STUDY ON MEASUREMENT OF EDUCATIONAL EVALUATION IN ADVANCED PROJECT MANAGEMENT SUBJECT

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Abstract

In order to guarantee the educational effect in practice educating which designates the society member as the object, it is indispensable to execute the education design which is based on educational technology method such as instructional design.

In this paper, important study item was calculated on the basis of the analysis result of the conceptual structure of PMBOK, the course program of project management subject was designed. In addition, measurement of the educational effect in project management subject is tried using with the questionnaire survey described with basis on important study item.

It is obtained that the looking back study with group debate is to be study method in order to raise the educational effect.

Key words : project management, educational evaluation, instructional design, educational technology

1. Introduction

Feature of project management education is to be the practical education which is based on practical science, and the adult education which target at the working people. The knowledge regarding modern project management was systematized by Project Management Institute. The result is published as the project management body of knowledge (PMBOK) guide book [1]. The class design of project management subject of Yamaguchi University is based on PMBOK.

Educational technology in the 1950's advanced in the United States as an academic system. It is purpose of educational technology to systematize the originality and ingenuity as education art which improves the educational effect and to support the education activity of educators. The range of educational technology has reached to all academic fields which relate to human science, management science and science and engineering etc. In Kirkpatrick's four-level model [2], Bloom's taxonomy of educational objectives [3], Gagne's Nine Events of Instruction [4] and so on, it is known as the result of educational technology. At early stage, as for educational technology, it developed infantile education, elementary education and secondary education as a main research object.

On the one hand, theoretical system of adult education was rearranged as the andragogy by Malcom S. Knowles [5], adult education was recognized as the theoretical system which differs from elementary education. But, adult education theory was not located as a fundamental theory for human resource development because general adults are dealt with the target of education. The new education methodology where it focused on the human resources as a learner, in the United States in the 1980's, was systematized [6]. That is instructional design. As for development of instructional design in order to assure the improvement of the educational effect, it is the new history in educational technology. Educational technology method was applied to also the teaching material development of project management education. The result was published as project manager competency development framework by PMI [7]. But, as for development example of the project management educational program on the basis of instructional design, still report is little.

One of the causes of that is management system continues to advance day by day. Actually, PMBOK has been revised every 4 years. Therefore, standardizations of education curriculum for project management and education evaluation method are not established yet.

In this paper, method of instructional design technique and educational technology is applied measurement of the educational effect in project management subject is tried.

2. Methodology

MOT graduate school of Yamaguchi University is the graduate school for the society member. At the Yamaguchi University, project management subject is opened as one of the basis subject in technical management education curriculum.

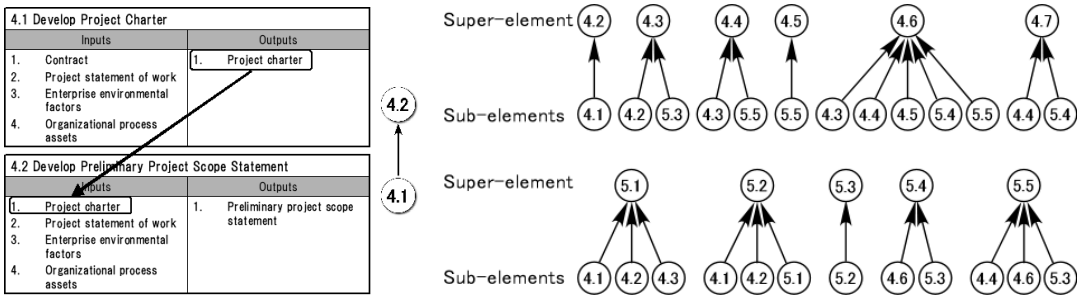
Number of student taking project management subject is 18 person (17 men, 1 women), and the average age is 42 year old.

The author decided the individual PM educational program, because standard curriculum of project management education is not published. The educational program designed on the basis of the analysis result of conceptual structure of PMBOK guide. Measurement of the educational effect was tried by doing the questionnaire survey regarding the study contents of subject. The answer person chooses the answer from three choices. Question was arranged a on the basis of the important study item in PM educational program.

2.1 Conceptual structure analysis of PMBOK

According to PMBOK guide book, 44 processes to manage the project are defined. INPUTS and the skill, the tool, and OUTPUTS of each process are arranged. There are many relations that an output becomes an input of another process. These relations form a complex network. The management process can be considered as a unit of study. The study sequence of the PM processes can be defined based on the management sequence of the process. For instance, “Project charter” which is the output of project management process 4.1“Develop Project Charter” is an input of PM process 4.2 “Develop Preliminary Project Scope Statement”. Then, a study sequence between the PM processes 4.1 and 4.2 can be described with study elements ***4.1*** and ***4.2*** marked by a circle as shown in Figure 1. Here, the study sequence is drawn schematically by using node and arrow corresponding to the study element and the study order.

Figure 1(b) shows study sequences in PM processes including in Project Management Integration Knowledge Area and in Project Scope Management Knowledge Area. Figure 2(a) shows a matrix based on the study sequences of Figure 1(b). Figure 2(b) shows the adjacency matrix corresponding to the Figure 2(a).



(a) (b)

Figure 1 (a) Correspondence of project management process and study sequence
(b) Study sequences in management processes including in Project Management Integration Knowledge Area and Project Scope Management Knowledge Area

Sub lerning element \ Super learning element	4.1	4.2	4.3	4.4	4.5	4.6	4.7	5.1	5.2	5.3	5.4	5.5
4.1		1						1	1			
4.2			1					1	1			
4.3				1		1		1				
4.4						1	1					1
4.5						1						
4.6											1	1
4.7												
5.1									1			
5.2										1		
5.3			1								1	1
5.4						1	1					
5.5				1	1	1						

(a)

$$\begin{pmatrix}
0&1&0&0&0&0&0&1&1&0&0&0\\
0&0&1&0&0&0&0&1&1&0&0&0\\
0&0&0&1&0&1&0&1&0&0&0&0\\
0&0&0&0&0&1&1&0&0&0&0&1\\
0&0&0&0&0&1&0&0&0&0&0&0\\
0&0&0&0&0&0&0&0&0&0&1&1\\
0&0&0&0&0&0&0&0&0&0&0&0\\
0&0&0&0&0&0&0&0&1&0&0&0\\
0&0&0&0&0&0&0&0&0&1&0&0\\
0&0&1&0&0&0&0&0&0&0&1&1\\
0&0&0&0&0&1&1&0&0&0&0&0\\
0&0&0&1&1&1&0&0&0&0&0&0
\end{pmatrix}$$

(b)

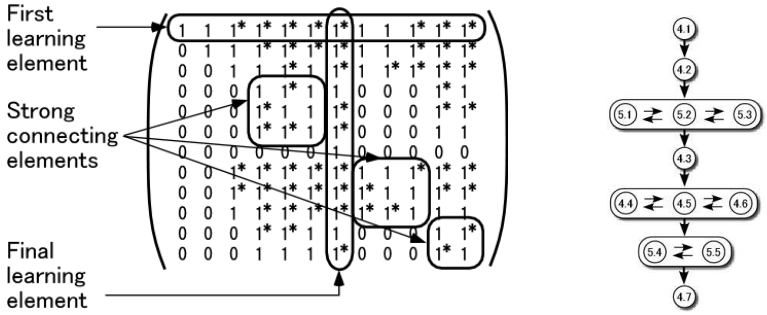
Figure 2 (a) Direct relations between subordinate and superior study elements
(b) Adjacency matrix corresponding to direct relations

The adjacency matrix shown in Figure 2(b) is marked by ***A***, and the unit matrix is marked by ***I***.

$$(A+I)^{k-1} \neq (A+I)^{k} = (A+I)^{k+1} = M \qquad (1)$$

It operates until the relational expression (1) consists, and a reachability matrix is obtained [7]. This operation is a Boolean product. Figure 3(a) shows the reachability matrix ***M*** corresponding to the adjacency matrix of Figure 2(b).

Matrix elements of ***M*** described by {***1***} show the immediate study relations between the study elements. Matrix elements {***1****} of ***M***, are not included in original matrix (***A+I***). These matrix elements {***1****} have appeared as a result of the operation of the expression (1). So that, the matrix element {***1****} indicates an indirect study relation between the study elements of the line and the row.



(a) (b)

Figure 3 (a) Reachability matrix **M** corresponding to the adjacency matrix
(b) Conceptual structure chart of study led by (a)

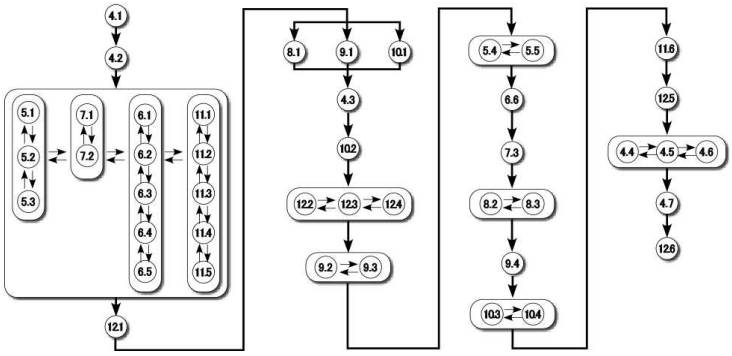


Figure 4 the study conceptual structure chart of PMBOK

From this yes arrival matrix, it can draw the conceptual structural chart of the study in the project integrated management knowledge area and the project scope management knowledge area (Figure 3). With the method above, the result of analyzing the conceptual structural chart of the whole PMBOK is shown in Figure 4.

2.2 Course program for project management subject

In Figure 5, order of study every of framework which is calculated alongside the conceptual structural chart of PMBOK is shown. In the respective knowledge area, the mark is attached to the smallest number. The course program of project management subject was decided on the basis of the order of the number which is marked in Fig.5.

Knowledge Area Processes	Initiating Process Group	Planning Process Group	Executing Process Group	Monitoring & Controlling Process Group	Closing Process Group
Project Management Integration	1	10	15	22	23
Project Scope Management		2		16	
Project Time Management		3		17	
Project Cost Management		4		18	
Project Quality Management		5	14	14	
Project Human Resource Management		8	13	19	
Project Communications Management		9	12	12	
Project Risk Management		6		20	
Project Procurement Management		7	11	21	24

Figure 5 Order of studying the framework based on the study conceptual structure chart

2.3 Questionnaire survey

Questionnaire survey executed at start and end stages of class of project management subject. In addition, after the questionnaire survey when the ending, dividing the classroom into the group, it debated the group answer. Numbers of people of the group were 3 or 4.

Matrix analysis it did in order to calculate the index for nine knowledge areas from the questionnaire of 25 questions. The matrix which from the answer of 25 questions is converted to scores of nine indexes is shown in Figure 6. These scores correspond to nine knowledge areas. A Range of the numerical value of the score is from 0 to 10. The understanding level becomes higher as the index approaches the number “10”.

	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18	Q19	Q20	Q21	Q22	Q23	Q24	Q25
Project Management Common	◎	◎	○	○		○	◎					○											○		◎
Project Management Integlation			○	○	○				○		○		◎	○		○				○		○	○	◎	
Project Scope Management	○		○	○			○	◎				◎					○		◎	◎			◎	○	
Project Time Management		○						○	◎	◎				○	○				○		○	◎		○	○
Project Cost Management		○			○		○	○	○					○	◎	◎		○	○		○			○	○
Project Quality Management		○		○			○	○			◎		○				◎		○					○	
Project Human Resource Management					◎	◎		△	○				○		○			○			○		○	○	○
Project Communications Management			◎	◎		○					○	○	○	○					○	○		○		○	○
Project Risk Management				○		○		△		○	○			◎	△		○		○		◎			○	
Project Procurment Management				△			○	○		△	○		○	○		○		◎	○	○			○	○	

Figure 6 Correspondence matrix between 25 questions and nine management knowledge areas

3. Results and Discussion

In Figure 7, it shows the analysis result of questionnaire survey as the radar chart. The analysis result of the private answer which does before the class is shown with solid diamond. It is observed that understanding level of project management before the beginning class is equally 40% for nine knowledge areas.

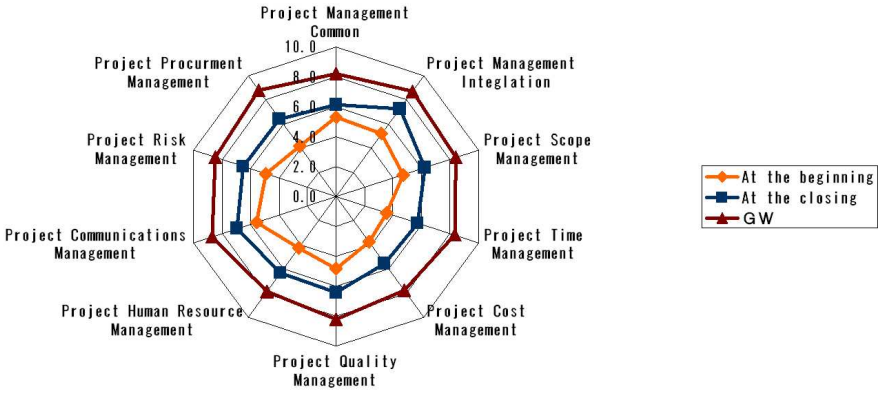


Figure 7 Radar charts that show results of analyzing answers of questionnaire

It shows the average score by self assessment after the class with the square in figure 7. By comparison with the chart before the class, all of nine management knowledge areas are improved almost equally. Average improvement ratio of scores was 17.4%. In questionnaire survey before the class, the grade result or model answer example of the findings from are not fed back.

Because of that, experience of questionnaire survey before the teaching, is thought that influence has not been exerted on investigation after the business. This result suggests that individual degree of understanding improves as a result of the study in project management learning.

Then, the group answer with group debate is shown with the solid triangle. It is observed that all of scores become large by comparison with the private answer. Average improvement ratio was 20.0%. Compilation of group reply is thought the thing which is suitable to the looking back study with group debate.

The decision making by the group is done by the joint ownership of knowledge, the support of discussion and the integration of private decision. Decision of the group decreases acknowledgment load and acknowledgment bias. This result suggested that understanding level has become high by the multiplier action between the looking back study effect and the group decision making effect.

It is considered that the looking back study with group debate is the study method of being effective in order to raise the educational effect in the practice education for human resource development.

4. Conclusion

In this paper, it is reported that a result of trying the measurement of the educational effect in the project management subject in Yamaguchi university. It decided the course program of project management subject, on the basis of the conceptual structure analysis of PMBOK. It executed the measurement of the educational effect in project management subject, with the questionnaire survey which is formed with question of 25 questions. It digitalized the questionnaire survey result, as the index for nine management knowledge areas with matrix analysis. As a result, average score after the class was improved with 17.4% by comparison before the class. Furthermore, average score improved with the compilation of the group answer with group debate.

It is considered that the looking back study with group debate is the study method of being effective in order to raise the educational effect in the practice education for human resource development.

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