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Textbook Development for SDGs,STEM, and Energy by Cross-border Education"

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"Challenging Education for Future Change"

FACULTY OF EDUCATION
KHON KAEN UNIVERSITY | THAILAND

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CONFERENCE PROCEEDINGS

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Rationale

People around the world inevitably face the influence of globalization. Their value and the way of life would be challenged. Education could be one solution for providing citizens to survive with knowledge and skills so that they are able to adjust appropriately to the changing world. To ensure the anticipated outcomes, challenging education and sustainable development seems to be a promising approach. Educators and stake holders, who involved in human resources development, may be enhanced learning community and challenging education for future change.

The goals of the ICER 2017 are to give international educators the opportunity to share ideas and form networks while working together on *challenging education for future change*. It is anticipated that the exchange of ideas and research findings will contribute greatly to future generations.

Sub-themes

1. Teacher Education and Professional Development
2. Curriculum and Instruction, Learning in classroom contexts
3. Educational Measurement and Evaluation
4. Educational Climate: *cultural and social context*
5. Educational management: *planning, policy implementation and assessment*
6. Lifelong Education: *non-formal and informal learning*
7. Education for Diversities: *gender, underprivileged, marginal groups, special needs*

Message from the Host

Greeting to all participants and welcome to Khon Kaen University

The International Conference on Educational Research (ICER) 2017 is the 10th annual conference to celebrate the 49th anniversary of the establishment of the Faculty of Education, Khon Kaen University (KKU). It is jointly organized by **Khon Kaen University** of Thailand, the **Education University of Hong Kong** of China, **State University of Surabaya** of Indonesia, **Mindanao State University-Iligan Institute of Technology** of Philippines, **Thailand Education Deans Council**, and the **Consortium of Sixteen Education Deans** of Thailand (Group 16). This year we are pleased to have the **Central University of Technology, Free State** of South Africa to join co-hosting the conference as our new university partner.

The goals of the ICER 2017 are to give international educators the opportunity to share ideas and form networks while working together on ***challenging education for future change***. It is anticipated that the exchange of ideas and research findings will contribute greatly to future generations.

During the ICER 2017 event, the APEC-Khon Kaen International Symposium 2017 with its theme "*Innovation of Mathematics Education through Lesson Study Textbook Development for SDGs, STEM, and Energy by Cross-border Education*", in collaboration with the **University of Tsukuba** of Japan and sponsored by the **Office of the Higher Education Commission** of Thailand, is also held at KKU starting from September 9 to September 12, 2017. So the two events will share the plenary sessions during the first two days of APEC symposium.

On behalf of the Faculty of Education, KKU, I would like to express my gratitude and my sincere appreciation to our co-host institutions, the guest speakers and the organizing committees for their efforts. I also would like to thank all delegations and participants who come from afar to join this event.

Associate Professor Maitree Inprasitha, Ph.D.
Dean, Faculty of Education
Director, Institute for Research and Development in Teaching Profession for ASEAN
Director, Center for Research in Mathematics Education
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A Proposed Guideline for Development Research on Management Science Education in the Context of Reprofiling Policy in Nakhon Si Thammarat Rajabhat University

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Abstract

In the context of reprofiling policy in Nakhon Si Thammarat Rajabhat University, lecturers and staffs are also growing research activities. Additionally, the Balance Scorecard approach is prospects analyzed and implication of a balanced set of learning and growth perspectives. This is a comprehensive framework on cause and effect relations to achieve development research on management science education objectives. This paper proposes a comprehensive framework for development research on management science education in the context of reprofiling policy in Nakhon Si Thammarat Rajabhat University. A Systematic integrative review conducted a seminar and focus group discussion on management science education using a Balance Scorecard strategy map for developing and monitoring lecturers' capabilities. Five experts in sustainability crucial research were shared and encourage generating ideas and participants involved to explore and evaluate the key indicators performance. The results provides a framework to establish a strategy map for development research on management science education in the context of reprofiling policy in Nakhon Si Thammarat Rajabhat University based on four dimensions: integrative research based teaching and learning; learning and organizational growth; sustainable development; and financial supporting. Moreover, the overriding lesson to exist knowledge is the crucial of a systematic and informed approach.

Keywords: *Balance Scorecard, Comprehensive Framework, Management Science Education, Reprofiling Policy*

Introduction

Presently, the Faculty of Management Science (FMS) at Nakhon Si Thammarat Rajabhat University (NSTRU) has been engaged in Rajabhat University reprofiling policy towards a sustainable development in Thailand 4.0. The Research on Management Science Education (RMSE) gained 10 Thai industrial sectors on the 2015s in a foster to focus the development goals of tourism and hospitality management, developing community and rural economics

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awareness and academic services to society (Sookprot, 2016). Although the FMS, NSTRU administrators play a key role in advancing the successfully goals, it is the RMSE on the Thai industrial sector that will be instrumental in the success, through the way lecturers and staffs are also growing research activities, develop shared and encourage generating ideas, invest in personal learning communities, innovate, and participants involved to explore and evaluate the key indicators performance.

The outcomes of RMSE are often used to emphasize the research capability and promotion of lecturers' awareness and information on educational sustainability – e.g. focusing on promoting researcher behaviours and critical thinking, focusing on proposal preparation about tourism and hospitality management, developing community and rural economics awareness and focusing on shaping attitudes about sustainable consumption research. A predominant approach through which the discussion of lecturers and staffs are also growing research activities, sustainability and responsibility of RMSE can be engaged in Rajabhat University reprofiling policy is through their curriculum. Researchers have explored adequately approaches for doing so, ranging from the adoption of literature reviews.

The use of a more 'Balance Scorecard approach' (BSC) as a 'strategy' is instrumental driven upon and integrated across all traditional business management subject areas, such as marketing, economics, finance etc., has been proposed a comprehensive framework by Matten and Moon (2004), although recent research has highlighted the difficulties of implementing such an approach (Laszlo & Zhexembayeva, 2011). Other discusses have also argued that enhancing MSC across an integration research-based teaching and learning curriculum can gain its effectiveness with students (Sharland, Fiedler, & Menon, 2013). As a result, the outcomes even become a guideline for the teaching of other topics underlying Rajabhat University reprofiling policy.

Existing research shows that how to do increasing focus, in general across FMS, in the adoption of RMSE, the majority of this is through elective subjects and adequately research guideline, detached from the community and rural setting of FMS, thereby reflective of a comprehensive framework on cause and effect relations to achieve development research on RMSE objectives. This paper proposes a comprehensive framework for development research on management science education in the context of reprofiling policy in Nakhon Si Thammarat Rajabhat University.

Methods

Proposes of a BSC as a Comprehensive of RMSE

According to Kaplan & Norton (1997), describes the consideration of an organization into four perspectives: financial perspective, customer perspective, internal process perspective, and learning and growth perspective. The conceptual framework is analyzed and consists of a balanced set of a comprehensive framework on cause and effect relations to achieve organizational strategic goals. For this purpose, in each perspective, some questions are proposed which should be answered by strategic decisions. The goals of the four perspectives involves with each other in a cause and effect relation. The development and alignment of intangible assets induce improvements in process performance, which, in turn, drive the success for customers and shareholders.

Lawrence (2002) proposed that in each of its perspectives, the BSC divides the answers to four questions categories:

- How does the shareholders can benefit? (Financial Perspective);
- How do the customers see the company? (Customer perspective);
- What should be improved? (Perspective of internal processes);
- Is it possible to continue to improve and create value? (Learning and growth perspective).

Furthermore, the strategy map of the BSC show that hypotheses of the strategic thinking and others key performance indicator to develop a part of a critical thinking of cause and effect that connects the desired outcomes of the strategy. The application of BSC in university observed that universities, especially public universities, concentrated their strategic goals more on quality performance then in financial – e.g. by emphasizing community participation, innovation, strategic partnership and scientific research excellence in their strategies. In order to develop a BSC for RMSE in Rajabhat universities, it is essential to gain the values from BSC for higher education. To adapt the BSC for environmental education programs in universities, the four dimensions of the BSC were dimensions:

1. Dimension of financial perspective;
2. Dimension of customer perspective;
3. Dimension of internal process perspective; and
4. Dimension of learning and growth perspective.

Samples

To collect the data, researchers obtained data from 21 MSE lecturers. The 5 experts in sustainability crucial research were shared and encourage generating ideas and participants involved to explore and evaluate the key indicators performance.

Procedures and Data Collection

The research procedures conducted as shown in Figure 1.

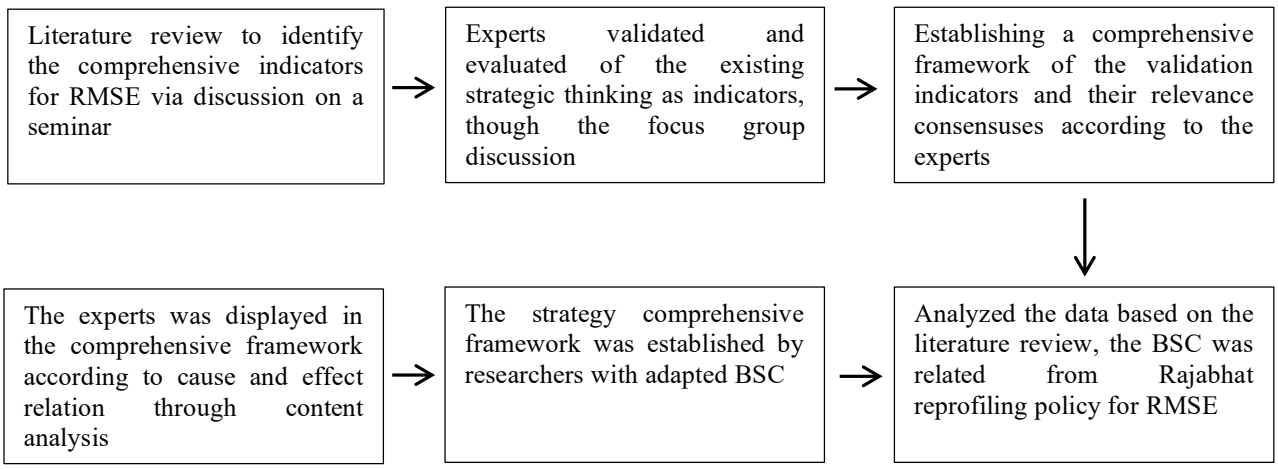


Figure 1 The research procedures conducted

Instrumentation

The existing literature based on RMSE enabled the finding of 4 indicators. A Systematic integrative review conducted a seminar and focus group discussion on management science education using a Balance Scorecard strategy map for developing and monitoring lecturers' capabilities. The indicators were applied.

Data Analysis

The literature review employed the identification of the most relevant indicators relevance this topic, consensuses done by the 5 experts. After identifying the indicators a weight of relevance to conduct, it was possible to start the process of adaptation of the RMSE to FMS at Rajabhat universities. The data was to modify the original BSC approach, five dimensions through content analysis.

Results

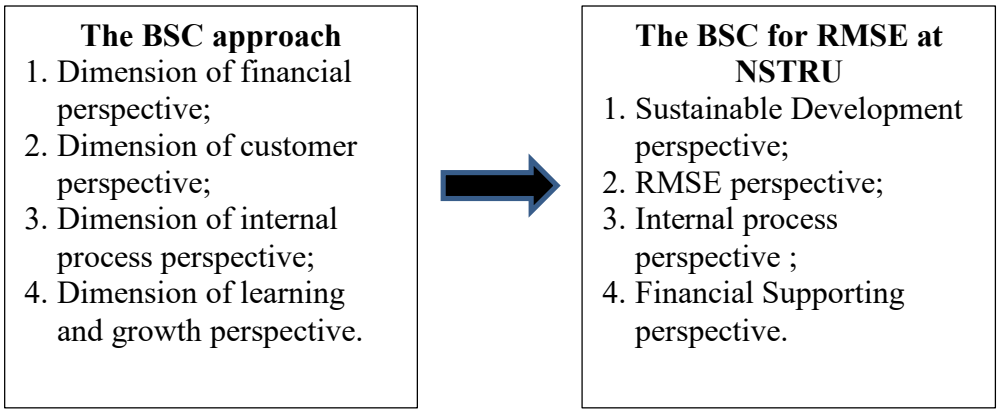
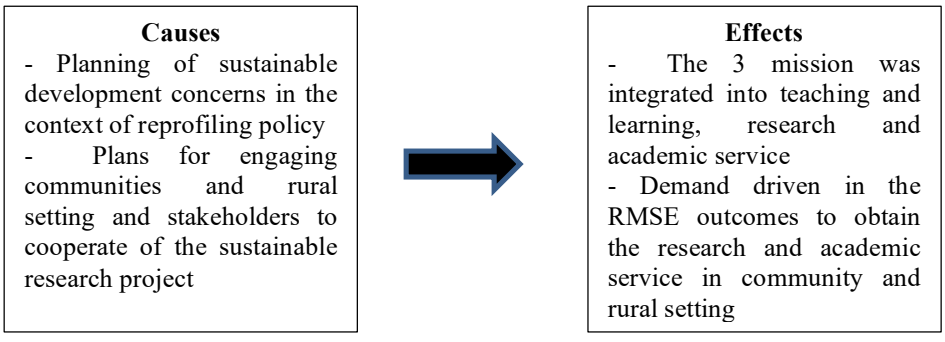


Figure 2 A comprehensive framework on cause and effect relations on RMSE

In Figure 2, the results showed that proposed guideline of a comprehensive framework for development research on management science education in the context of reprofiling policy in Nakhon Si Thammarat Rajabhat University. Based on the existing results, researchers developed a comprehensive model that identifies the factors affecting dimension of sustainable development perspective, dimension of RMSE perspective, dimension of internal process perspective, and dimension of financial supporting perspective. A comprehensive framework has two important agenda to implement of RMSE adequately approach was the crucial of a systematic and informed approach as follows as:

1. Dimension of Sustainable Development perspective



2. Dimension of RMSE perspective

Causes		**Effects**
- Research projects (undergraduate and graduate students focused on RMSE underlying social demand (community and rural setting)	→	- Lecturers and staffs integrated research based teaching and learning in the form of community service learning

3. Dimension of Internal Process perspective

Causes		**Effects**
- Implications of technology (hardware/software) according to Thailand 4.0 development	→	- Development and training through learning and organizational growth - RMSE was focusing on becoming a value-based and innovation-driven economy by moving from

4. Dimension of Financial Support perspective

Causes		**Effects**
- The challenges for cost management underlying the conceptual 'Maximize profit and minimize cost'	→	- The establishment of asset utilization in RMSE programme - Searching the revenue opportunities to support research grant with other stakeholders

Discussion

In this research, researchers proposed a comprehensive framework for development research on management science education in the context of reprofiling policy in Nakhon Si Thammarat Rajabhat University. With the development, the FMS at NSTRU could be a provides a framework to establish a strategy map to implement as a comprehensive framework, by exploring the present status of and views about RMSE in the context of reprofiling policy. As outlined in the findings, there was employed the identification of the most relevant indicators relevance this topic, consensuses done by the 5 experts. After

identifying the indicators a weight of relevance to conduct, it was possible to start the process of adaptation of the RMSE to FMS at Rajabhat universities.

Researchers also found four dimensions perspective support for RMSE and as opposed to generate a comprehensive framework, a perception among lecturers, staffs and experts that RMSE is focused upon in the management science education programme. Actually, this is indicative of an implicit focus on RMSE by faculty within the business section, through a variety of teaching, learning and assessment methods. Researchers developed a comprehensive model that identifies the factors affecting dimension of sustainable development perspective, dimension of RMSE perspective, dimension of internal process perspective, and dimension of financial supporting perspective. The findings also highlighted that while the faculty is enthusiastic about embedding RMSE. They are also wary of the potential institutional barriers which could arise either from within or outside of the framework in the context of reprofiling policy. In cause, what the findings show is that any attempt to embed RMSE requires substantive a BSC approach support, in terms of administrative, academic and resource based support, but also more importantly a determination to re-evaluate the ethos of the FMS at NSTRU. Researchers found that in the absence of the latter the former would become an inconsequential change.

Additionally, in accordance with Reay et al. (2013), we find that while the FMS were enthusiastic about RMSE from a normative perspective, they do anticipate potential institutional barriers and therefore, could potentially resist significant change. This nature of academics as professionals characterizes how they have a tendency to support institutionalized practices (Reay et al., 2013), and in instances where embedding RME equires a substantive disruption of these institutionalized practices resistance could arise even from within faculty, showcasing the autonomy of the academic profession (Sharland, Fiedler, & Menon, 2013).

Conclusion

Researchers proposed the existing research and developed a comprehensive framework that emphasizes the Balance Scorecard approach is prospects analyzed and implication of a balanced set of learning and growth perspectives. This is a comprehensive framework on cause and effect relations to achieve development research on management science education objectives. The framework of a BSC's presented in this paper is a generic practical model that can serve as a guide to develop, implement and monitor RMSE in Rajabhat universities/other universities. The practical model can guide policy and practice recommendations and interventions and be used to guide future research to produce evidence about the specific mechanisms through which each domain in the model affects RMSE and outcomes. This research is necessary for intervening at policy and organizational levels in designing necessary structures to maximize RMSE contributions to high-quality educational management.

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Investigating Effects of Training and Transfer of Automotive Mechatronics Problem Solving Skills

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Abstract

The Thai government is devising "Thailand 4.0" policy that establishes an economic model based on creativity, innovation, new technology and high-level services. This challenge rapidly-advancing technological in the workplace is problem-solving skills. Problem solving skills is a key concept used to cope with the demands of a rapidly changing world. It is the most important regarded as a cross-curricular competence (e.g., in automotive mechatronics system). This research investigated effects of training and transfer of automotive mechatronics system problem-solving skills from an 8-week field experimental training study (N = 16) and control training study (N=15) undergraduate mechanical technology students, Faculty of Industrial Technology at Nakhon Si Thammarat Rajabhat University in the semester 2/2015. Data were analyzed by using computer programming, and the level of significance was set at .05 for all tests. Investigating effects of training and transfer was tested by Analysis of CoVariance (ANCOVA). The results revealed that there were no statistically significant differences between two groups. Performance skills, the post-test scores of who had taught TAP learning strategy increased, and the conventional learning group increased to. As a result, the differences between groups were statistically significant differences. The TAP learning strategy showed that the AMSPSS Strategies had become a test domain for assessments, as in the favour of cross-curricular problem solving skills. In order to gain cognitive demands of these kinds of AMSPSS Strategies are structuring, representation and integration of information to solve engine control systems (ECS).

Keywords: *Automotive Mechatronics System, Problem Solving Skills, Training, Transfer*

Introduction

Recently, Thailand has continuously been developing its appropriateness economic model, starting from "Thailand 1.0," which focused on the agricultural sector, to light industries with "Thailand 2.0," where the country utilized workforce skills and heavy industries with a focus on domestic productions, through to "Thailand 3.0," which is focused on Thailand a production hub for exports. As a result, under Thailand 3.0, the country has faced middle-income trap development, major concerns which prompted the government to transform Thailand's economic structure to "Thailand 4.0." The goal of Thailand 4.0/Industry 4.0 is focusing on becoming a value-based and innovation-driven economy by moving forward from producing commodities to innovative products; emphasizing on promoting technology, creativity, and innovation in focused industries; and from a production-based towards a service-based economy.

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This challenge rapidly-advancing technological in the workplace is problem-solving skills. Problem solving skills is a key concept used to cope with the demands of a rapidly changing world. It is the most important regarded as a cross-curricular competence (e.g., in automotive mechatronics system). In the automotive industrial sector view, general competencies with a broad automotive mechatronics system like problem solving skills are particularly important for developing with a newly articulated (Reed, 2015). On the one hand, problem solving skills is regarded as a cross-curricular competence that is important for successful learning at institute/university, at workplace, and in different areas of professional development areas. On account of the crucial importance of Automotive Mechatronics System Problem Solving Skills Strategies (AMSPSS) is conceptualized as a cross-curricular as well as a task-specific competence. Furthermore, the AMSPSS Strategies has become a test domain for assessments, as in the favour of cross-curricular problem solving skills. In order to gain cognitive demands of these kinds of AMSPSS Strategies are structuring, representation and integration of information to solve engine control systems (ECS).

Theoretical Background

This research encourages the development of undergraduate mechanical technology students' ability to think critically to enhance students' abilities to logical assess and formative interventions to impact the AMPSS Strategies. Therefore, problem-solving skills have been developed to be better in students who have conducted instruction with other learning strategies – (e.g., case-based reasoning, problem-based learning, inquiry-based learning, and etc.) relative to these who taught by lecturer. Researcher has fostered in the increase of students' critical thinking and problem-solving skills, which are combined regard as a cross-curricular competence to solve engine control systems (ECS).

In analytical problems of ECS, all information articulated to solve the problem is explicitly stated or can be inferred from the given problem situation (e.g., camshaft positioning sensor allocating engine to measure engine ignition timing control when all constraints like fuel injection quantity, air fuel ratio, engine speed, road load capacity, etc., are given). Analytical problem solving can thus be seen as the reasoned application of existing knowledge to solve the problems. In order to accomplishment cross-curricular problem solving skills requires a person to (1) understand, (2) characterize, (3) represent and (4) solve the problem, (5) reflect and (6) communicate the problem solution. Descriptions of the AMSPSS, Strategies which is the theoretical basis for the assessment, comprise comparable steps: (1) starting with a real-world situation problems, (2) organizing it according to automotive mechatronics system concepts as thinking skills, (3) gradually trimming away the real-world situation through processes as analytical skills, (4) solving the automotive mechatronics system solution in terms of the real-world situation as performing skills (Sudsomboon, 2010a; 2010b; Sudsomboon & Hemwat, 2012). The implications of training and transfer of automotive mechatronics system problem-solving skills strategy (TAP) learning strategy is discussed.

In summary, the cross-curricular problem solving skills and AMSPSS strategies becomes evident when one looks at the cognitive resources required to enhance a TAP learning strategy to solve ECS problem tasks. Transfer of learning is an important goal of education. The term is somewhat ambiguous transfer can be defined as an effect of prior learning on new learning and problem solving (Mayer, 2008). The purpose of this research was to investigate effects of training and transfer of automotive mechatronics system problem-

solving skills. Investigating aspects of this hypothesis by addressing this research question: What was the influence of TAP learning strategy?

Methods

Design

A nonequivalent control group pretest–posttest design was used in this research. The quasi-experimental study was conducted. The research compared investigated the effects of instruction using of training and transfer of automotive mechatronics system problem-solving skills strategies versus traditional education in engine control systems.

Participants

Participants separated in two groups, consisted of third year undergraduate mechanical technology students, Faculty of Industrial Technology at Nakhon Si Thammarat Rajabhat University in the semester 2/2015 to prevent contamination. None of the students in either group had been exposed to TAP learning strategy. The research given effect size estimate between the TAP learning strategy and conventional learning strategy is d=1.0 (one standard deviation apart). To design a study at the recommended level of 80% power, for two-tailed $\alpha = .05$, (Cohen's d = 1.0), and Power = .75, (N = 30 for between groups and N = 15 for within groups). As a result, participants were done by 16 undergraduate mechanical technology students in the TAP learning strategy group and 15 participants in the conventional learning group. In summary, a power analysis determined that the required sample size was 15 per group (Cohen, 1988).

Instrumentation

The AMPSS strategies was developed by Sudsomboon (2014, 2016) and Nissan Motors Service Manual to assess dimensions of critical thinking of undergraduate mechanical technology students. The scale has 16 items in five sub-scales. Cronbach's alpha was found to be .85 and in our study a Cronbach's alpha was .89. This scale is scored on a 5-point Likert-type scale of 1 to 5 (1 = absolutely do not agree to 5 = absolutely agree). Total scores have a range from 1 to 50.

Procedure

An 8-week field experimental training study (N = 16) and control training study (N=15) undergraduate mechanical technology students, Faculty of Industrial Technology at Nakhon Si Thammarat Rajabhat University in the semester 2/2015 was conducted. Training and Transfer procedure divided into 2 groups (the TAP learning strategy and conventional learning groups).

The importance of these common components of cross-curricular competence and engine control system problem solving is emphasize supported by Sudsomboon (2014, 2016) and Nissan Motors, who conducted an item-demand analysis of the test items and scales. These identified problem-solving skills, analytical thinking skills, and performing skills as important components of both domains. Interestingly, cross-curricular problem solving items turned out to be camshaft positioning sensor allocating engine to measure engine ignition

timing control items in terms of the TAP learning strategy as well as dealing with constraints and knowledge of procedures.

Data Collection

For the TAP learning strategy group, there were 16 students assigned to 5 TAP learning strategy groups; each group consisted of 3 students. The TAP learning strategy group worked 32 h with 2 learning packages (camshaft position sensor signal processing inspection and engine ignition timing control signal processing inspection) developed by researcher. Each the TAP learning strategy group was 4 h per week for 8 weeks and was facilitated by a faculty member who taught automotive technology subject with undergraduate mechanical technology students, Faculty of Industrial Technology at Nakhon Si Thammarat Rajabhat University. The 15 students assigned to the conventional learning group (lecture group received didactic lectures for 4 h per week for 8 weeks on the same content as that of the TAP learning strategy group.

Data analysis
Data were analyzed by using computer programming, and the level of significance was set at .05 for all tests. Investigating effects of training and transfer was tested by Analysis of CoVariance (ANCOVA).

Results

What was the influence of TAP learning strategy towards the engine control system problems?

Table 1 The pre-test of ANCOVA for problem-solving skills, analytical thinking skills, and performing skills between the TAP learning strategy (N = 16) and conventional learning groups (N = 15)

Variables	Pre-test				Post-test				*F	*P*
	TAP		Control		TAP		Control			
	Mean	SD	Mean	SD	Mean	SD	Mean	SD		
Problem-solving skills	20.63	4.66	21.18	4.94	25.78	4.19	24.91	4.37	2.469	.113
Analytical thinking skills	33.52	6.08	34.94	6.55	38.07	5.04	36.76	5.82	1.613	.608
Performance skills	36.07	8.91	35.56	8.72	41.35	7.21	38.27	7.55	.705	.004

Note: * F is directly measured by the time group interaction term in the repeated measures ANOVA. The adjustment is the pre-test score in ANCOVA

In Table 1, the results revealed that comparisons of the scores between the two groups, ANCOVA, using pre-test scores as the covariates was presented. Problem-solving skills scores increased 5.15 points for students after TAP learning strategy and increased 3.73 points for students in the conventional learning group. This difference was not statistically significant (F = 2.469, df = 1, p = .113). Analytical thinking skills scores in the TAP learning strategy increased to 4.55, however scores in the conventional learning group increased to 1.82. There were no statistically significant differences between two groups (F = 1.613, df =

1, p = .608). Performance skills, the post-test scores of who had taught TAP learning strategy increased to 5.28, and the conventional learning group increased to 2.71. As a result, the differences between groups were statistically significant differences (F = .705, df = 1, p = .004).

Discussion

The research investigated effects of training and transfer of automotive mechatronics system problem-solving skills from an 8-week field experimental training study. In this research, the transfer in cross-curricular problem solving of research question, the overall of training showed that performance skills, the post-test scores had the differences between groups were statistically significant differences. Therefore, according to accomplishment cross-curricular problem solving skills requires a person to (1) understand, (2) characterize, (3) represent and (4) solve the problem, (5) reflect and (6) communicate the problem solution (Sudsomboon, 2010a; 2010b; Sudsomboon & Hemwat, 2012). There is no evidence to prove the theory for transfer. In a weaker interpretation, the interaction between group and prior cross-curricular problem solving competence is a prerequisite of the corresponding interaction effect.

In other words, we found effects of transfer on analytical problems of ECS, all information articulated to solve the problem is explicitly stated or can be inferred from the given problem situation (National Automotive Technicians Education Foundation, 2013; Reed, 2013; Sudsomboon, 2014, 2016; Sudsomboon et.al., 2017) that are similarly according to effects of transfer on cross-curricular problem solving. The statistical were not statistically significant differences of the interaction between group and prior cross-curricular in the problem-solving skills and analytical thinking skills. Students given a short scheme of 7 parts improved their solving-problem ability more, relative to students provided a long segmentation scheme of four parts (Jonassen & Hung, 2006).

Descriptions of the AMSPSS, Strategies which is the theoretical basis for the assessment, comprise comparable steps: (1) starting with a real-world situation problems, (2) organizing it according to automotive mechatronics system concepts as thinking skills, (3) gradually trimming away the real-world situation through processes as analytical skills, (4) solving the automotive mechatronics system solution in terms of the real-world situation as performing skills. A short case segmentation scheme helps students efficiently solve problems. In the present research, the TAP learning strategy employed long schemes. It is recommended that future would be formatted in shorter segments Anastassova & Burkhardt, 2009). .

The TAP learning strategy effects mean that the success of a treatment is not the same for all learners within a group because the treatment is more or less suitable for specific individuals or groups of individuals contingent on their aptitude or ability. In our study TAP learning strategy indicated positive cognitive training effects for enhanced students' use of other automotive mechatronics system problem solving skills, analytical skills, and performing skills (Mayer, 2008).

Conclusion

The TAP learning strategy effects has implications for what expertise is; how problem solving in any domain ought to be conducted; and how it should be researched; how problem solving processes are best conducted; and so on. Here the discussion is confined to some brief

indicative remarks. The TAP learning strategy showed that the AMSPSS Strategies had become a test domain for assessments, as in the favour of cross-curricular problem solving skills. In order to gain cognitive demands of these kinds of AMSPSS Strategies are structuring, representation and integration of information to solve engine control systems (ECS). However, each of these latter technologies presents new opportunities to capture and/or use possibilities to enhance the problem solving process, especially in group solving processes. The capacity of this new TAP learning strategy is to enhance problem solving process in other ways than just partial proposal selection can be systematically method possibilities.

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