WHAT IS THE ROLE OF A MECHANICAL AND METALLURGICAL ENGINEERING TEACHER IN THE CTE HIGH SCHOOL?

Chang-hoon Lee, Won-seok Seo*

Chungnam National University, South Korea

(* Corresponding author: my-sws@hamail.net)

The purpose of this study was to analyze the mechanical and metallurgical engineering (MME) teachers' job characteristic applying the DACUM technique. To accomplish the purpose of this study, the MME teachers' job characteristic was conducted by twelve MME teachers with more than 20 years of experience in the CTE high school through the DACUM workshop in January, 2015. Therefore, the results were verified by twenty subject matter experts using questionnaire. The conclusions were as follows. First, the MME teacher was defined who teach the mechanical and metallurgical subjects with the certification of secondary school teacher and performed work-related to character education, career guidance, life guidance, and others in a specialized high school, the Meister high school. Second, this research determined 16 duties and 199 tasks for fulfilling high-performing MME teacher; moreover, the study extracted the importance, difficulty, frequency and entry-level demand of each task with the five Likert scale.

I. Introduction

In order to establish the status of teachers in the field of mechanical and metallurgical education as experts and become educators who can train human resource that meets the demands of the industrial field, the duty of teachers in the field of mechanical and metallurgical education must be systematically drawn.

The study is significant as it invited mechanical and metallurgical education teachers who have actual teaching experiences in schools through DACUM technique to participate in the DACUM workshop and extracted the job description and experiences from their actual work. This is because it mostly reflected the expertise and experiences of highly experienced teachers who are actually working in school, rather than the duty decided upon by the faculty of pedagogical content knowledge and subject matter knowledge in the field of mechanical and metallurgical subjects.

This study seeks to analyze the duty of mechanical and metallurgical education teachers through the DACUM technique and to define the traits of teachers in the field of mechanical and metallurgical education.

The DACUM chart derived from this study will become the cornerstone for future improvements and developments in educating mechanical and metallurgical education pre-service teachers of teacher training institute. Furthermore, it will be able to contribute by suggesting basic references for the compilation of dictionaries of occupation, ways of developing teaching materials and improving the standard criteria for selecting teachers.
II. Purpose of the study

First, define the duties of teachers in charge of teaching materials related to the field of mechanical and metallurgical education. Second, after deriving the duties and tasks of mechanical and metallurgical teacher, categorize the tasks by Importance of the task, Learning difficulty, Frequency and Entry level. Third, suggest the DACUM Research Chart to the mechanical and metallurgical engineering teacher.

III. Job analysis of vocational and technical education teachers

Although there are no results regarding the DACUM analysis of local mechanical and metallurgical teachers, there is a job analysis of vocational and technical education teachers which is applicable in the upper category of mechanical and metallurgical teachers. 10 duties and 100 tasks were derived from the accomplishment ability table of vocational and technical education teachers of the vocational training institute in 1983. The 10 duties are
1. planning, developing and evaluating career education/ training program (11 types),
2. teaching preparation and planning (6 types),
3. teaching method (29 types),
4. evaluation of teacher and learning assessment (6 types),
5. managing program (9 types),
6. guidance counseling (5 types),
7. relation between school and community (10 types),
8. student career extracurricular section (6 types),
9. professional enhancement of teachers (8 types),
10. field work (10 types) (Kim, 1990: 94). In a report of the O*NET center of the United States, it suggested 33 tasks for secondary career education teachers.

IV. Methodology

1. Configuration of DACUM committee

Because of the possibility of DACUM to have the analysis derived differently depending on the facilitator and the DACUM panel members (high-performing incumbent workers), we recruited someone who is a qualified DACUM facilitator (Level III) and has 20 years of work experience as a DACUM trainer in South Korea. The DACUM coordinator was selected based on the analysis criteria proposed by Norton (1997: C-5~7). Therefore, we selected an even proportion of teachers handling teaching materials of mechanical and metallurgical education to prevent prejudice to arise during the process of job analysis due to professional myopia (meaning: lack of discernment or long-range perspective in thinking or planning). These are twelve mechanical and metallurgical teachers who have more than 10 years of educational experience in the country’s industrial and technical and vocational high schools and the Meister high school where is specifically designed to prepare youths to work in high-skilled manufacturing jobs and other fields). DACUM analysis panel members are all men and their average teaching experience is 23.4 years.

2. Classification and assessment of data

Classification and assessment of data was done by the panel members who have participated in the DACUM workshop during the process of analyzing career duties; and the analyzed duties and tasks were coded and written.
This study analyzed the 4 categories applied on previous studies (Kim, Kim, & Kim, 2006; Kim, & et al, 2013). Each task was identified in accordance to followings;

1) importance of the task (How important is the performance of this task in your job as a OOOO?)
2) learning difficulty (How difficult is it to learn to perform this task?)
3) frequency (How often do you perform this task?)
4) entry level (Is this task expected of a beginning worker?)

3. Verification of the feasibility of DACUM chart

In order to verify the DACUM chart of mechanical and metallurgical teacher derived through the DACUM workshop, researchers formed a validation committee composed of 21 members (one validation support staff, twenty validation committee) and by providing the DACUM chart of mechanical and metallurgy to them as subjects, a survey was conducted. The validation committee received recommendations from DACUM panel members in accordance to the suggestion of Norton (1997: G-1) or were sampled intentionally by the researchers and the final members were composed of those who satisfied six or more out of the seven items for the DACUM Expert Worker Selection Criteria (technical competence, full-time employment, occupational representativeness, effective communicator, team player, full-time commitment, and freedom from bias). The validation committee is composed of one who has ‘more than 5 years - less than 10 years teaching experience’, three who has ‘more than 10 years - less than 20 years teaching experience’, 11 who has ‘more than 20 years- less than 30 years teaching experience’, and six who has ‘more than 30 years- less than 35 years’ of teaching experience.

The questionnaire for research had a total of 22 questions and was designed in such way that subjects can freely write their opinions on each number. This was done to verify the task excluded from the DACUM Quality Performance Criteria Checklist by Norton(1997). In order to verify the feasibility of the questionnaire for research, researchers had the face validity reviewed by one industrial education professor with DACUM Level I certification and one teacher who has more than 20 years of experience and a doctoral degree. Then, they had the composition of the survey and the configuration of questions edited and supplemented to prevent any difficulty that may arise in understanding the questions within the validating committee.

The verified comments collected from the validation committee were confirmed to be a total of 295, and specifically was used as an appropriate title for tasks, addition of tasks, and rearrangement of difficulty, importance, and frequency.

The perceptions of the validated comments that were collected were reviewed by the research council. Having the reflected content above as basis, the edits and supplements of DACUM research chart for mechanical and metallurgical teachers were finalized through an agreement with the DACUM coordinator.

V. Result

1. Definition of Mechanical and Metallurgical Education (MME) teachers

The final definition of a mechanical and metallurgical teacher is ‘one who has a certificate for secondary school teacher and teaches specialized courses related to the field of mechanical and metallurgical subjects to students in industrial and vocational high schools, high school geared towards industrial demand, etc.a and plans and performs character education, career guidance, and guidance counseling.’
2. Duties of the MME teacher

The duties of mechanical and metallurgical teachers as analyzed in the DACUM workshop appears to be 16 as shown in Table 1. The tasks affiliated with the 16 duties were analyzed to be a total of 199.

<table>
<thead>
<tr>
<th>Duty</th>
<th>Task (N)</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Preparation for specialized subject</td>
<td>11</td>
<td>5.5</td>
</tr>
<tr>
<td>B. Teaching activities as specialized subject</td>
<td>22</td>
<td>11.1</td>
</tr>
<tr>
<td>C. School counseling</td>
<td>9</td>
<td>4.5</td>
</tr>
<tr>
<td>D. Career and Vocational guidance</td>
<td>15</td>
<td>7.5</td>
</tr>
<tr>
<td>E. Performing administrative affairs</td>
<td>12</td>
<td>6.0</td>
</tr>
<tr>
<td>F. Self-improvement</td>
<td>11</td>
<td>5.5</td>
</tr>
<tr>
<td>G. Mechanical Drawing</td>
<td>10</td>
<td>5.0</td>
</tr>
<tr>
<td>H. Use of general purpose machine tool</td>
<td>21</td>
<td>10.6</td>
</tr>
<tr>
<td>I. Use of numerical control machine tool</td>
<td>10</td>
<td>5.0</td>
</tr>
<tr>
<td>J. Automatic equipment production</td>
<td>7</td>
<td>3.5</td>
</tr>
<tr>
<td>K. Industrial equipment production</td>
<td>14</td>
<td>7.0</td>
</tr>
<tr>
<td>L. Metal material production</td>
<td>12</td>
<td>6.0</td>
</tr>
<tr>
<td>M. Metal Material Testing</td>
<td>9</td>
<td>4.5</td>
</tr>
<tr>
<td>N. Quality improvement for metal material</td>
<td>11</td>
<td>5.5</td>
</tr>
<tr>
<td>O. Automotive maintenance</td>
<td>15</td>
<td>7.5</td>
</tr>
<tr>
<td>P. Automotive body repair</td>
<td>10</td>
<td>5.0</td>
</tr>
<tr>
<td>Total</td>
<td>199</td>
<td>100.0</td>
</tr>
</tbody>
</table>

The panel works under the guidance of a trained facilitator for one day to develop the DACUM Research Chart. Therefore, the results of the DACUM job analysis were illustrated with the left column of DACUM Research Chart containing the duties of mechanical and metallurgical teachers and the task for each duty is aligned horizontally. For lack of space, we will not show the chart here.

VI. Recommendation

First, there were instances when the ability factor was either comprehensive or subdivided depending on the job category. In the future, it would be desirable to have the common ability factors that mechanical and metallurgical teachers must have as the standard and have the DACUM job analysis centered on specialized majors wanted by mechanical and metallurgical teachers.

Second, although there are limits faced by DACUM in failing to consider the educational conditions inside the facility, these limits could be used as basis to improve the educational conditions of mechanical and metallurgical teacher training colleges.

Third, DACUM panels are composed of mechanical and metallurgical teachers with an average of 20 years of working experience so they faced difficulties in getting out from the frame of the current national level curriculum and
limitations in putting out futuristic abilities of mechanical and metallurgical teachers and changes in the revised curriculum. Therefore, continuous study must be done in preparation for this.

Acknowledgement

This paper was excerpted and summarized in the study of Lee C., et al. (2015).

Reference


About the authors

*Dr. Chang-hoon Lee* is an associate professor in department of Mechanical and Metallurgical Engineering Education within the College of Education at Chungnam National University in Korea. He also presently serves as dean for the graduate school of Industrial and Engineering Education program in CNU.

*Won-seok Seo* is a researcher in the field of career and technical education focusing on comprehensive career and technical education, CTE teacher training and phenomenological approach research at Chungnam National University in Korea. Please feel free to contact to me if you have further questions at my-sws@hanmail.net.