THE APPROPRIATENESS OF AUTOMOTIVE TECHNOLOGY EDUCATION CURRICULAR CONTENT THROUGH COMPETENCIES AS PERCEIVED BY TRAINING INSTRUCTORS

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ABSTRACT

The purpose of this research was to determine the appropriateness of automotive technology education curricular content through competencies as perceived by training instructors of automobile company in Thailand. The quantitative data was collected through a 24-item questionnaire. The research was conducted by 46 training instructors who were involved in curricular content development. The data were analyzed by means, standard deviation, and content analysis.

The results of this research revealed as follows:

1. Training instructors perceived the cognitive domain competencies as more important benefits of automotive technology education program than competencies in the affective and psychomotor domains.

2. The knowledge domain of automotive technology education program completers to: 1) identification of automotive hand tools set; 2) identify to use mechanical, electrical and electronics precision/measure equipment; and 3) knowledge to select information guide to solve problems.

3. The main issues of automotive technology curricular content suggest to: 1) develop the problem solving skills in Automotive Electronic Control Systems; 2) decision making through service information seeking; 3) identify and use scan tools for diagnosis; 4) identify and use electrical and electronic instrument for analyzing the electrical and electronic parts; and 5) identify and use measuring/precision tool for analyzing the mechanical parts.

Keyword: Analyzing the Curriculum, Automotive technology Education, Curricular Content Development,
INTRODUCTION

Knowledge that cannot be applied has little utility in today’s complex, technologically driven world. For centuries, societies have recognized that a keen understanding of mathematics, science and communications skills were essential to cultural preservation and progress. But historically, such disciplines were taught and perpetuated in isolation of their application in the real world, a world where people must work and make a living. However, with the advent of technology at an ever accelerating pace, there has been a rethinking regarding the most effective methodologies for teaching math, science and communication skills. Teaching those disciplines in the context of where and how people live and work is not only gaining in acceptance, but it is deemed critical to survival in a technology-imbued environment. For example, an automotive technician’s job description consists of far more than the performance of manipulative tasks required to service today’s complex motor vehicles.

The curricular content of technology education by reviewing with according to Lewis (1992), curriculum delineation is one of the most challenging facets of the change from industrial arts education to technology education. Gradwell and Welsh (1991) reiterated these thoughts in noting that the critical question is: “What are the basic concepts that [technology education] student should learn?” In a modified Delphi study conducted by Wicklien (1993), leaders in the field identified major problems facing technology education. The research noted lack of identify in the knowledge base of technology education, vary curriculum development models, and a lack of consensus on the technology education curriculum as the top problems for the discipline.

Numerous authors have attempted to identify the curricular content of technology education programs. Pucel (1992a; 1992b) advanced ten categories of technology education curricular contents:

1. Technological method
2. Common tool usage
3. Common equipment usage
4. Basic technological process
5. Materials
6. Terminology
7. Environmental concerns
8. Social values
9. Scientific principles
10. Economic factors

According to Pucel, the first six categories should be the primary focus on technology education programs, while the latter four categories should be taught in other areas of the institution curriculum. The first six categories address both the cognitive and psychomotor domains, but a void still exists with regard to what, if any, student attitudes should be components of technology education. The scope and sequence of the curricular, generated by student needs, analysis of constraints, and articulation agreements, should dictate what, how, and when course content is taught in technology education (Gallagher, 1993; Pautler, 1984; Taba, 1962). All of this, the delineating technology education’s curricular content, technology education is being taught based on each individual teacher’s definition of technological literacy. Today’s successful of automotive technology education must possess an array of workplace skills and a unique blend of academic and technical skills.
WHAT IS AUTOMOTIVE TECHNOLOGY EDUCATION CURRICULAR CONTENT THROUGH COMPETENCIES?

The effectiveness of automotive technology education programs encourage students to be productive, innovative and enterprising. This involves generating ideas and taking action, as well as developing competencies that satisfy social demands, wants and opportunities and extend human capabilities. Students learn about training materials, technical information and systems and technology practice by which they are known. They consider the resources, teaching and training methods, equipment, and techniques that are relevant to the context in which they are working. Students examine the context of a task or learning activity to solve the problems, and relate what is known to what might be done.

The automotive technology education is divided to theory and practice. It is a dynamic process because automotive technology can change. In the recent year, the evolution of automotive technology is changed by many car automobile makers. The major branch of the evolution is focused on computer technology which is represented by embedded microcontroller systems (Peatman, 1998). Electronics use in automobiles has been increasing steadily to improve reliability and add more functionality. For example, car model in the 2001 year electronics increased for 19% of the cost of mid-sized cars and is expected to reach 25% by year 2005 for mid-sized cars and possibly 50% for luxury models (Jones, 2002).

Modern automotive technology can describe by adapting microcontroller-based processing systems which we divided as follow as six modules: 1) Gasoline/diesel engine control system; 2) Automotive suspension systems; 3) Automotive transmission systems; 4) Automotive electricity and electronics control systems; 5) Navigation system; and 6) Communicating via standard protocols through the Controller Area Network (CAN). Therefore, the interdisciplinary skills approach focus on designing a subject that is relevant, knowledge meaningful and competency-based (knowledge, skills and attitudes) for students. The subject illustrate challenges students and skills to solve real time problems both to moral and ethics.

It is therefore essential that automotive technology education professionals be equipped with tools to effectively assess how curricular content, instructional material, and teaching and training methodologies are facilities and activities. Students who successfully participate in automotive technology education activities would develop a number of intellectual qualities including “understanding and competence in designing, producing, and using technology products and systems, and in assessing the appropriateness of technological actions” (Wright and Lauda, 1993). Creating appropriate curricular content strategies as well as establishing effective technological literacy efforts at each level of schooling should be an ultimate goal of the professional development training program.

PURPOSES

The purpose of this research was to determine the appropriateness of automotive technology education curricular content through competencies as perceived by training instructors of automobile company in Thailand. This data, in additional to input from automotive training instructors, could assist in delineating a core automotive technology education curriculum. More specifically, the following research questions was addressed; “What knowledge, skills, and attitudes do training instructors perceive as important for automotive technology education curricular content student to possess?”.
THEORETICAL FRAMEWORK

Figure 1 shows the approach that ibstpi (The International Board of Standards for Training, Performance and Instruction) (http://www.ibstpi.org) has followed to develop and validate competencies (Klein & Richey, 2005). In addition, researcher would like to propose competency development concept which involved identifying the knowledge, skills, attitudes, capabilities, and tasks associated with a particular job role such as instructional design. The first one is defined; current practices and existing standards are identified to curricular content through competency (knowledge and skills). Furthermore, the ethics and values commonly used to evaluate performance-related behaviors must also be determined (Attitudes). Finally, a vision of the evolving nature and the future job role is articulated. Current practice, existing standards, ethics, values, and a vision of the future collectively provide the major input into the identification and validation of knowledge, skills, and attitudes believed to be critical to effective performance in a particular job role. Researcher applied this competency model, and modified its on conceptual framework with construct a questionnaire.

METHODOLOGY

Instrumentation
In order to address the research questions, a 24-item questionnaire was developed. Each item on the questionnaire was rated by training instructors of automobile company in Thailand on
a five-point Likert-type scale (1 = useless to 5 = very important). The 24 items were applied from Pucel’s (1992a; 1992b) ten categories of technology education and Gregson’s (1991) listing of important work values and attitudes as identified and rated by training instructors. Additional questionnaire items was added to assess current automotive technology education content that derived from the Competency-Based Curriculum Development on Automotive Technology Subjects for Mechanical Technology Education Program (Weerayute and Anusit, 2007). These items included knowledge of automotive current and future technologies, knowledge of automotive electronic control systems, and knowledge of scan tools and computer diagnosis procedure applications.

A questionnaire was accomplished prior to the instrument being reviewed for content validity by index of consistency (IOC), and found that internal consistency in three aspects a 24-item had congruence index 0.5-1 with five experts in automotive technology education in higher education. A try out of the questionnaire was conducted with 30 public automotive in-service teachers from technical colleges in Bangkok on November, 2007. Resulted from the try out identified by conducting through Cronbach’s Coefficient Alpha method. The reliability in three aspects as follows; cognitive domain (knowledge) 0.91, psychomotor domain (skills) 0.88, and affective domain (attitude) 0.93.

Subjects
The population was 83 training instructors from 12 automobile companies in Thailand. The sampling size was 46 participants who involved in curricular content development, selected by purposive sampling. Determining automotive technology education curricular content included input from a variety of automotive knowledgeable sources, including automotive technology education instructors, as well as industry representatives. Its focus on automotive technology education curricular content as it relates to mechanical technology education programs.

Procedure
The questionnaire, demographic data sheet, and a cover letter were delivered by direct contact to the population in January, 2008. A total of 46 questionnaires were returned by direct delivery (100%) after three week. Demographic data were obtained regarding the instructors’ educational level and years of training experience. Thirteen percent of training instructors indicated that they had received a graduate degree. Eighty-two percent of training instructors indicated that they had received an undergraduate degree, while five percent had received a diploma. The mean years of training experiences was 11.4, with 34.6% having 3-10, with 45.4% having 10-15, and with 20% having 16 or more years.

Data Analysis
A descriptive statistics was calculating using the SPSS version 11 statistical analysis program. The data was analyzed using mean rating, standard deviation, and content analysis for each aspect.

RESULT

The perceived importance of automotive technology education curricular content through competencies can describe on table 1. Table 1 depicts the overall mean scores for the sample of 46 training instructors rating of automotive technology education competencies. All one of the 24 competencies listed on the questionnaire were perceived as valuable for automotive technology education students programs. The sixth highest rated statements were all
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cognitive domain attributes. The seven highest competencies rated were seven statement cognitive domain attributes. The highest competency rated affective domain was three statements. The next highest competency rated psychomotor domain was one statement. Although still rated above 3.50, the lowest rated competency was a ability to perform desktop publishing (3.63).

Table 1
Descriptive Results for All Domains

<table>
<thead>
<tr>
<th>Item Statement</th>
<th>Mean</th>
<th>SD</th>
<th>Level</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cognitive Domain</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Identification of automotive hand tools set</td>
<td>4.92</td>
<td>.28</td>
<td>Highest</td>
</tr>
<tr>
<td>2. Identify to use mechanical, electrical and electronics precision/measure equipment</td>
<td>4.87</td>
<td>.34</td>
<td>Highest</td>
</tr>
<tr>
<td>3. Knowledge to select information guide to solve problems</td>
<td>4.83</td>
<td>.38</td>
<td>Highest</td>
</tr>
<tr>
<td>4. Knowledge of computer applications</td>
<td>4.75</td>
<td>.45</td>
<td>Highest</td>
</tr>
<tr>
<td>5. Knowledge of engineering mathematics and statistics</td>
<td>4.62</td>
<td>.58</td>
<td>Highest</td>
</tr>
<tr>
<td>6. Knowledge of engineering materials</td>
<td>4.58</td>
<td>.61</td>
<td>Highest</td>
</tr>
<tr>
<td>7. Knowledge of automotive technology clusters</td>
<td>4.52</td>
<td>.70</td>
<td>Highest</td>
</tr>
<tr>
<td>8. Knowledge of hydraulics/pneumatics systems</td>
<td>4.49</td>
<td>.76</td>
<td>High</td>
</tr>
<tr>
<td><strong>Affective Domain</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Exhibiting a safety attitude</td>
<td>4.61</td>
<td>.48</td>
<td>Highest</td>
</tr>
<tr>
<td>10. Concern for the save environment and energy</td>
<td>4.57</td>
<td>.52</td>
<td>Highest</td>
</tr>
<tr>
<td>11. Ability to follow workshop regulations</td>
<td>4.53</td>
<td>.57</td>
<td>Highest</td>
</tr>
<tr>
<td>12. Being code of conduct</td>
<td>4.46</td>
<td>.73</td>
<td>High</td>
</tr>
<tr>
<td>13. Cooperating with others</td>
<td>4.35</td>
<td>.75</td>
<td>High</td>
</tr>
<tr>
<td>14. Openness to new idea</td>
<td>4.28</td>
<td>.78</td>
<td>High</td>
</tr>
<tr>
<td>15. Career positive attitude</td>
<td>4.23</td>
<td>.81</td>
<td>High</td>
</tr>
<tr>
<td>16. Professionalism role</td>
<td>4.19</td>
<td>1.01</td>
<td>High</td>
</tr>
<tr>
<td><strong>Psychomotor Domain</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17. Utilize automotive common hand tools</td>
<td>4.62</td>
<td>.49</td>
<td>Highest</td>
</tr>
<tr>
<td>18. Utilize engineering materials</td>
<td>4.46</td>
<td>.73</td>
<td>High</td>
</tr>
<tr>
<td>19. Operate automotive common equipment</td>
<td>4.37</td>
<td>.76</td>
<td>High</td>
</tr>
<tr>
<td>20. Apply service manual and work instruction</td>
<td>4.21</td>
<td>.83</td>
<td>High</td>
</tr>
<tr>
<td>21. Apply mechanical, electrical and electronics precision/measure equipment</td>
<td>4.05</td>
<td>.94</td>
<td>High</td>
</tr>
<tr>
<td>22. Apply information technology to solve problems</td>
<td>3.96</td>
<td>1.05</td>
<td>High</td>
</tr>
<tr>
<td>23. Interpretation of current data for predicting parameters</td>
<td>3.78</td>
<td>.94</td>
<td>High</td>
</tr>
<tr>
<td>24. Ability to perform desktop publishing</td>
<td>3.63</td>
<td>1.02</td>
<td>High</td>
</tr>
</tbody>
</table>

CONCLUSION

The result from this study indicated the following findings for the fields of automotive technology education as follows:

1. Training instructors from 12 automobile companies in Thailand perceived the cognitive domain competencies as more important benefits of automotive
technology education program than competencies in the affective and psychomotor domains.

2. The knowledge domain of automotive technology education program completers to:

Identification of automotive hand tools set
- Identify to use mechanical, electrical and electronics precision/measure equipment
- Knowledge to select information guide to solve problems

The findings of this research indicate that training instructors from 12 automobile companies in Thailand desire completers of automotive technology education program to possess cognitive domain attributes. They need to declare the evolution of teaching methods must change, differences, manipulate, accuracy, just in time, and then academic instructors should be done thinking skills curricular content. This finding was affected as follow as new automotive technology, complexity for inspecting, diagnosis skills involved computer applications. Of course, curricular content included factors that affected to student’s competency. High technology input to automobile, so that teaching methods focus on systematic thinking, working by reasoning, and integrated any body of knowledge by putting together.

The results of this study can be used in conjunction with other knowledgeable input from professional careers, data regarding student needs, and analysis of constraints to delineate the curricular content of automotive technology

RECOMMENDATIONS

In the open-end questions, researcher found that the main issues of automotive technology curricular content suggest to:

1. Develop the problem solving skills in Automotive Electronic Control Systems.
2. Decision making through service information seeking.
3. Identify and use scan tools for diagnosis.
4. Identify and use electrical and electronic instrument for analyzing the electrical and electronic parts.
5. Identify and use measuring/precision tool for analyzing the mechanical parts.

REFERENCES


