

Discussions

From this study in part 1 showed that jelly could be prepared by using kai algae extracted solution in 12 formulas. In part 2, all those jellies contained the difference content of total phenolic compound content, antioxidising inhibition power and selenium content. The jelly which prepared from 20% extracted kai algae solution has the highest 3 parameters content, since kai algae has valuable nutrient at high level so the nutrient must higher as concentrate of kai solution. For the above data showed the effect of pectin contents, the more pectin content in jellies had an effect on total phenolic compound content, antioxidising inhibition power and selenium content. Since, pectin was one type of hydrocolloid which was controlled its concentration in food addition. The high content of pectin may trapped all of total phenolic compound content, antioxidising inhibition power and selenium content in its structure[2]. From sensory evaluation, we can conclude that the proper formula in preparation kai jelly was F7 because the most people preferred F7 at the
highest score. This is the reason for the color of extracted kai solution depend on its concentration.

**Acknowledgement**

The author wish to thank department of chemistry on the instrumentation for this work.

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MARKETING STRATEGIES INFLUENCING CUSTOMER SATISFACTION AND CUSTOMER LOYALTY: A CASE STUDY OF TESCO LOTUS IN BANGKOK

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Stamford International University
Thailand

ABSTRACT

The purposes of this research were: (a) to find a relationship between customer satisfaction and customer loyalty; (b) to find a relationship between four marketing strategies (i.e. product quality, product price, product variety, and customer service) and customer satisfaction; and (d) to examine the marketing strategies that would have positive effects on customer satisfaction and verify the most important factor that would lead to customer loyalty. The samples in this study were 400 customers of Tesco Lotus. The questionnaire consists of 24 questions. Descriptive statistics which consists of Percentage, Mean, Standard Deviation, and inferential statistics which consists of Pearson Correlation, Multiple Regression Analysis, and One Way Analysis of Variance (ANOVA) were used in this study. The research results showed that there is a positive relationship between customer satisfaction and customer loyalty. The increase in satisfaction of customers leads to the increase in customer loyalty. The four marketing strategies i.e. product quality, product price, product variety, customer service are positively related to customer satisfaction and customer loyalty. Product price is the best predictor for customer satisfaction, whereas product quality is perceived as the strongest influencer for customer loyalty.

Keywords: Marketing Strategies, Customer Satisfaction, and Customer Loyalty

Introduction

Customer satisfaction is a measure of how products and services supplied by a company meet or surpass customer expectation. It is seen as a key performance indicator within business and is part of the four perspectives of a balanced scorecard. In a competitive marketplace where businesses compete for customers, customer satisfaction is seen as a key differentiator and increasingly has become a key element of business strategy. At present, the economy is in bad shape or in recession. Organizations are increasingly interested in retaining existing customers while targeting non-customers. Measuring customer satisfaction provides an indication of how successful the organization is at providing products and/or services to the marketplace. In addition, customer satisfaction can be defined as a full meeting of customer’s expectation towards products and services from the company. All marketing-oriented companies have considered the increase of customer satisfaction as a principle approach to implement as a routine basis to increase profitability. Many academic supports from various researchers point out satisfaction as an attractive business philosophy in which reaching customer satisfaction can be expected to gain more market share and acquire repeat purchase. There are many marketing strategies or factors that the company can use to increase customer satisfaction.
However, the most important factors inspiring the researcher to conduct this study are product quality, product variety, product price, and customer services. These four factors are accepted as the most important marketing strategies of Tesco Lotus Hypermarkets to compete in the global market.

**The History of Tesco Lotus**

Tesco Lotus is a hypermarket chain in Thailand and China. In Thailand, the stores are operated by Ek-Chai Distribution System Co., Ltd. Established in 1998, Tesco Lotus was a joint venture between Charoen Pokphand Group and Tesco, the British giant supermarket chain. Facing criticism over the growth of hypermarkets in Thailand, the CP Group sold its shares on Tesco Lotus in 2003; however, the CP Group still remains its share on Tesco Lotus in China. Tesco Lotus stores stock groceries both western and local products as well as a selection of stationery, school supplies, clothing, shoes, electrical equipment and many other non-food products at very competitive prices. Tesco Lotus, the world’s third largest retail business, has always striven to be a one-stop shopping experience for customers (Tesco Lotus-Wikipedia, 2008).

**Independent Variables**

Independent variables in this study consist of demographic profile (i.e. age, gender, marital status, educational level, period of shopping); and marketing strategies (i.e. product quality, product price, product variety, and customer service).

**Dependent Variables**

Dependent variables are customer satisfaction and customer loyalty.

**Definitions of Terms**

Customer satisfaction: A full meeting of the customer’s expectation, including attitude and feeling toward products or services they have been provided.

Customer Loyalty: A need of customer to repeat purchase, maintain positive attitude toward the same product or service provider and also continuously recommend products and services to others.

Customer service: Serving customer with warm and friendly welcome in order to create impression and satisfy customer.

Product quality: The overall nature, general characteristic or standard of product when it is compared to other products; how good or bad product is.

Product price: An amount of money charged for product when customer purchases at Tesco Lotus.

Product variety: Several or different type of product; the quality of not being the same or not doing the same thing all the time.

Tesco Lotus: A hypermarket chain or a big shopping center in Thailand that sells many different products.

**Literature Review**

The competition between hypermarkets and other business markets is intense. Besides current competitors who supply the same product to customers, wholesaler, and retailers, there are many new different hypermarket stores entering into the business market, and offering the same product. Meanwhile, customer acquisition is become more difficult due to the fact that customers have more choices. So, the hypermarket stores should be aware of the business dynamic of the market. The strategies of retaining current customer satisfaction and increasing satisfaction of new customers are significant to the company.

Kotler (2003) mentioned that many companies are interested more in the market share and sales volume rather than considering their customer satisfaction; this is a mistake because it focuses only on market share and is a backward-looking metric. On the other hand, companies should try to satisfy customers, and make them appreciate both products
and services. Then the market share will soon follow. Thus, companies need to improve and increase level of customer satisfaction in order to increase sales volume and maintain their market share. Huber, Herrmann, and Wricke (2001) mentioned that a satisfaction of customers’ needs and wants is the underpinning of a company’s long-term success, then it is crucial for the company’s management team to consider each factor that could achieve the highest level of customer satisfaction.

Customer satisfaction is a psychological state that occurs when customers compare their prior expectations before purchase with the perception towards performance of products and/or services after purchase (Oliver, 1996). In general, customer satisfaction is described as the full meeting of the customer’s expectation, including attitude and feeling towards products or services they have been provided (Oliver, 1980). Other researchers describe satisfaction as “an emotional state that occurs in response to an evaluation of the interaction experience with the salesperson” (Crosby, Evans, and Cowles, 1990). In short, customer satisfaction can be explained as the product or service perceived that match the expectation of customers (Kotler, Wong, Saunders, and Armstrong, 2005). The theory of confirmation/disconfirmation reviewed by Oliver (1980) explains that satisfaction will be achieved when customer’s expectations are fulfilled (confirmation), positive disconfirmation will result in enrichment of satisfaction with products and/or services that a customer receives are better than their expectation. Differing from positive disconfirmation; the negative disconfirmation happens when products and/or services of a company could not meet customers’ expectation. In short, both confirmation and positive disconfirmation of customer expectations cause customer satisfaction while negative disconfirmation of customer expectation causes dissatisfaction. Therefore, it can be explained that customer satisfaction will arise when performance of products or services exceed a customer’s expectation while dissatisfaction result from products or service performance which are below customer’s expectation.

Customer satisfaction becomes the company marketing strategy in the present. Many companies tend to focus more on the control of product quality and service quality in order to reach customer satisfaction (Bitner and Hubbert, 1994). Moreover, customer satisfaction has been used as a major mode of measuring the effectiveness and quality of product delivery and service to customers (Doyle, 2003). Both meeting and exceeding customer satisfaction facilitates managers to do market planning; they give the instant view of a company’s performance by following customer response and perception over time (Doyle, 2003).

If customers are satisfied with the particular products or services of the company, they will purchase the same products again and more frequently (Reichheld, 1996). Moreover, they would be inclined to try more product line extensions (East, 1997). In addition, customers who are satisfied with products and/or services also benefit to the company in several ways. Despite future intentions to repeat purchase with the same products or services provided, satisfied customers also spread through positive word-of-mouth recommendations for the products and/or services to their friends and relatives (Heskett, Jones, Loveman, Sasser, and Schlesinger, 1994). On the other hand, customers who are dissatisfied with the products or services will cause the drop of a companies overall satisfaction level. Instead of spreading positive word-of-mouth, they tend to stop purchasing products or services from their current provider and then switch to purchase from other providers instead (Levesque and McDougall, 1996).

Customer loyalty will increase significantly when satisfaction accomplishes a certain level, and at the same time customer loyalty will drop dramatically if the satisfaction level drops to a certain point. Highly satisfied customers tend to be more loyal customer than the customers who were merely satisfied (Tepeci, 1999).
In general, “Loyal Customer” refers to customers who repeat purchase, maintain positive attitude toward the same product or service provider and also continuously recommend products and services to others (Kandampully and Suhartanto, 2000). Although, the concept of customer loyalty in a business-to-business market is not specifically defined, Oliver (1999) described loyalty as a deeply held commitment to re-buy or re-patronize a preferred product/service consistently in the future, thereby causing repetitive same brand or same brand-set purchasing, despite situational influences and marketing efforts having the potential to cause switching behavior.

In addition, it is easy for a company to identify their existing customers rather than other potential customers (Bruhn, 2003). Compared to customer satisfaction, retaining customer loyalty has similar benefits. The company can increase revenue, reduce costs and enhance the financial performance by increasing numbers of loyal customers (Egan, 2001). Retaining customers has significant impact on overall company feasibility and profitability (Newman and Crowling, 1996). Additionally, benefits of retaining loyal customers include decreased risks from customer perception, lower customer price sensitivity and giving referral to the company. Loyal customers who are satisfied with products or service will spread over-positive word-of-mouth recommendations as well as recommend the company to other customers (Rowley, 2005).

To summarize the benefits, Reichheld and Teal (1996) proposed that retaining customer loyalty can contribute to the ‘life cycle of profits’ to the company, including revenue growth over time, cost saving over time, referral income, and price premiums. So, many companies are trying to keep their current customers at present because they believe that satisfied customers stay loyal to the products or services of a company and it is better to invest more money and put more efforts into this than any marketing campaign (Barnes, 1994). Thus, maintaining customer loyalty in marketing development strategies cannot be ignored, especially, in a business market which has numerous competitors, keeping good relationships with business customers could provide the increase of customer retention to the company.

There is no surprise that the hypermarkets should consider product quality on the list of priorities. High product quality could gain greater product acceptance from customers and it will lead to the customer satisfaction as well (Schellhase et al., 2000). The product factor includes product quality, packaging design, product feature, and warranties. In current competitive markets, product reliability is particularly important to customers because customers frequently choose to buy products based on the quality excellence (Chumpitaz and Paparoidamis, 2004). In contrast, if the company fails to meet buyer’s expectation and requirements, the relationship between the two parties will dramatically change. Egan (2001) indicates that customer service directly focuses on customer satisfaction. Moreover, the key aim of business operation is now focusing on long-term customer retention rather than short term. Parasuraman (1998) confirmed that the company is now shifting from selling products to serving customers effectively.

**Research Method used**

This study used the descriptive statistics which consists of percentage, frequency, mean and standard deviation, and inferential statistics which consists of Pearson Correlation, Multiple Regression Analysis, and One Way Analysis of Variance (ANOVA).
Populations and Samples

The populations in this study were customers who purchase products of Tesco Lotus. The approximately customers shopping at Tesco Lotus, Pinklao Branch, Bangkok are about 12,000. The study attempted to have 95 percents confident level (0.95=probability) of the sample size with tolerable error of 5 percent. In determining the adequacy of the sample size, the formula of Taro Yamane was used for calculation. Therefore, the minimum required samples for this study were 387 people. However, in order to maintain accuracy, the researcher has expanded to study 400 samples. A total number of respondents who completed the questionnaires were 398, and the response rate can be calculated as 99%.

Conclusion from the Findings

This section presented the results of statistical analysis on the demographic profile of respondents, mean value of customer satisfaction, a relationship between customer satisfaction and customer loyalty, and a relationship between four marketing variables (product quality, price, product variety, customer service) and customer satisfaction. Moreover, this section presented the most important factors that have positive effects on customer satisfaction, and verified the most important factor that would lead to customer loyalty.

Demographic Profile

The demographic profiles of respondents can be presented as follows:
1. Respondents with age between 30-45 years old were 178 or 45%. Respondents with age of 29 years old and below were 150 or 37.5%, whereas respondents with age of 45 years old and older were 70 or 22.5%.
2. The female respondents were 279 or 70%, whereas male respondents were 119 or 30%.
3. Two hundred and nineteen respondents (219) or 55% were married, whereas 179 or 45% were single.
4. Respondents who received certificate Below Bachelor’s degree were 215 or 53.75%; Bachelor’s degree, 150 or 37.5%; Master’s degree, 30 or 7.5%; and only 5 or 1.25% received Doctoral degree (Ph.D.).
5. Two hundred and forty-eight respondents (248) or 60% have been shopping at Tesco Lotus for less than 5 years, whereas 140 or 35% have been shopping between 6 to 10 years, and only 10 or 2.5% have been shopping for more than 10 years.

Mean and Standard Deviation of Customer Satisfaction

Table 1: Mean and Standard Deviation of Customer Satisfaction toward Marketing Strategies of Tesco Lotus

<table>
<thead>
<tr>
<th>Marketing Strategies</th>
<th>Mean</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product Quality</td>
<td>3.62</td>
<td>0.51</td>
</tr>
<tr>
<td>Product Price</td>
<td>4.49</td>
<td>0.35</td>
</tr>
<tr>
<td>Product Variety</td>
<td>3.32</td>
<td>0.54</td>
</tr>
<tr>
<td>Customer Service</td>
<td>3.83</td>
<td>0.15</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>3.81</strong></td>
<td><strong>0.38</strong></td>
</tr>
</tbody>
</table>

As shown in Table 1, product price has a mean value of 4.49 or very strongly satisfied. Customer service has a mean value of 3.83 or strongly satisfied. Product quality has a
mean value of 3.62 or strongly satisfied. Product variety has a mean value of 3.32 or moderately satisfied. A total average mean of customer satisfaction is 3.81, which can be interpreted as strongly satisfied.

**Hypotheses Testing**

The seven hypotheses were tested, and the results of hypothesis testing were presented as follows:

**Ha1:** There is a relationship between customer satisfaction and customer loyalty

The correlation analysis was used to describe the relationship between customer satisfaction and customer loyalty. The results of Pearson Correlation indicate that there is a strong relationship between customer satisfaction and customer loyalty (Pearson correlation = 0.678, P-value = 0.000 < 0.05). It can be concluded that the increase of customer satisfaction is strongly related to the increase in customer loyalty.

**Ha2:** There is a relationship between product quality and customer satisfaction.

The correlation analysis results indicate significant positive relationship between product quality and customer satisfaction (Pearson correlation = 0.540, P-value = 0.04 < 0.05). This Pearson Correlation score indicates that customers consider the product quality as one of very important factors. Product quality has a total mean score of 3.6266. The high product quality leads to the increase of customer satisfaction.

**Ha3:** There is a relationship between product price and customer satisfaction.

The Pearson Correlation indicates that there is a very strong relationship between product price and customer satisfaction (Pearson correlation = 0.875, P-value = 0.000 < 0.05). Product price has a total mean score of 4.4925. Customers consider the appropriateness of discount as the highest factor attracting them to shop at Tesco Lotus. Better discount in product price increases customer satisfaction. Customers consider product price as the first priority.

**Ha4:** There is a relationship between product variety and customer satisfaction.

The results of correlation analysis indicate that there is a relationship between product variety and customer satisfaction (Pearson correlation = 0.656, P-value = 0.045 < 0.05). Product variety is positively related to customer satisfaction. Product variety has a total mean score of 3.3295, and customers draw most attention to the maintaining of product variety with highest mean score of 3.47.

**Ha5:** There is a relationship between customer service and customer satisfaction.

The results of Pearson Correlation indicate that customer service is positively related to customer satisfaction (Pearson correlation = 0.501, P-value = 0.003 < 0.05). Customer service has a total mean score of 3.8331, which shows the same direction as correlation analysis results. Tesco Lotus has customers' best interest at heart with the highest mean score of 3.84.

**Ha6:** Product quality, product price, product variety, and customer service are the important factors influencing customer satisfaction.

Multiple regression analysis was used to analyze product quality, price, product variety, and customer service in order to find the most important factor influencing customer satisfaction. The results of analysis can be concluded that the product quality, product price, product variety, and customer service are the factors influencing customer satisfaction. Product price is the best indicator influencing customer satisfaction. The discount price which Tesco Lotus uses as their philosophy “we sell for less” is very successful in their competitive marketing strategy.

**Ha7:** Product quality, product price, product variety, and customer service influencing the customer loyalty.

Multiple regression analysis was used to test four factors with customer loyalty. The results of multiple regression analysis from coefficient table suggest that four factors
have a significant effect on customer loyalty. The standardize beta value confirms that product quality is the best predictor which has the greatest influence on customer loyalty.

Discussion and Recommendation

This study confirms a positive relationship between customer satisfaction and customer loyalty. The increase in satisfaction level of customers leads to the increase in customer loyalty. The study also investigates the effect of four marketing strategies i.e. product quality, product price, product variety, and customer satisfaction on customer satisfaction and customer loyalty. The results of the study can be used to answer the research questions in which four factors have positive effect on customer satisfaction. Product price is the best predictor for customer satisfaction, whereas product quality is perceived as the strongest influencer for customer loyalty.

The results from the study support the research finding of the previous researchers which, presented that there is a strong relationship between customer satisfaction and customer loyalty. Szymanski and Henard (2001) found that customer satisfaction has a positive effect on customer loyalty. Fornell (1992) asserted that increase in customer satisfaction leads to the increase of customer loyalty. Sheth and Sisodia (1999) found that whether they are business customers or ordinary consumers, they tend to stay with the company if they feel satisfied with the company’s offerings. Therefore, the company must try to satisfy business customers’ requirements in order to make them stay loyal, repeat purchase, and recommend the company to others to create the company’s profitability.

Recommendations for Further Research

The present study was conducted by focusing on customers shopping at Tesco Lotus, Pinklao branch, Bangkok. The researcher would like to suggest that it would be useful to compare customer satisfaction of the selected Tesco Lotus with other Tesco Lotus Hypermarkets, which are located in different areas.

This study focuses only on four marketing strategies: product quality, product price, product variety, and customer service. The researcher would like to suggest that future research should focus on more than these four marketing factors.

This study focuses on customer satisfaction of Tesco Lotus, the researcher would like to suggest that future research should compare customer satisfaction of Tesco Lotus with other hypermarkets such as Big-C, and Carrefour etc. to find the strength and weakness of each hypermarket for the improvement of their marketing strategy.

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**Internet Sources**


Dr. Sukhumpong Channuwong received his Doctoral Degree in Business Administration (D.B.A.) from Argosy University, California, U.S.A. His research interests include human resource development, leadership style, business strategy, organizational behavior, stress management, and philosophy. He used to serve as Head of International Business Department at Troy State University, U.S.A. & St. Theresa INTI College; and Dean of Faculty of Business Administration, Chaopraya University, Nakhonsawan Province, Thailand. He is currently Dean of Graduate School at *Stamford International University, Thailand*. 
ART FOR DEATH DECORATION

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Abstract

This research investigated: (1) local customs relate to death ceremony, (2) coffin decoration, (3) careers for ‘Ruan Luang’ construction in Chanthaburi, (4) ‘Ruan Luang’ construction in Chanthaburi province. The results revealed various types of art for death. Research procedures included documentary study and interview local people concerning art for death decoration. The findings help (1) conserve local art, (2) spread art and culture, (3) create art business.

Key Words: art, death ceremony, decoration, coffin, ‘Ruan Luang’

Background of the Study

Art relates to both old and new ideas. It combines both modern and conservation. Art is known about the dynamics of beauty growth and redevelopment. Roles of art are seen in everywhere as long as a person has brain to think about it. This study investigates art for decoration after death. This is a sub-project under the main research entitled ‘Ruan Luang Models in Chanthaburi’ conducted by myself- the researcher.

Theories

Artist is a thinker and constructor. Thus, there are large areas for theories of art. The following presents some that relate to this study.

Art History

‘Art’ is the combination of various sciences. Art is usually organized as an assemblage or a cabinet of provocative things to think with, each of which has multiple connections to others, both within anthology and elsewhere. Art is also an anthology in the older sense of the world – an accounting of things which in their variety and allure might resemble a garden of flowers; a collection of texts that, in some case, have been appreciated as fine works of art in their own right (Preziosi, 1998: 9).

Social Class and Class Consciousness

Brettell (1999 : 155) states that the social history of art has been the most active and confident branch of the larger history of art for more than a generation, and no period in the history of art has been more systematically rewritten using socio history methods than the history of modern art. Modern culture saw the creation of an immense new bourgeoisie and an urban working class, whose relationship with the traditional peasants. Different classes created strains in society that affected everyone. The issue of class is of paramount importance. Actual experience has taught the new generation people differently.
Nationalism in Modern Art

Brettell (1999: 197-199) points out that art shows national identity. Whenever one walks through galleries, the person feels a sense of nationalism. An art visitor feels the national character. It is actually the imagery rather than the representational strategies. It is the history of the place of people.

We have already learned that a good deal of modern art associates more readily with the present than with the past, and that it is all but obsessed with the manner of representation, or what we might call technique. Yet it must be said that nationalism is among the most cataclysmic political events, and that, in spite of cosmopolitanism, the history of modern art remains a sequence of largely national histories written in national languages by historians who view art as the embodiment of national values.

A case for Reforming Architectural Values

Saint (1997: 34-35) points out the architectural values. They are:
1. The architectural attitude or, more properly, architects’ attitude.
2. The art-historical attitude and the critical appreciation of the fine arts.
3. The archaeological attitude.
4. The popular attitude.
5. The economic attitude.
6. The functional attitude.

Culture and Community

Osman (2001: 10-11) argues that culture and community is an important topic for ASEAN members. It deals with how a community as a conglomerate of people in a common locality give form to common way of life, establish social institutions, share common values and customs, and create patterned works of various forms. Studies of traditional communities especially the village, have been studied extensively by the social scientists, especially the anthropologists. Community studies as they are often referred to usually deal with village communities, delineating every facet of their culture, economic activities, recreational and leisure past-time, political and social organizations, kinship system and the family, religion and belief system, artistic work or even socialization. However the thrust of each study varies, but most studies deal with continuity and change. Culture by definition is a dynamic entity, prone to changes in response to external influences including the city or internally due to innovative inclinations of its members. At the same time, the continuity of culture provides an even keel in facing uncertainties of change.

Research Objectives

The main objectives of this study were to investigate:
1. Local customs relate to death ceremony,
2. Coffin decoration,
3. Careers for ‘Ruan Luang’ construction in Chanthaburi,
4. ‘Ruan Luang’ construction in Chanthaburi province.

Procedure

Research procedures were studying documents and interviewing local people.
Findings
The findings are divided into two main parts. One is general art after death. Two is art after death in Chanthaburi province.

It is found that art for death decoration in Thailand has been practiced for a long time. Art is classified by people status. After the death of the old people in the family, younger persons in the family decorate the death bodies and coffins as beautiful as they can or do as the late person asked when they were alive. In the past, after putting the dead body in a coffin, a roof has been constructed to cover the coffin. The roof is often made of wood or bamboo. ‘Pa Kao Ma’ is used for a ceiling and curtain. The ‘Pa Kao Ma’ will be donated to those who cremate the dead body. A banana stalk is carved for a coffin base. In Chanthaburi, it is found that the building that covers the coffin is called ‘Ruan Luang’.

Suggestions
The findings lead to the following suggestions.
1. Local people conserve local art.
2. This study helps spread art and culture.
3. create art business.

For H.M. Queen Rambhai Barni
Source: http://www.siamensis.org/board/10192html
For Late Princess Galyani Vadhana

‘Nok Hussadee’
(1) ‘Nok Hussadee’ Castle (Lampang Province)
(2) At Cremation Ceremony
Source: http://www.lannacorner.net/lanna/pic/3749-2.jpg

Art of Mon (at Samutsakorn Province)
Source: http://blogazine.prachatai.com/user/ong/post/1730
Art of Raman by Sompit Mongkolpan
Source: http://monthai.siam2web.com/?cid=80014

Banana Stalk Carving
Source: http://watlaxanaram.blogspot.com/2008/08/blog-post.html
Acknowledgement

The author would like express my deep appreciation to the interviewees and those whose works have been cited. All details are in my complete research entitled ‘Ruan Luang’ Models in Chanthaburi.

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AN ANALYSIS OF ENERGY CONSUMPTION AND ENERGY CONSERVATION IN RAMBHAI BARNI RAJABHAT UNIVERSITY

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ABSTRACT

This project was aimed to analyze energy consumption and study procedures for energy conservation in Rambhai Barni Rajabhat University. In B.E.2549, Rambhai Barni Rajabhat University utilized all building areas about 58,877 m². All electric energy consumption was about 1,478,227 kWh/year, that is electric energy consumption was 90.39 MJ/m²/year. Energy consumption for air condition system was at 55.34 %, for lighting system at 26.16 % and for other systems at 18.50 % of the total energy. The study to conserve energy, had 3 concepts: (1) using electrical equipment by energy saving, (2) microclimate modification, and (3) improving efficiency of equipment and the building envelope.

Using electrical equipment by energy saving, was done that minimal utilization and consumers cooperation campaign. Microclimate modification was operated through environmental improvement, resulted that to air-conditioner saving. Improving efficiency of equipment and building envelope developed 3 methods. (1) Maintenance for air-conditioner about 366 unit, by washing and cleaning, that saved for 0.63 Btu/watt, equal to 7.71 % and reduced electric power at 2.97 %. (2) Installation building with film on clear glass. Science center and main library building had clear glass for 708.4 m². The main library building will save energy for 7,263 kWh/year, and the science center for 9,761 kWh/year. (3) Using high efficient air-conditioners. Because 23 air-conditioners, had been used more than 13 years and consume energy more than standard value of ministerial regulation. They were replaced by high efficient air-conditioners, that will save for 27,791 kWh/year.

Keywords : energy conservation
Background of the Study
Thailand has faced a problem of economy crisis, energy conservation has been campaigned. The government policy on saving energy covers all government workplaces. While industrial parts have been promotes, energy consumers have been increased.

Theories

Energy Fundamentals
Energy enters our everyday lives in many different ways. However, people do not use energy resources as efficiently as they could. There is a large discrepancy between the rate of energy use by a typical citizen of an industrialized society and the typical citizen of a developing country, and it is accompanied by a notable difference in what people perceive as the standard of living. (Ristinen and Kraushaar, 1998: 4)

Environmental Risks and Constraints
Energy is essential to sustain life. The supply and use of energy, however, have a wide range of adverse environmental and social effects. As energy use grows, adverse environmental effects also tend to increase and spread, and new environmental risks may be created. The extraordinary growth in energy use in the past has focused attention on the environmental impacts of energy supply and use, especially in industrial countries (Willrich, 1975: 53).

Heat Energy
This is the energy associated with random molecular motions within any medium. The term thermal energy is interchangeable with heat energy. Heat energy is related to the concept of temperature. Increases of heat energy contained in any substance result in a temperature increase, and conversely, a decrease of heat energy produces a decrease of temperature (Ristinen and Kraushaar, 1998: 9)

Electric Energy
The idea of electric energy is less obvious than the examples of other types given previously. Not surprisingly, electric energy is one of the last types of energy to have been brought into practical use. With electric energy, nothing can be seen, either stationary or in motion, but the effects can be readily apparent. In spite of this difficulty, an understanding of electric energy is necessary for the functioning of a complex industrial society. It is electric energy that allows us to have telephones, television, lighting, air conditioning, electric motors, and so forth. A battery, such as we have in a flashlight or automobile, is a common device for storing electric energy. The chemicals in a battery have an inherent difference of electric potential. When the battery is charged, electric charges are brought to the higher potential so that energy is stored as chemical energy for later use as electric energy. Thus a battery works both ways; it can convert electric energy to chemical energy, or chemical energy to electric energy. Mechanical energy is converted to electric energy in a generator, where conductors are forced to move through a magnetic field to induce a voltage between the ends of the conductor. And, if a voltage is applied to the terminals of a common type to generator, it can function as a motor, thereby converting electrical energy to mechanical energy (Ristinen and Kraushaar, 1998: 11).
Energy Conservation

The total energy consumed in any activity can be thought of as the product of two factors: energy required for the activity (intensity) and frequently of activity. The factor called intensity of use is the amount of energy required to do the task once; the level of activity is the number of times the task is done – the frequency. The maximum possible success of technical fixes for energy conservation is limited by the laws of physics. However, there is still a lot of room for improvement for energy conservation, especially in the efficiency of energy use for particular tasks. For example, a 18 watt fluorescent bulb gives the same light output as a 75 watt incandescent bulb and lasts ten times as long. In energy conservation, the issues are more than just technological, because energy consumption also depends on the frequency of the activity (Hinrichs and Kleinbach, 2002 : 25).

Policy

Energy is the world important issue and it needs a policy to help solve the problem. Making of energy policy is a cycle of governmental decisions made within constraints imposed by the character of energy resources as well as the nature of the political institutions and actors involved. Variation, elaboration, and illustration of methods should be prepared to solve energy problem (Rosenbaum, 1981: 24)

Objective of the Study

This project was aimed to analyze energy consumption and to study procedures for energy conservation in Rambhai Barni Rajabhat University.

Methods

1. Survey areas in Rambhai Barni Rajabhat University where consume electric energy.
2. Collect data on energy consumption of all electrical appliances for the past four years.
3. Analyze data.
Results

1. Energy consumption in Rambhai Barni Rajabhat University for the past four years, B.E. 2546-2549, is shown for cost average, units, and total cost as the follow graphs respectively.
2. Ratio of energy utilization in B.E. 2549 is shown in the following graph.

<table>
<thead>
<tr>
<th>System</th>
<th>Electric Energy Consumption</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>kWh/year</td>
</tr>
<tr>
<td>Air condition</td>
<td>818,007.70</td>
</tr>
<tr>
<td>Lighting</td>
<td>386,634.01</td>
</tr>
<tr>
<td>Other</td>
<td>273,585.00</td>
</tr>
<tr>
<td>Total</td>
<td>1,478,226.71</td>
</tr>
</tbody>
</table>

3. Suggestions for Energy Reducing
   3.1 Select appliances which save energy.
   3.2 Adjust environment to help reduce temperature
   3.3 Improve equipment efficiency and the outside parts of the buildings.
   3.4 Create saving mind to personnel

Acknowledgement
The researcher would like to express my appreciation to staff at the Office of the President who provide data for this study. My appreciation also goes to Electrical Technology students who helped with data collection.

References


TOURISM PERSONNEL DEVELOPMENT IN CHANTHABURI PROVINCE

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Abstract

The main purpose of this study was to train personnel of tourism business in Chanthaburi province. The training processes were theories and site visit. The sample included 286 people whose work relate to tour business. The tourist site visit at the local community was selected using sustainable tourism management as its criteria. The evaluation process has been divided into two stages. One is during the training process and another is one month after the training process. The major finding revealed that the sample of this study showed high satisfaction toward the processes. The follow up evaluation showed high satisfaction and practical implementation.

Keywords: tourism, local community, tour business

Background of the Study

Chanthaburi provincial slogan is as follows:

The town of very famous waterfalls
The city of fruit is what the province called,
The best kind of peppers grow,
Plentiful gem’s cut everywhere to show,
Reed weaving mats’re well-known here,
The town to remember King Tak Sin’s great deed,
Gathering all folks to fight and defeat that Burmese.

(Kheourai, 1999: 159)

Chanthaburi is known as a coastal town on the eastern seaboard. It is rich in natural resources, such as gem mines and fertile soil, good for the cultivation of tropical fruit orchards such as rambutan, durian, and mangosteen. Rubber, pepper and reed are also important products in the province. Apart from agriculture, gem and jewellery cutting and reed weaving, fishing is also an important productions of the province.

The historical importance of Chanthaburi lies in tow events in 1767 and 1893. The first took place in the year 1767 when Phraya Tak of Phraya Kamphangphet realized that Ayutthaya would fall to the besieging farces of the Burmese, so he captured from the capital with a group of soldiers and headed for the sea coast. He and his followers marched along the eastern seaboard recruiting Thai men to liberate Ayutthaya. After taking Rayong, he then proceeded to take Muang Chanthaburi and set up military headquarters between the town and the coast.
In the second incident in the year 1893, during the reign of King Rama V, Chanthaburi was almost lost to France, a foreign colonial power. Chanthaburi became a province of Thailand in 1931. Now Chanthaburi is administratively divided into 10 districts and subdistricts: Muang, Khlung, Makham, Pong Nam Ron, Tha Mai, Laem Sing, Soi Dao, Kaeng Hangmaew, Na Yai Am and Khao Khitchakut.

**Location**

Chanthaburi province is in the eastern coast of Thailand. The coastal area in the east is a narrow plain formed by the accumulation of soil sediment from brackish water. It is suitable for cultivating fruit orchards. In the extreme east, the Banthat mountain range separate Thailand from Cambodia (Siriwan, 2001: 14).

**Attractions:**

King Taksin the Great Monument is located in the heart of the township on Tha Luang Road. This bronze statue was built in 1893.

The Phliw Waterfall National Park is located in Laem Sing district. The park has numerous species of wild plants and fruits. It has a three level waterfall. There is a laterite stupa called ‘Alongkorn Chedi’ built by the royal command of King Rama V. Next to the stupa is a pyramid-type building that houses the remains of Queen Sunantha Kumarirat who visited this waterfall 2 years before her death.

Khao Khitchakut National Park is located in Makham district about 30 kilometers from the provincial township. There is a very big waterfall with twelve levels named Krathing Waterfall. On top of Mount Khichakut are Lord Buddha’s footprints and a very beautiful cave called Tham Rishi or Hermit’s cave.

Laem Sadet Beach, Khung Kraben and Khung Wiman are located in the Tha Mai district. Visitors can enjoy the beautiful white sand beach, cape, mountain and bay. On top of Klung Wiman hill, there is a big standing Buddha image, turning his face to the sea.

Wat Khao Sukim is located in the Tha Mai district. It is a religious center for meditation.

Tuk Daeng (Red building) is located in the Laem Sing district, near the pier for fishing boats and the two forts that were built in the reign of King Rama III. This building was originally the headquarters of the Phikhat Patchamit Fort, but later when the French occupied Chanthaburi for a short period of time, they adapted this building into living quarters for officers. The Red Building was used as prison for Thais. It was said that the roof was used as a chicken cage from which chicken waste was dropped onto the prisoners.

Khao Phloy Waen. A lot of gems have been found around this hill. On top of the hill is a Singhalese style stupa and the replica of the Footprint of Lord Buddha.

Neun Wong Fort was built in the reign of King Rama III, located in Muang district.

Chanthaburi Provincial Cultural Center is located in Rajabhat University. It was the palace of King Rama VII’s Queen Rambhai Barni who donated her palace to become a teacher’s college.

Chanthaburi Fruit Fair is held annually in May or June to promote the abundance of local fruits. (Kheourai, 1999: 159-160).

**Tourism and Hospitality**
Tourism hospitality has become a crucial issue.

Kozak and Andreu (2006: 31-32) defined “tourism market” as a concept that needs to be reconsidered as the information technology (IT) possibly has an opportunity to bring demand and supply on the virtual market together. While the main element of tourism demand as being the consumer who needs to satisfy their leisure requirements remains the same, computers could serve as suppliers or have the responsibility of suppliers. In addition to the specific features of the accommodation industry being open for 24 hr a day, computers may improve the non-stop services offered by the tourism and travel industry generally. A great number of hotel and airlines companies have launched their web sites on the Internet and are about to activate them as a two-way communication channels. This finding may suggest that online travel products are commoditized. Quality is ranked as the second most important variable followed by security, variety and brand. Consumers are becoming more willing to reveal personal credit card information over the Web. However, there is a negative relationship between the likelihood of purchasing travel products over the Web using the online travel agency and the personal significance factors “important” and “significant”. The differences within personal significance may suggest that consumers find it less likely to purchase from online travel agencies when it is very important to purchase.

Oh, Kim and Shin (2006: 1, 20-21) pointed out the significant development in hospitality and tourism marketing research and practices. They reviewed 223 marketing-focused articles published in eight journals in 2002-2003, four of the journals being rather “hospitality-oriented” and the other four rather “tourism-oriented”. The review results are presented by study subjects investigated and research methods employed and several significant research trends. The study also identified contemporary marketing issues and practices that were active or emerging in the hospitality and tourism industries. The findings show a critical manner for the sake of stimulating additional scientific marketing research on divers hospitality and tourism topics and improving general research practices toward a sounder tradition of domain research: (1) Not only applications but also theory development, (2) Lack of ground theories and substantive knowledge accumulation, (3) Let’s experiment more, (4) Methods are just means, and (5)What’s new?

Vanhove (2006: 100, 102-103) pointed out that ‘competitiveness in tourism’ can be described with the elements that make a destination competitive. This relates to its ability to increase tourism expenditure, to increasingly attract visitors while providing them with satisfying memorable experience and to do so in a profitable way, while enhancing the well-being of destination residents and preserving the natural capital of destination for future generations. Important types and levels for tourism destinations are: (1) country, (2) a macro-region, consisting of several countries, (3) a province or another administrative entity, (4) a localized region, (5) a city or town, and (6) a unique locate with great drawing power. A model of the five force for investigating the competitive environment, that may serve the purposes for studies well, are: (1) the threat of entrants, (2) the power of suppliers, (3) the power of buyers, (4) the threat of substitutes, and (5) competitive rivalry.
Purpose of the Study
The main purpose of this study was to train personnel of tourism business in Chanthaburi province.

Procedure
The training processes were theories and site visit. The sample included 286 people whose work relate to tour business. The tourist site visit at the local community was selected using sustainable tourism management as its criteria. The evaluation process has been divided into two stages. One is during the training process and another is one month after the training process.

Results
The major finding revealed that the sample of this study showed high satisfaction toward the process. The follow up evaluation showed high satisfaction and practical implementation.

Suggestions
1. A training course and site visit are recommended for tourism personnel development.
2. Site visits should be emphasized on the self sufficient tour development.
3. Tourism development should help improve people’ s careers and incomes.

References


Appendix