

Engineering Education Support System on QCD with FSE

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Abstract

"Engineering education projects using College of Technology for the small and medium industry" had been executed, which was advertised from 2006 to 2008 by Ministry of Economy, Trade and Industry in JAPAN. The project member is composed of Suzuka National College of Technology and Suzuka Chamber of Commerce and Industry with Production support office of Suzuka-city.

New concept for Engineering Education System was developed, which was called "FQCDSE" evaluation method. The FQCDSE indicates "F" of Function, "Q" of Quality, "C" of Cost, "D" of Delivery, "S" of Sale & Service, "E" of Environment including Safety and Standard. This QCDFSE is a concept concerning the global engineering design and this is considering of new concept of the "FSE" to the "QCD", which is traditional concept for Industrial Management and Engineering Design. The curriculum of education system consists of about 8 lecture units, 8 practice training units and forum per year. The targets in this curriculum are junior staffs and workers of small and medium industries. The machines and facilities of our college and several cooperated companies were used in practice training. Technical staffs of our college participated into the program, and learned with trainee, too.

In this paper, the engineering design education system based on the proposed concept is introduced.

1. Introduction

On 2006, about the stagnation of industry activities had been misgivings by the retirement of the baby boom generation from 1947's to 1949's called "2007's problems". In the small and medium industries that supported the manufacturing of Japan, the engineering education and the personnel training of the mister's techniques were the pressing issues to their junior staffs.

"Engineering education projects using College of Technology for the small and medium industry" was planned as one of the countermeasures by Ministry of Economy, Trade and Industry in JAPAN.

This project was required the development of engineering education support system/program that aligned to the demand of local industry and cooperated with the local community and the local administrator. In addition, the project was requested to be shifted to an independent

business in the future. The target generation was junior engineers, who are potential manager in the future, in small and medium industry.

“Suzuka Chamber of Commerce and Industry” produced the program with “Suzuka National College of Technology” and “Suzuka city”. Then the committee has been developing new concept for Engineering Education System which was called "FQCDSE" evaluation method.

The economy and social background were changed suddenly by "Lehman Shock that was final year of the program", but the program with the new concept was no changed.

2. Scheme of the project

The management committee and ad-hoc groups were set up in the Suzuka chamber of commerce and industry. Suzuka National College of Technology provided a coordinator, coordinator assistance, professor, technical staff and facilities. Some corporate retiree who belongs to the industrial support division of Suzuka city played a very important role as a lecturer and supervisor. Also some local industries cooperated, and provided opportunities for practical training.

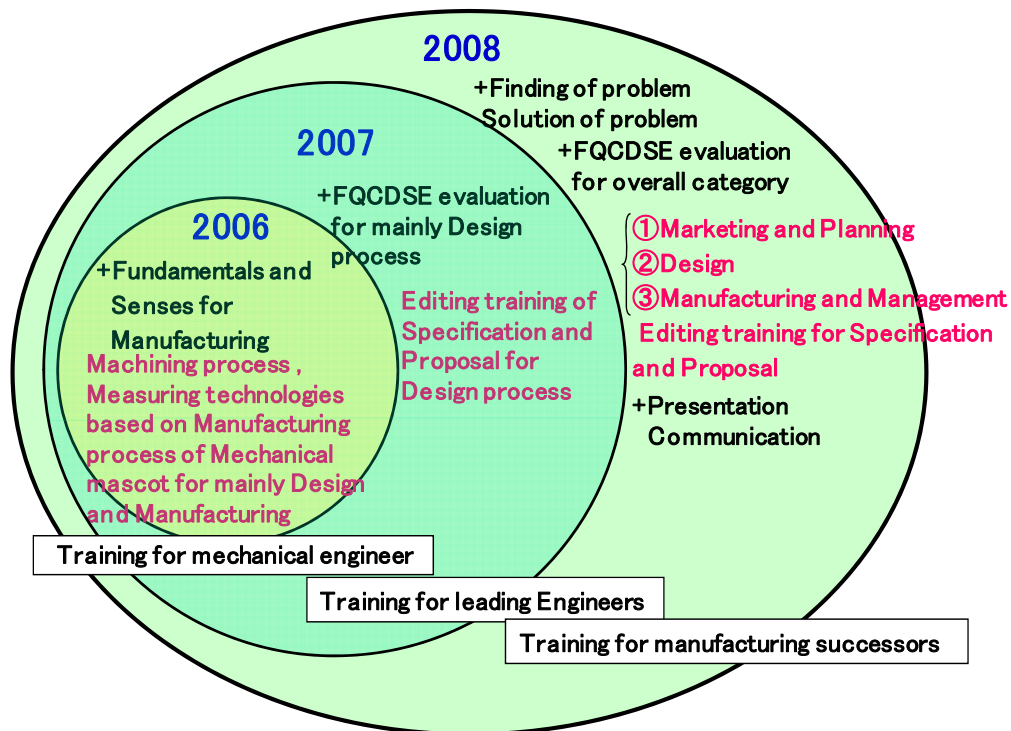


Figure 1: Outline of the seminar

3.1 Proof curriculum of the project seminar

The Northern part of Mie Prefecture is a region specialized for the manufacturing of industrial products, for example automobiles and industrial machines, electronics and chemicals. Then demands of the small and medium industries were the education and trainings of "Engineer who succeeded to the technology and the knowhow of the manufacturing, and was able to develop them further".

The committee and ad-hoc groups planned and developed a unique seminar that was combination of lecture and practical training. Engineering design competences as for the practical "Senses", "Fundamentals" and "Communication" etc. were addressed in the curriculum. The training of editing for specification and proposal was done by Work Based Learning in seminar or small group. The real subjects were provided from the companies of each trainee. Moreover, "Manufacturing human resources development forum" was held for the final seminar.

The curriculums were reviewed and brushed up by the survey and the interview from trainees and their superiors every year. Outline of the program of three years is shown in Figure 1 and Table 1. Table 1 is including the survey result. The customer satisfaction improved every year.

Table 1 Outline of the seminar and survey result

Year	2006	2007	2008	2009
Administrator	SCCI	SCCI	SCCI	SCCI
Cooperators	City SNCT	City SNCT	City SNCT	City SNCT
Funds	METI	METI	METI	SCCI
Subjects	Training for mechanical engineers	Training for leading engineers	Training for manufacturing successors	Engineering course of manufacturing leader seminar
Term	July to January	August to December	August to December	August to November
Number of seminar	15	16+1	16+1	14+2
Total time (h)	45	48+3	48+3	42+6
Recruit (N)	10	15	20	15
Trainee (N)	11	16	19	13
Corporation (N)	9	11	13	7
Satisfactions of Trainee (%)	40	80	90	—
Satisfactions of Superior (%)	50	100	100	—
Professors	5	4	7	3
Technical staffs	12	12	7	6
Lecturers of retire from corporations	7	9	8	7
Cooperation company	6	7	5	5

3.2 Development of QCD with FSE (FQCDSE)

New concept for Engineering Education System was developed, which was called "FQCDSE" evaluation method. It had been suggested by a member of the committee, and development and proof have been done in the project seminar by the committee.

The FQCDSE indicates "F" of Function, "Q" of Quality, "C" of Cost, "D" of Delivery, "S" of Sale & Service, "E" of Environment including Safety and Standard. "QCD" means traditional and popular engineering factor in the industries.

The world economy was grown and innovated in the 1990's by an economic engineering using the information and communication technology. Also "Globalization of economy and the culture" advanced rapidly after the fall of the Berlin Wall on November 10, 1989. Then it has brought the development of the emergent countries as called BRICs.

But then the cost priority principle based on only traditional QCD without FSE caused serious scandals and significant accidents in some corporations in the 2000's. In addition, too early economic growth caused environmental problems in the worldwide.

The committee has thought that Function and Service & Sale are very important as the considering factors of engineering ethics, Corporate Social Responsibility (CSR) and customer satisfactions.

"E" of Environment should consider for pollution degree. Moreover their regulations for environment and safety are addressed by international standards or directives as for IEC, ISO or RoHS. Therefore, "S" of Safety and "S" of Standard were defined in "E" of Environment, when "Environment" was used as wide sense meaning for engineering factor.

The conventional engineering, as for "Quality control engineering", "Maintenance management engineering", "Reliability engineering", "Management engineering", and "Production engineering" would be used often for a specific fabrication process, however the new concept would attempt analyzing by the same factors of FQCDSE for all engineering processes.

This QCD with FSE will lead a concept concerning the global engineering design that can be adapted to the changes.

4. Conclusion

After 2009, the developed unique Engineering Education Program has been executed by Suzuka chamber of commerce and industry and/or Suzuka city as an engineering course for the manufacturing leader seminar. Moreover, it was applied to the engineer education for the student of the Suzuka College of Technology too.

"FQCDSE" shows the engineering factors that the engineer should think about by the process of society/manufacturing regardless of the field or the occupational category. This concept is being edited as the textbook.

5. Acknowledgements

We appreciate sincerely for all staff and lecturer of Suzuka chamber of commerce and industry, Suzuka city, the relevant corporations and the Suzuka National College of Technology, who had a relation on this project.

We wish that the developed Engineering Education Program and textbook with the concept of FQCDSE were used and grown from now on.

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