Document Representation Techniques Observed in Students' Papers on Laboratory Classes after Discontinuing of Computer Literacy Subject

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学生の実習レポートにみるリテラシー科目消失後の 文書表現技術の状況

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In order to assess the influence of discontinuing computer literacy subject, according to reconstitution of education programs from college (3-year program) to university (4-year program), document representation techniques of the first batch students have been investigated. The survey was conducted based on the questionnaire and submitted papers on chemistry laboratory class. Regarding the usage of Microsoft *Word*, a majority of students knew the techniques about the paragraph formatting such as the indention and the tab setting. Contrarily, the item for the whole document layout, that is spacing setup and arrangement of the figure in a text area, had low awareness. Additionally, in the actually submitted papers, many examples were seen inadequate for the representations concerning the entire document structure like relationship between heading level and paragraph. On the other hand, in the operation of Microsoft *Excel*, frequently employed in cooperation with *Word*, two thirds of students did not know even the presence of basic techniques guided in the College education so far.

These results suggest that literacy education focusing on representation techniques and guide to the data processing techniques employing *Excel* are still needed for freshmen considering that those techniques will be essential for processing graduation thesis in the future.

Introduction

In 2004, College of Medical Sciences Tohoku University (3-year program) was reorganized to School of Health Sciences, and the first batch of the 4-year program students was accepted. According to this, education program was fundamentally changed especially in

the basic natural science subjects and the liberal arts. Conventionally, Department of General Education had taken charge of these subjects in the College, in cooperation with specialty departments (Nursing, Radiological Technology, Medical Technology, and Maternity Nursing) and independently from those of Tohoku University. Then it was consolidated to Subjects Common across Campus (*Zengaku-kyouiku Kamoku*).

Among them, concerning the subject on information science, computer literacy training was discontinued. In the College period, basic information science subject consisted of network technologies as well as practical literacy training with integrated software, Microsoft *Office*. That is, usage of *Word* for the processing documents and *Excel* for experimental data processing and graph drawing, on Windows OS[1]. These contents were in consideration to bearing papers on lecture and laboratory classes, and eventually graduation thesis. Each specialty department successively gave education on information science in relation to national examinations for medical specialists[2,3]. To the contrary, in Common across Campus education, it has been changed to the contents based on C language programming with the UNIX OS[4].

In the fall of 2005, the first batch students were promoted to the fourth semester. The specialty subjects got into stride, and intramural practice (laboratory class) concurrently started. The author has so far investigated the utilization circumstances of personal computer (PC) in students' papers on chemistry laboratory class[5,6]. In spite of having lost the literacy training, among the students in School of Health Sciences, the ratio of papers processed by PC has exceeded that submitted in the College period. The former investigations were based on rather quantitative view, and there was no qualitative assessment, such as document format and appearance (readability).

In this study, the author has investigated their representation techniques based on the questionnaire and papers submitted in chemistry laboratory class. The purposes are to know the impact of the disappearance of the literacy subject, and to grasp the present condition of the first batch students' literacy ability.

Methods

Students and Class Subject: The students were 33 juniors in 2006 (Class of 2008) of the Department of Medical Technology, the first batch of graduates in School of Health Sciences, Tohoku University. Those students had finished the class of basic information science in Subjects Common across Campus. The laboratory class subject was *Clinical Chemistry* including urinalysis. This consisted of 10 themes, and the students had to hand in their papers on each theme. The deadline was set depending on their contents, approximately one week after finish of the theme.

Knowledge and Usage of the Representation Techniques: A questionnaire survey was performed at the end of the laboratory course period. The students were asked whether they knew about the several representation techniques of *Word*, concerning the paragraph and document format. They were given four choices as answer; 1) one has used the technique, 2) one knows how to do it, but has never tried, 3) one knows the expression, but does not know how to do it, and 4) one does not realize that *Word* has such function. In parallel, the sources of information that they had acquired the knowledge were also asked.

In the matter of *Excel* techniques, similar questions were asked about the data input,

processing, calculation and graph drawing. For comparison, the same investigation was also conducted for the second batch students (Class of 2009, 37 persons), by whom the laboratory class was not yet started at the time of this study.

Analysis of submitted papers : We reviewed all the papers submitted, and evaluated how much the students can make good use of *Word* representation techniques. Their usage of each techniques was classified into 5 ranks; 1) almost well-used, 2) partially not used, 3) used to around a half-extent, 4) partially used, 5) not used (or ignored the format). We evaluated their ability to use standard and hanging indent, and tab settings as paragraph format. In the matter of document format, margin between the document components such as chapters and paragraphs (before the heading), expression of headings, left margin of the paragraph depending on a heading and a paragraph level (chapter, section etc.) were assessed.

Results and Discussion

In respect of the *Word* techniques, more than a half of the students knew how to use standard indention and tab settings, according to the questionnaire survey. Setting of super- and subscript, often used in scientific description, and page setup (document margin) were also known by nearly half of the informants. On the other hand, there were few those knew the methods of hanging indent and decimal tab setting. The items about "conspicuousness" of the whole document, such as a line spacing setup, method for selection of a figure layout in a text area, had still lower degree of cognition (Fig. 1).

Regarding the sources of information about the known techniques, one of the important source was the instruction given by the peer or the teacher (24%), followed by the information on the Web (20%) and a software manual (16%). The students learned those techniques in university classes (not always in
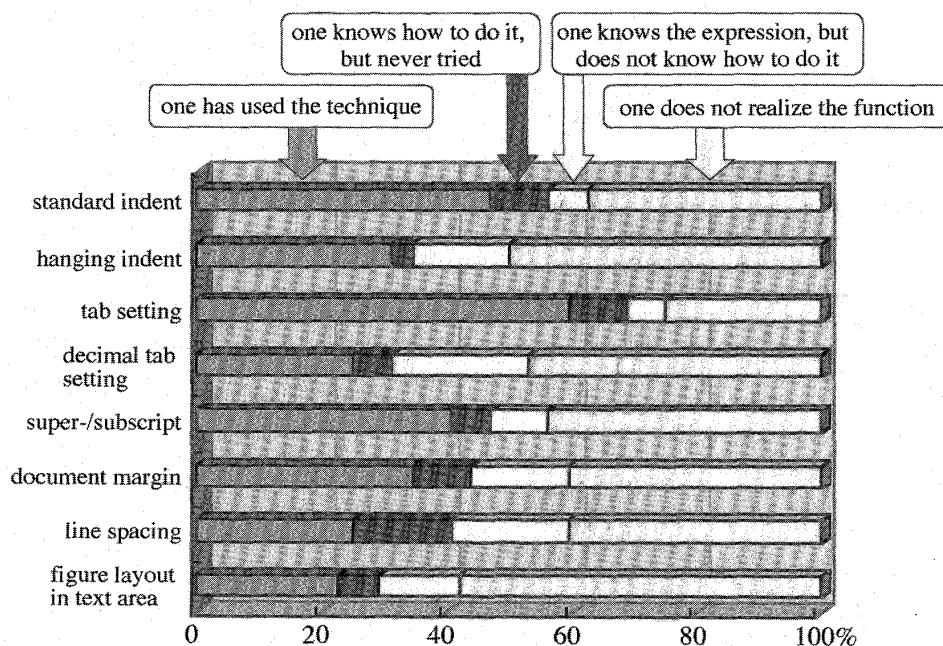

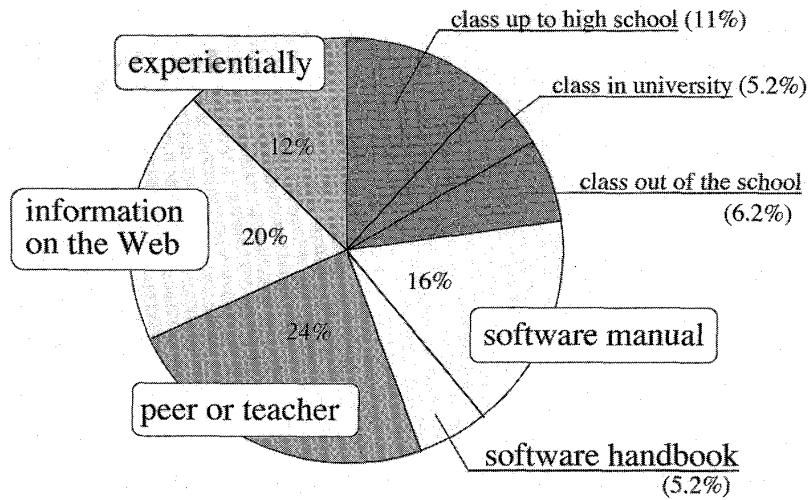**Figure 1.** Students' knowledge of representation techniques of *Word*.

Figure 2. Sources of information that students had acquired the representation techniques of *Word*.
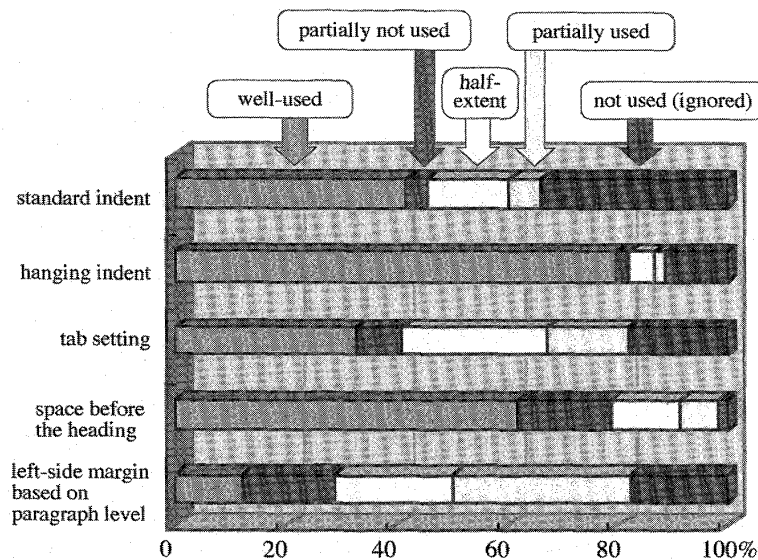

Figure 3. Students' ability in usage of representation techniques observed in the submitted papers.

information science) were few (5.2%), and less than those had learnt in the class even up to the high school (11%). Furthermore, those who have experientially acquired the techniques reached up to 12% (Fig. 2). What has to be noticed is that the source of knowledge is nearly constant to every individual, and not depending on the operation technique.

Observing the actually submitted papers, students' knowledge and operating skill seemed to be well reflected in the document appearance. Left-side margin of the paragraph, and spacing between the paragraphs and/or chapters were missing compatibility with their heading levels, resulting in unclearness of the relationship between the paragraphs (Fig. 3). This suggests that the students have poor representation technique relating to the appearance of the whole document. Contrary to the questionnaire results, hanging indention technique

appeared to be well used in nearly 80 percent of the papers. However, it should be thought that this result was rather caused by the "automatic itemization" function as the default setting of *Word*. In fact, according to the questionnaire survey, a majority of the students did not know the manual (non-automatic) itemization method using hanging indent in combination with decimal tab. It can be the evidence that many cases were observed in which an unnatural interval of a number and a text were seen among the papers. Therefore, we may say that the students use this automatic function without being conscious of document appearance.

The usage of a spreadsheet program *Excel*, is also an important subject in computer literacy training. In the scientific field, it is frequently employed for processing experimental data and subsequently drawing a graph, which will be a valuable component of the document. Thus, we made great concern with the students' ability in usage of this software. In contrast with techniques in *Word*, their operation ability in *Excel*, were seriously poor. Two thirds of

informants did not know even the existence of the basic technology such as auto-filling and data sorting (Fig. 4). Those techniques had been thoroughly guided in the College literacy education so far.

Furthermore, we also investigated their knowledge regarding the regression analysis with least square method for drawing a curve, displaying equation and correction coefficients. This technique is essential for data processing in the laboratory class of clinical chemistry. As shown in Figure 5, almost all (97%) the first batch students knew the method. With respect to the source of knowledge, 43% of them had learned the technique from a peer or a teacher, followed by those learned at the class in university (28%). However, the latter probably does not mean the class of information science, but other classes accompanied by the work with correlation analysis so that the students had got the knowledge forced by the necessity.

We can easily assume that the techniques can be experientially learned during experimental data processing in this laboratory class. Thus, the similar survey was conducted with
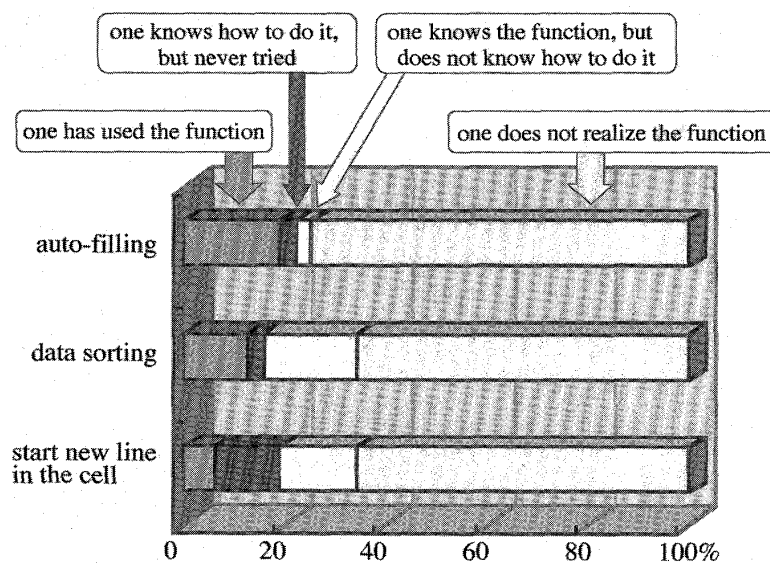

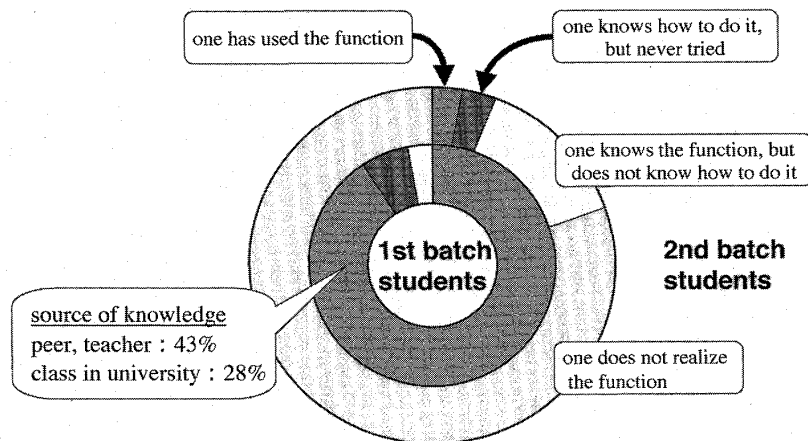**Figure 4.** Students' knowledge of operation techniques of *Excel*.

Figure 5. Knowledge of techniques for regression analysis using *Excel*. Comparison between the first batch (inside) and second batch students (outside).

the second batch students to compare before and after getting started the laboratory class. Contrary to the first batch, almost all the second batch students, by whom laboratory class has not started, did not know the method even the existence (Fig. 5).

We consider that students of current generation are used to PC operation with enough experience from their elementary school days and have skill to some extent. Contrarily, education in schools might lack systematic lesson for literacy considering preparation of the documents. Most of the students have learnt the operation of each application such as *Word*, by themselves with try and error, while they have less chance to learn representation techniques. Moreover, *Excel* techniques can be hardly got acquired experientially, without recognition of the presence of functions. Thus practical training of data processing is also needed. In the former study, it became obvious that the students have strong motive to get skilled and prepare the papers completely with PC[6]. As some students appealed, a lesson to prepare whole documents[7] is needed. The education of information processing in the college may have to shift the stress from "how to operate" to "how to express", in other words, appearance, logic and rhetoric.

Conclusion

Although the students can mostly operate the word processing software, they cannot make good use of their functions without being conscious of document appearance. Furthermore, they do not recognize what they can do with a spreadsheet program. The results in this study suggest that literacy education focusing on representation techniques and guide to the data processing techniques employing *Excel* are still needed for freshmen considering that those techniques will be essential for processing graduation thesis in the future.

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