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The Development of a Trial Curriculum Classification and Coding System Using Group Technology

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ABSTRACT

The rapid development of science & technology and the globalization of society have accelerated the fractionation and specialization of academic disciplines. Accordingly, Korean colleges and universities are continually dropping antiquated courses to make room for new courses that better meet societal demands. With emphasis placed on providing students with a broader range of choices in terms of course selection, compulsory courses have given way to elective courses. On average, 4 year institutions of higher learning in Korea currently offer somewhere in the neighborhood of 1,000 different courses yearly. The classification of an ever growing list of courses offered and the practical use of such data would not be possible without the aid of computers. For example, if we were able to show the pre/post requisite relationship among various courses as well as the commonalities in substance among courses, such data generated regarding the interrelationship of different courses would undoubtedly greatly benefit the students, as well as the professors, during course registration. Furthermore, the GT system's relatively simple approach to course classification and coding will obviate the need for the development of a more complicated keyword based search engine, and hopefully contribute to the standardization of the course coding scheme in the future.. Therefore, as a sample case project, this study will use GT to classify and code all courses offered at the College of Engineering of K University, thereby developing a system that will facilitate the scanning of relevant courses.

Key words: Curriculum, Group Technology, Classification and Coding, pre/post requisite relationship

I. Introduction

The rapid development of science & technology and the globalization of society have accelerated the fractionation and specialization of academic disciplines. Accordingly, Korean colleges and universities are continually dropping antiquated courses to make room for new courses that better meet societal demands. In the current knowledge based society, there is an ever growing demand for competent workers who are able to converge and apply knowledge of a wide range of related areas of expertise, rather than those merely steeped in one specialized area. With emphasis placed on providing students with a broader range of choices in terms of course selection, compulsory courses have given way to elective courses. On average, 4 year institutions in Korea currently offer somewhere in the neighborhood of 1,000 different courses yearly.

However, the curriculum coding system currently employed in most universities(while allowing for the differentiation of various fields of study within the major field and general education curriculum) make little or no allowance for the interrelationship among courses offered by different colleges or majors within those colleges. Consequently, the students' search for just the right course is an unnecessarily cumbersome task, one that(as is becoming more and more evident) cannot be accomplished without the aid of a computer

On this backdrop, this study attempts to employ GT(Group Technology), an engineering technique previously used in manufacturing to cut production costs by identifying commonalities in product design and production, in the establishment of a new, more effective curriculum coding system. The gist of this study is to propose a method of curriculum categorization and coding that will allow the search of similar courses within the curriculum corpus using the course digit code system. If we were able to

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provide a tree diagram that clearly outlines the pre/post requisite relationship among various courses as well as commonalities in substance among courses, such data generated regarding the interrelationship of different courses would undoubtedly greatly benefit the students, as well as the professors, during course registration.

Therefore, as a sample case project, this study will use GT to classify and code all courses offered at the College of Engineering of K University, thereby developing a system that will facilitate the scanning of relevant courses. Details of the approach are as follows:

(1) GT Classification of the Curriculum and Establishment of a Coding System

(2) Establishment of a Curriculum GT Database

(3) Development of a Search Engine

(4) Generating Results(courses listed by topic, pre/post requisite course list, sorting according to major, etc.)

II. Research Trends in Curriculum Coding

In most Korean universities across the nation, categorization of course offered is largely limited to attributing a series of numbers according to major fields or providing a separate chart outlining pre/post requisite requirements. While such a system may be useful in distinguishing major courses and general education courses, it does not provide information regarding the interrelationship among courses across various major fields. Consequently, it offers little help for students wishing to enroll in comparable courses outside their immediate major field.

Benchmarking other universities abroad would be helpful in this regard. According to Yoshida[2] D University in Japan was the first in the world to develop and utilize the MIMA(Mining Information for Management and Acquisition) Search Engine for the fields of science and engineering. This practical and comprehensive system enables students to type in topics of interest and be provided with not only a list of relevant courses but also information on pertinent journal articles and technical materials from various media sources. The significance of the system is that it is the first successful attempt to utilize the powerful search capabilities of the MIMA search engine to systematize the listing of courses. By automatically standardizing key words inputted by the users, the system is able to semantically draw connections among various courses according to similarities. [1, 3]

However, one of the drawbacks of the system is that although it is useful in determining the similarities among courses, it is structurally unsuited for replacing the existing curriculum coding system altogether. This study, in effect, takes the next logical step in utilizing GT to provide a practical means to categorize and code courses according to commonalities. The GT was first introduced by Mitrofanov in Russia in the 1950s and has since been put to wide practical application in the manufacture industry. It was an innovative engineering technique designed to booster economies of size through systematically group together parts similar in shape, size, materials, and manufacturing process. In this study, we have applied this technique to categorizing all courses according to commonalities, thereby achieving systematical grouping of courses via factoring in the properties of the course syllabi. The practical benefits of such a system are that all courses sharing contexture similarities are now grouped together under a similar digit code.

With the implementation of the GT based curriculum coding system, in favor of the existing system, students will be able to better grasp the interrelationship(e.g. commonalities, pre/post requisites, etc.) of courses offered, and also have access to detailed information(e.g. name of instructor, contact information, college and major of the course, prescribed class level, etc.) that will greatly enhance their chances of making the right choice during course registration.

III. Establishment of the Curriculum Categorization & Coding System Using GT

The trial run of categorization and coding was conducted on the approximately 250 courses currently offered at the College of Engineering of K University. To begin with, a comparative analysis of all the courses offered by the individual departments of the colleges was conducted, and courses of similar nature were grouped and allotted codes

using the GT System. As shown in 'Table 1', the course categorization and coding system employs a total of 14 digit hybrid coding scheme, which entails a hierarchical model based mono code up to the first five digits and a serial model based poly code for the remaining 9 digits.

1) Primary Division: Each discipline is allotted a single digit numerical code. Ex) Science/Technology 5

2) Secondary Division: Each major is allotted a two digit numerical code. Ex) Physics/Chemistry 15

3) Tertiary Division: Each course of each department is allotted a separate 2 digit code. Ex) Health/Hygiene 10

4) Configuration: The configuration of the courses is allotted a single digit numerical code. Ex) Fundamentals 1, Compulsory 3, Advanced 5, Design/Lab/Project(7 - Basic, 8 - Advanced)

5) Major Course Number: After listing the majors in alphabetical order and then the courses for each major in alphabetical order, a 4 digit numerical code was assigned for each course. Ex) General Architectural Structure 3601

6) Faculty Code: The Instructors, once listed in alphabetical order, were assigned a 3 digit numerical code. Ex) Kil-Dong Hong 301

7) Level: The relevant grade level was duly indicated with a single digit numerical code. Ex) Grade Level 1, Grade Level 2, etc.

Fig. 1 outlines the prescribed method by which the Curriculum Classification & Coding System may be utilized. In the initial screen, the user is provided with a choice of two search methods. If the user chooses the search method based on the course code, the system conducts a search of the curriculum database and lists all courses that share the same first 5 numerical digits, additionally noting pre/post requisite relationships among the courses. The fact that certain courses share the same first 5 numerical digits(indicating primary, secondary, and tertiary divisions) is a clear indication of the similarities among the courses in question. The configuration of the General courses are indicated either as 'Fundamentals,' 'Compulsory', or 'Advanced', whereas Design/Lab/Project courses are indicated either as 'Basic' or 'Advanced'. When the user clicks a particular course within the list, a detailed course description appears, which includes contact information for the instructor (allowing a more personal Q&A interchange between instructor and the prospective student).[4, 5]

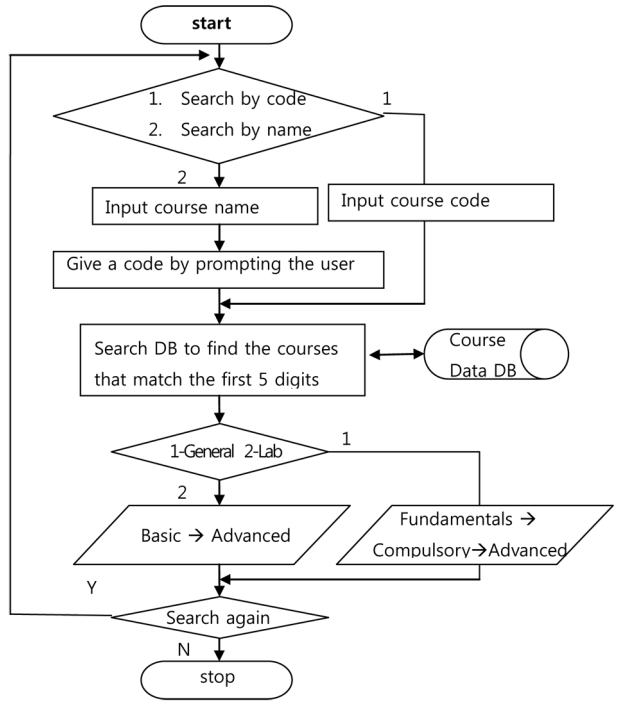

Fig. 1 The flowchart of CC&CS

Alternatively the user may choose to input the course title, which sets in motion the following process: Table 2 provides an example of the first 6 numerical digits of courses pertaining to a primary division of 'Science/ Technology' and a secondary division of 'Computer'. The primary division entails all courses currently offered at K University divided into 8 areas of study. The secondary and tertiary divisions also rely on close examination of the nature of the courses in each primary division.

As shown in Table 2, the user is required to select appropriate menus for each level of division(i.e., primary, secondary, and tertiary). As a result, a temporary 5 numerical

Table 1 14 digits coding scheme

Course Title	Primary Division (discipline)	Secondary Division (major)	Tertiary Division (major courses)	Configuration (level/type)	Major Course Number	Faculty Code	Grade Level
	0	00	00	0	0000	000	0

Table 2 A sample part of the curriculum classification and coding scheme

Division code	Primary division		Secondary division		Tertiary division		Configuration	
Detailed menu	Religion	1						
	Foreign Language	2						
	Humanity/Culture	3						
	Economy/Society	4						
	Science/technology	5	Math/Statistics Physics/Chemistry Biology/Earth Computer	10 15 20 25	 Language/compiler Database Processor Internet/security Graphics AI OS Others	 10 20 30 40 50 60 70 90	Fundamentals General Advanced Design/lab/proj Basic Advanced	1 3 5 7 8
	Arts/Physical Ed.	6						
	Career Planning/ Volunteer Work	7						
	Convergence/hybrid	9						

digit code will automatically be provided, with which the system can then proceed to conduct a search of the curriculum database for similar courses. The subsequent procedures now coincide with the first search method.

IV. Conclusions and Anticipated Effects

This study describes the establishment of a computer based curriculum categorization & coding system using GT applied to the approximately 250 courses that comprise the curriculum corpus of the College of Engineering of K University. Although the main purview of this study was limited to engineering-oriented courses, the system can be equally effectively applied to courses offered in other areas of study. The system is specifically designed as an aid for students during course registration. Since the system makes it possible for students to easily search, examine, and select courses offered in various major fields, they are able to formulate their own learning goals through self-orientation. For graduate students and faculty members, the system provides a support system for the identification and development of new convergent areas of research.

The anticipated effects of the system are as follows:

1) Convenient course registration: obviates reliance on cumbersome-to-use course registration catalogue.

2) Indication of pre/post requisites: easy identification of relationships among various courses.

3) Detailed course descriptions: provides all the fundamental information necessary for students to make educated course choices.

4) Contribution to the standardization of curriculum coding: laying the foundation for the standardization of curriculum coding more suited for the convergence era.

5) Self-Orientation: enabling each student to draw a personal roadmap of courses to take during his/her college careers.

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