DEVELOPMENT OF A COMPETENCY ANALYSIS PROFILE MODEL FOR TRAINING UNDERGRAUATE AUTOMOTIVE TECHNOLOGY STUDENTS AT KMUTT: AUTOMATIC TRANSMISSION SYSTEMS DIAGNOSIS AND REPAIR

Weerayute Sudsomboon
Department of Mechanical Technology Education,Faculty of Industrial Education and Technology,
King Mongkut's University of Technology Thonburi, Thailand.
E-mail: weerayute.sud@kmutt.ac.th

ABSTRACT: *The purpose of this study were: 1) to develop a competency analysis profile model for training undergraduate automotive technology students of Mechanical Technology Education program at King Mongkut's University of Technology Thonburi; and 2) to propose guidelines for implementation of the model. This model is based on automatic transmission systems diagnosis and repair, which is one a series of automotive technology lists. The qualitative data were collected through document analysis, in-depth interviews technique and DACUM (Developing a Curriculum) job analysis process with professional automotive technology training instructors from the excellent car automobile company in Thailand.. A model consisted of 5 job duties, 78 tasks and 7 core competencies framework. Furthermore, the specifically designed it cross the competencies by applied from core competency, competency framework and entry level, which each is assigned 1 of 3 skills level. The results suggest that the two delivery methods were similar in terms of final learning outcomes: 1) instructional system design through modules and focuses on performance-based, individual paced & needs and learning in the field with assistance of resource person; and 2) assessment and evaluation should be apply the authentic method through objective criterion, criterion-referenced and student competency.*

Keywords: ***Automotive technology, Competency analysis profile, Job analysis process, Student competency, Training model***

1. INTRODUCTION

As a results, the dynamic changes in each of any factor such as globalization and free trade, current of knowledge based economy, demands driven and economies, and economy of scale – scope – speed. The automotive industry, which is one of the largest industries in Thailand, employs many peoples and spends billions of baths. Technology is embodied in devices that extend human capacities. The workplace is changing. Rapid developments in technology and its increasingly complex applications are changing the expectations of employers and the technical skills necessary for social demands. It provides the tools to extend Mechanical Technology Education (MTE) Program at King Mongkut's University of Technology Thonburi (KMUTT). As technology assumes an increasingly dominant role in society, technology literacy is becoming as essential as students' competency and the ability to service, repair and diagnosis. In providing the fundamentals of technological literacy, technology education increases capability prepare to live and work in a world of continuously evolving technologies. Current automobiles are a challenge to service and repair because of this advanced technology, but the future automobile will be even more complicated (Riley.1985). This advanced and continuously evolving technology will require students' competencies to have greater knowledge, skills, and attitudes. In the area of triple service, repair, and diagnosis that a technologically literate student uses tools, materials, training systems, and processes in an informed, ethical, and social responsible. To be responsible members of society, students must be aware, attempt and achievement that ever changing technology has on their lives.

The MTE program at KMUTT separates into 5 areas are: 1) applied engineering mechanic; 2) thermal engineering; 3) dynamic systems and control; 4) automotive technology; and 5) applied educational technology. The nature of MTE program requires the integration of different disciplines such as general education (e.g., mathematics, science, social science, computer programming, information technology, language arts, leadership and management), mechanical engineering, electrical engineering,

electronic engineering, industrial engineering and industrial education and training, etc. Therefore, the purposed education development is motivated by the need for a systematic MTE educational curriculum between mechanical engineers and technical teacher education (Technologist/Experts in training). The concept is teacher training in MTE program is to stress implementation of teaching technique principle and to emphasize the knowledge, skills and attitudes in field of mechanical engineering and educational technology. Derived from the concept of industrial education is a terminology used more specifically in this research to describe social demands that need competency-based learning strategy for student development. With collaborative efforts, enterprise and university jointly design learning programs to meet the demands of student potential as well as the needs of social demand. The goal of produce undergraduate students, MTE program illustrates learning outcomes that first thing. The major our students almost always appear to be vocational and technical teacher on the commissions of vocational and education in the public/private sector. Which they were operate to auto-mechanics division more than 60%, and operate to be training instructors within mechanical engineers in any areas of career professional.

The research outcome needed to improve educational standards through social demand perspectives transform to demand-driven approach. The utilizations essentials for improving training program development which students' competency similar to learner-centered education as follow as National education Act (1999) and Amendments (Second National Education Act (2002). Learning outcomes of this research will support social demands and response to educational effectively and efficiently. The training program is developed and effective learning, and to recognize the importance of involving different stakeholders which they were embarking. So the journey of educational change based on participation will be emphasis, but the enthusiasm and commitment of instructions generated by the participatory. Furthermore, the purposes of this study was to develop a competency analysis profile model for training undergraduate automotive technology students of Mechanical Technology Education program at King Mongkut's University of Technology Thonburi.; and 2) to propose guidelines for implementation of the model. The research question included:

1. Do training instructors think a competency analysis profile model should be offered in MTE program to support students' competencies?

2. How to identify the effectively of a competency analysis profile model depend on social demand?

3. What are the essential guidelines to implement of a competency analysis profile model in the context of automotive transmission systems diagnosis and repair?

2. PERSPECTIVES

In order to accomplish this research, it is essential to understand the characteristics of competency analysis.

2.1 Rationale for designing Competency Analysis Profile

Competency analysis identifies the essential behavior model for professionals to carry out a task or mission. This behavioral model includes motive, characteristic and skill or knowledge of the fundamental characteristic. Specially, competency refers to the performance that a person has to implement in order to work effectively, especially when adequately playing a role or undertaking a task/mission. Furthermore, it can be observed and measured (International Labour Organization. 2002). Thus, competency is not only the aggregation of knowledge, skills, and attitude, but also a dynamic concept of putting action into practice. In particular, it also means to accomplish the purpose of learning outcome under a specific need. In order to achieve the goal of automotive technology training effectively, what needs to be done first is an analysis of the content of the competency in education and training so that the items and standards concerning measuring competencies can be determined.

2.2 The Function of Competency Analysis Profile

The implementation of an educational training program should be based on social demands, and the competency analysis process identifies whether students have attained the competency standards proficiently. The purpose is to let graduates devote themselves to the effect of globalization and revolutions in technology within social demands and graduates' skills. The main purpose of competency analysis is to analyze one occupation to improve a learner understand and approach in the content deals of work habit, work situation, and workplace. The essential have to integrate knowledge, skills and attitudes that he/she posses.

Automotive technology changes affect adjustments in, and instructional system and design of, students' competencies. Thus, MTE program should use a suitable competency analysis model in order to establish the competency connation and standards in every domain. The intention is to find out accurate reference information for course development, instructional design and evaluation targets (Casey. 1999). Consequently, the development of an automotive technology competency analysis profile

model is actually an important requirement for training undergraduate students.

2.3 The DACUM Process

DACUM was derived from the phrase "Developing A Curriculum" and DACUM approach was created in July 1968 in British Columbia, Canada. It is a competency-based approach to curriculum development and places the emphasis on the learners gaining ability to meet specific objectives formulated according to a set of standards. DACUM is based on three assumptions as follows: 1) Expert workers can define and describe their job more accurately than anyone else; 2) Any job can be effectively described in terms of the tasks that successful workers in that occupation perform; and 3) In order to be performed correctly, all tasks demand certain knowledge and attitudes from workers (Norton. 1991). The DACUM process consists of four components namely: 1) the selection of workshop participants; 2) the DACUM workshop; 3) data analysis; and 4) the development of the course. The participants in the workshop should be experts in their respective areas of specialization, articulate and forward thinking.

2.4 The DACUM workshop

The DACUM workshop brings together all these experts and provides the topic for identify a competency analysis profile content framework with to consultation and negotiation of competency-based curriculum. The DACUM workshop includes the themes of Automotive Technology Profile by starting check the National Skills standards Board of America that proposes a common framework, as shown in figure 1, to be followed by each state or industry sector which desired to develop standard. Researcher was moderator explained about the overview of skills standard framework. Therefore, started at 1) Occupational title was synonymous to job title, which specifies the domain of competency standards. 2) Critical work function, equivalent to collective competency, was the major responsibility in a job area. 3) Key activity, synonymous to a single skill, is the major duty or task involved in carrying out a critical work function. 4) Performance indicator provides information on how to determine when someone was performing each key activity competently. 5) Technical knowledge was the related knowledge needed to perform the key activity. 6) Employability knowledge and skill was a general competency used to improve performs the key activity. Competency can be described as using a precise language to specify performance. The precision involves the consistent use of an "action verb" as the beginning word. The action verb, also called active verb, was a transitive verb had the meaning of acting, performing, or executing, and always provides important information about the content of a competency. An action verb was usually used to describe skill, competency, basic academic ability, educational objective, curriculum design, learning assessment, learner profile, curriculum vitae, and recruitment advertisement. An action verb also needs an object. The object, a noun or a noun phrase, is the performing target of the action verb. Aside from this, it may need to specify the condition or circumstance to increase precision. Hence, a competency statement had the form of "action verb + object + condition" (Mansfield & Mitchell. 1996; Norton, 2004).

Occupational Title: occupational name in industry sectors
Critical Work Function: main responsibilities associated with occupational
Key Activity: identifiable and measurable competencies
Performance Indicator: effective performance in key activity
Technical Knowledge: knowledge associated with key activity
Employability knowledge and skill: general competencies for key activity

Figure 1. Skills Standards Framework of America

3. RESEARCH METHODS

The qualitative data were collected through document analysis, in-depth interviews technique and DACUM (Developing a Curriculum) job analysis process with professional automotive technology training instructors from the excellent car automobile company in Thailand. Data collection and analysis in this research were:

1. Collect relevant literature, relative documents and related research included automotive training program, instructional material framework, Observation, document analysis.

2. Invite training manager from the excellent car company to in-depth interviews with 9 specialized by doing two-way communication, which researcher was built interview guild line support to the purpose of this research. Then, syntheses the collected data are explore classifications of students' competency, perceived needs of enterprise and university; understand the teaching resources of KMUTT, trend and current status in automotive technology, and learning outcomes that support to social demands. Results can draft be Automotive Technology Competency Analysis Profile Model (ATCAP), which consists of fifth stages: 1) Training needs analysis; 2) Training design; 3) Instructional Development; 4) Training implementation; and 5) Program evaluation.

3. The DACUM workshop includes the themes of Automotive Technology Profile with 11 training instructors from the excellent car company. Data

conducted needs analysis, in which actual needs are determined; for the needs of training, for a change in competency procedures (e.g., inspect, repair, and diagnosis), for update technology and modern content, for considerate the essential sources in instructional methods and materials, and code of conduct.

Therefore, researcher was conducted in order to construct an automotive technology competency analysis profile (ATCAP) model for training undergraduate students at KMUTT. In automotive technology education, a systematic process has evolved consisting of five steps which guide one in developing a competency analysis profile. This is also referenced to as an outcomes-based training. The competencies/outcomes must be specifically articulated and individually addressed in terms of how the learner will acquire the desired knowledge, skills and attitudes, and how acquisition of that competency will be measured or accessed. ATCAP model represented into fifth stages:

Stage 1. Needs Analysis: First is a needs analysis, in which actual needs are determined and sound of social demands, for improve curriculum, for updated automotive technology, for change in automotive procedures, or some combination of needs. If the need for training is confirmed, a job analysis is next (the DACUM approach recommended). Next is task verification, which can extend involvement in the job analysis from experts' workers and can provide a means of rating the importance and difficulty of each task and obtaining other valuable decision-making information. It provides into sixth components:

1.1 Conduct needs analysis
1.2 Conduct job analysis
1.3 Conduct task verification
1.4 Select tasks for training
1.5 Conduct standard task analysis
1.6 Conduct literacy task analysis

Stage 2. Design: Based on information collected in stage 1. The instructional programs and materials to be developed, which instruction will be individualized, and support instructional media. The development of learning must focus on objectives for each task or group of tasks, followed by the competency analysis profile. Then, the development of learning can apply to student competency measures. It provides into fourth components:

2.1 Determine training approach
2.2 Develop learning objectives
2.3 Develop performance measures
2.4 Develop traing plan

Stage 3.Development: Should develop main components, although depending on the type of materials to be produced. It provides into sixth components:

3.1 Perform competency profile
3.2 Draft learning guides/modules
3.3 Construct learning aids
3.4 Construct curriculum guide/lesson plan
3.5 Construct supportive media
3.6 Pilot-test/revise materials

Stage 4. Implementation: It provides into fourth components:

4.1 Implement training plan
4.2 conduct training
4.3 conduct formative evaluation
4.4 document training

Stage 5. Evaluation: The final stage should be done the formative evaluation complete. The important step is to conduct the summative evaluation to collect data for use in decisions on maintaining or improving the education. This involves gathering data on the overall instructional process, program outcomes, student follow-up, and cost-effectiveness. Completion of the evaluation stage produces the performance data and feedback vital to any education or training system concerned with quality and improving its worth. It provides into third components:

5.1 Conduct summative evaluation
5.2 Analyze information collected
5.3 Initiate corrective actions

4. RESULTS

The results has shown an ATCAP model by proposing the following students' competencies that identified and verified by a panel of subject matter experts currently employed in the field of Automotive Technology Education. The ATCAP model of automatic transmission systems diagnosis and repair is divided into 5 job duties, 78 tasks and 7 core competencies framework. This panel of experts has determined that these skills will adequately prepare students for entry level positions in the context of automotive engine service, repair, and diagnosis. This model is developed into module which each in core competencies are included to guide identifies the knowledge, skills and attitudes students need to perform each competency. Core competencies are designed to be the basis for training program to ensure stakeholders input that is relative and meaningful to the workplace. This competency intended to include all basic, necessary skills for this area, but may be supplemented with additional competencies as

essential as students' competency and the ability to service, repair and diagnosis.

Experts are identified to training effectively into three categories:

1. Competency - an observation and measurable behavior that has a defining beginning and end; can be performed within a limited amount of time; consists of two or more core competencies; and leads to a product, service, or decision.
2. Core competencies – the skills, knowledge, and attitudes (written in measurable terms) needed to perform a given competency.
3. Entry level – position of stakeholders that requires no previous experience, but may require some training and/or specific knowledge, skills, and attitudes. All tasks have the skills level designation recognize program content requirements vary by program type and regional subject taught. Therefore, flexibility has been built into the ATCAP list by assigning each task the skills level. The skills level number simply indicates the minimum in their program in order to be taught in that area. It assigned 1 of 3 skills level is:
   1. Elementary Skills Level ***(E-1)*** items must be taught in the training program ninety-five percent (95%).
   2. Intermediate Skills Level ***(I-2)*** items must be taught in the training program eighty-five percent (85%).
   3. Advanced Skills Level ***(A-3)*** items must be taught in the training program seventy percent (70%).

The ATCAP model was a pilot project conducted by MTE program at KMUTT. The result revealed that: (Duffy. 2000)

Module 2: Automatic Transmission Systems

Sub-module 2.1		**Perform General Transmission and Transaxle Diagnosis to Determine Necessary Action**
Core Competencies:		
2.1.1	E-1	Interpret and verify shop safety rules and procedures
2.1.2	E-1	Interpret and verify environmental protect, energy conservations, public mind, and procedures
2.1.3	E-1	Inspect the procedure as follow as instructional module
2.1.4	E-1	Check and prepare basic tools, special tools, equipment, and materials correctly
2.1.5	E-1	Verify and interpret automatic transmission systems concern by duplicating car instruction manual
2.1.6	I-2	Explain why proper diagnosis methods are important to automatic transmissions repair
2.1.7	E-1	Diagnosis unusual fluid usage, level, and condition problems; determine needed repairs
2.1.8	E-1	Perform pressure tests; determine needed repairs
2.1.9	I-2	Perform stall tests; determine needed repairs repairs.
2.1.10	I-2	Perform lock-up converter system; determine needed repair
2.1.11	I-2	Explain when and how to do a wet compression test
2.1.12	I-2	Perform engine cylinder compression tests
2.1.13	A-3	Diagnosis electronic, mechanical, and vacuum control system; determine needed repairs
2.1.14	A-3	Diagnosis noise, heat, vibration, and unusually problems; determine needed repairs
2.1.15	I-2	Inspect, adjust or replace kick down mechanism, shift valve, and throttle linkages or cables and check gear select indicator (each of positions follow as car instruction manual)
2.1.16	E-1	Perform service transmission through visual check; replace fluids and filters
2.1.17	A-3	Complete written report (e.g., results, discuss, recommendations, conclusions and suggestions) to be guideline for improving skills in

		problem-solving, creativity, and decision making
Sub-module 2.2		**In-Vehicle Transmission and Transaxle Repair**
Core Competencies:		
2.2.1	E-1	Describe the general safety rules pertaining to automatic transmission removal, reinstallation, and parts cleaning
2.2.2	E-1	Interpret and verify environmental protect, energy conservations, public mind, and procedures
2.2.3	E-1	Inspect the procedure as follow as instructional module
2.2.4	E-1	Check and prepare basic tools, special tools, equipment, and materials correctly
2.2.5	E-1	Verify and interpret automatic transmission systems concern by duplicating car instruction manual
2.2.6	A-3	Inspect and adjust or replace vacuum modulator; inspect and repair or replace lines and hoses
2.2.7	A-3	Explain the use of an automatic transmission lifting fixture or chain, and operate with a crane
2.2.8	A-3	Describe typical inspections that should be make during automatic transmission disassembly and cleaning
2.2.9	A-3	Inspect, repair, and replace governor assembly
2.2.10	A-3	Inspect and replace external seals and gaskets
2.2.11	A-3	Inspect extension housing; replace bushing and seals
2.2.12	E-1	Inspect leak test, flush, and replace oil cooler; lines and fittings
2.2.13	A-3	Inspect and replace speedometer drive gear (e.g., vehicle speed sensors, drive gear, and retainers)
2.2.14	I-2	Inspect, measure, clean, and replace valve body (includes surfaces and bores, springs, valves, sleeves, retainers, brackets, check-balls, screens, spacers, and gaskets; check/adjust valve body bolt torque
2.2.15	A-3	Inspect servo bore, piston, seals, pin, spring, and retainer; repair or replace as needed
2.2.16	A-3	Inspect accumulator bore, pin, seals, spring, and retainer; repair or replace as needed
2.2.17	A-3	Inspect, test, adjust, repair or replace transmission related electrical and electronic components (includes electronic control transmission module, solenoids, sensors, relays, switches, and harnesses layout)
2.2.18	A-3	Inspect, replace, and align power train mounts
2.2.19	A-3	Inspect and replace parking pawl, shaft, spring, and retainer
2.2.20	A-3	Complete written report (e.g., results, discuss, recommendations, conclusions and suggestions) to be guideline for improving skills in problem-solving, creativity, and decision making
Sub-module 2.3		**Off-Vehicle Transmission and Transaxle Repair: Removal, Disassembly, and Reinstallation**
Core Competencies:		
2.3.1	E-1	Describe the general safety rules pertaining to inspect and repair transmission and transaxle
2.3.2	E-1	Interpret and verify environmental protect, energy conservations, public mind, and procedures
2.3.3	E-1	Inspect the procedure as follow as instructional module
2.3.4	E-1	Check and prepare basic tools, special tools,

		equipment, and materials correctly
2.3.5	E-1	Verify and interpret automatic transmission systems concern by duplicating car instruction manual
2.3.6	I-2	Remove and reinstall transmission and torque convertor (rear-wheel drive)
2.3.7	I-2	Remove and reinstall transaxle and torque convertor assembly
2.3.8	E-1	Disassemble, clean, and inspect transmission/transaxle
2.3.9	E-1	Assembly transmission/transaxle
2.3.10	A-3	Complete written report (e.g., results, discuss, recommendations, conclusions and suggestions) to be guideline for improving skills in problem-solving, creativity, and decision making

Sub-module 2.4		**Off-Vehicle Transmission and Transaxle Repair: Oil Pump and Torque Converter**
Core Competencies:		
2.4.1	E-1	Describe the general safety rules pertaining to inspect and repair transmission and transaxle
2.4.2	E-1	Interpret and verify environmental protect, energy conservations, public mind, and procedures
2.4.3	E-1	Inspect the procedure as follow as instructional module
2.4.4	E-1	Check and prepare basic tools, special tools, equipment, and materials correctly
2.4.5	E-1	Verify and interpret automatic transmission systems concern by duplicating car instruction manual
2.4.6	I-2	Inspect torque converter flex plate, attaching parts, pilot and pump drive, and seal areas
2.4.7	I-2	Perform measure torque converter end play and check for interference; check stator clutch
2.4.7	I-2	Inspect, measure, and replace oil pump housings, shafts, vanes, rotors, gears, valves, seals, and bushings
2.4.7	E-1	Check torque converter and transmission cooling system for contamination
2.4.8	A-3	Complete written report (e.g., results, discuss, recommendations, conclusions and suggestions) to be guideline for improving skills in problem-solving, creativity, and decision making

Sub-module 2.5		**Off-Vehicle Transmission and Transaxle Repair: Gear Train, Shafts, Bushing and Case**
Core Competencies:		
2.5.1	E-1	Describe the general safety rules pertaining to inspect and repair transmission and transaxle
2.5.2	E-1	Interpret and verify environmental protect, energy conservations, public mind, and procedures
2.5.3	E-1	Inspect the procedure as follow as instructional module
2.5.4	E-1	Check and prepare basic tools, special tools, equipment, and materials correctly
2.5.5	E-1	Verify and interpret automatic transmission systems concern by duplicating car instruction manual
2.5.6	I-2	Check end play or preload; determine needed service
2.5.7	I-2	Inspect, measure, and replace thrust washers and bearings

2.5.8	I-2	Inspect oil delivery, seal rings, ring grooves, and sealing surface areas
2.5.9	I-2	Inspect bushing; replace as needed
2.5.10	I-2	Inspect and measure planetary gear assembly (includes sun, ring gear, thrust washers, planetary gears, and carrier assembly); replace as needed
2.5.11	I-2	Inspect transaxle drive, link chains, sprockets, gears, bearings, and bushings: replace as needed
2.5.11	I-2	Inspect, measure, repair, adjust or replace transaxle final drive components
2.5.12	A-3	Inspect and reinstall parking pawl, shaft, spring, and retainer; replace as needed
2.5.13	A-3	Complete written report (e.g., results, discuss, recommendations, conclusions and suggestions) to be guideline for improving skills in problem-solving, creativity, and decision making

Sub-module 2.6 **Off-Vehicle Transmission and Transaxle Repair: Friction and Reflection Units**

Core Competencies:

2.5.1	E-1	Describe the general safety rules pertaining to inspect and repair transmission and transaxle
2.5.2	E-1	Interpret and verify environmental protect, energy conservations, public mind, and procedures
2.5.3	E-1	Inspect the procedure as follow as instructional module
2.5.4	E-1	Check and prepare basic tools, special tools, equipment, and materials correctly
2.5.5	E-1	Verify and interpret automatic transmission systems concern by duplicating car instruction manual
2.5.6	I-2	Inspect clutch drum, piston, check-balls, springs, retainers, seals, and friction and pressure plate; replace as needed
2.5.6	I-2	Measure clutch peak clearance; adjust as needed
2.5.7	I-2	Check and test operation of clutch and servo assemblies by using special tools (as follow as car manufacturer's)
2.5.8	I-2	Inspect roller and sprag clutch, races, rollers, sprags, springs, cages, and retainers; replace as needed
2.5.9	A-3	Inspect break bands and drums; replace as needed
2.5.10	A-3	Complete written report (e.g., results, discuss, recommendations, conclusions and suggestions) to be guideline for improving skills in problem-solving, creativity, and decision making

The ATCAP model describes the core competencies framework for training program on automotive technology subjects provide opportunities to develop, reinforce, and apply. It consists of 7 core competencies framework have thus:

1. Numeracy skills as they calculate, estimate, and measure;
2. Information skills as they identify, locate, gather, store, retrieve, process, discuss, and present information;
3. Communication skills as they apply general education within technology to communicate their generate ideas, solutions, reflections, and products;
4. Problem-solving skills as they identify, describe, and analyze problems, and test their ideas and solutions through applied cognitive approach and behavioral approach;
5. Social and cooperative skills as they interact with others to solve problems and complete projects;
6. Leadership and career professional teacher skills as they set goals, plan, address challenges, resolve conflicts, and code of honor; and

7. Competencies as they carry out technological tasks using tools, equipment, and materials correctly, safety, effectively, and efficiently.

5. CONCLUSIONS

The following conclusions were derived from the results and analysis of this research:

1. The automotive technology competency analysis profile model, which has been developed in this research, can be used to improve capability and establish training program. It may be quicker and more effective to finish establishing the necessary competency analysis profile.
2. Each ATCAP identifies the competencies needed to enter a given automotive technology area.
3. The ATCAP not only lists the competency but also clusters those competencies into broader instructional modules and details the knowledge, skills, and attitudes (students' competencies) needed to perform each competency.
4. Within the competency list are two levels of items: core competency and core skills. Core competency items, which are essential for entry-level students, are required to be taught. Core skills items are those needed to integrate for increasing actively in the identification and verification of additional items.
5. The framework of the teaching and assessment strategy for educational training should be basis for competency analysis.
6. The ATCAP model of this research can provide vocational and technical institutes and car automobile training division with job duties and tasks as a reference in performance appraisal.

6. RECOMMENDATIONS

The recommendations that the two delivery methods were similar in terms of final learning outcomes:

1. Instructional system design through modules and focuses on performance-based, individual paced & needs and learning in the field with assistance of resource person.
2. Assessment and evaluation should be applied the authentic method through objective criterion, criterion-referenced and student competencies.

7. SUGGESTIONS FOR FUTURE RESEACH

1. This research focused on the development of an automotive technology competency analysis profile model MTE program at KMUTT, although the establishment of a competency standard still needs to be researched further.
2. This research should be guide adjustments in teaching resources, the instructional programme framework, implementation, evaluation, assessment and record the process information.
3. The reputation of the next research must be communicated to perspectives in the whole of automotive technology education (e.g., job duties and tasks placement statistics showing students accomplishment after program completion and comparisons to traditional type of training program can be available to students.
4. This research should explore to implement, cover in any area of automotive technology.

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