Effectiveness of Subjective Evaluation of Basic Computer Literacy at a University in Japan

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Abstract: We conducted a readiness survey on information technology education for students who matriculated in a university in 2006 and 2007. Related researches state that there is no relationship between subjective and objective evaluations; however, in 2006, we conducted only a subjective evaluation, using questionnaires, to determine the students′ levels of readiness. In 2007, we surveyed the two methods of evaluation to clarify the relationship between them. Consequently, we found a weak correlation between the methods. Moreover, the total points on the problems in the objective test, which showed a high discrimination, tended to have a stronger correlation with the subjective evaluation than the points on the problems that showed a low discrimination. Therefore, subjective evaluation is neither unreliable nor invalid. It is essential to consider the questionnaire items and problems and discuss the learning contents and teaching methods, based on the results of the subjective evaluation.

Introduction

We conduct a compulsory course termed Information Literacy Practice 1 in information technology education for first grade students. In April 2006, students who first learned the subject of information in high school matriculated in various universities in Japan. In the same year, we intended to clarify students' volition, computer literacy, etc., based on a readiness survey of the students who matriculated in a university and to discuss the future of information technology education. We conducted a questionnaire survey wherein the students primarily provided a subjective evaluation of their basic computer literacy. The following is an example of an item from the questionnaire.

Which of the following features of MS Word can you use? 1. Bold, Italic, Underline, etc; 2. Items; 3. Tables; 4. Styles; 5. Pasting an image; 6. Drawing a picture; 7. Table of contents

The readiness survey revealed that the students were aware that their basic computer literacy skills were poor (Nagai 2006). However, according to related research, such a subjective evaluation cannot measure learners' performance accurately because there is no correlation between subjective and objective evaluations (Yokouchi et al. 2006). If this finding is indeed accurate, and the subjective evaluation method is deemed pointless, we would lose out on the benefits of subjective evaluation methods, which are as follows: (a) they are easy to conduct, (b) they can be implemented quickly, (c) and they place little burden on the students. Moreover, this would have major implications in Japan because such self-evaluations are commonly used in classrooms. Therefore, in 2007, we developed and conducted a new readiness survey, which involved the addition of an objective test to the subjective questionnaire.

Objectives

To clarify the relationship between subjective and objective evaluations and the effectiveness of the former

Methods

We conducted a readiness survey consisting of subjective questionnaires and an objective test.

Readiness survey

Target students: All first degree students at Tokyo Metropolitan University

Number of students: 1598 (98.2%)

Term: Spring 2007

Subjective questionnaire

The categories of the questionnaire items were as follows: understanding of IT (information technology) terms, experience in OS (operation system), IT skills, word processor skills, spreadsheet skills, presentation software skills, database skills, and programming skills.

Objective test

The objective test consisted of 10 problems belonging to the following categories: understanding of information science (3 problems), understanding of information ethics (1 problem), word processor skills (2 problems), spreadsheet skills (2 problems), presentation software skills (1 problem), and programming skills (1 problem). We used IRT (item response theory) as the methodology of analysis of the objective test. According to Hayashi (2005), this model is superior to classical test theory in analyzing objective tests because it enables one to (1) evaluate performances on the same scale even if the test sets and populations are different, (2) establish theoretical reasons to equate different tests, (3) accurately decide whether a candidate has passed an exam, and (4) develop tests that have the desired level of difficulty and discrimination. Therefore, we can objectively obtain the individual performance achievement on an absolute scale.

Results and Discussion

Table 1 shows the number of items, according to category, for which 50% or more students answered that they understood IT terms and possessed IT, application software, and programming skills.

IT Terms	IT Skills	Word Processor	Spreadsheets	Presentation	Data Base	Programming	Total
5/10	3/8	4/7	1/8	0/8	0/4	0/9	13/54

Table 1: The number of items for which 50% or more students answered that they possessed the required skills

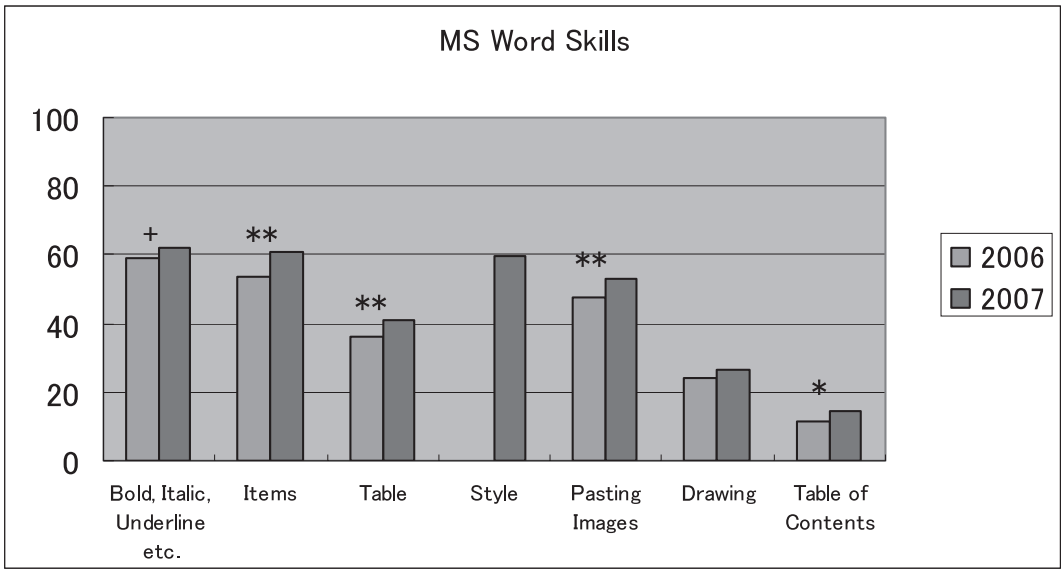

Figure 1: MS Word Skills

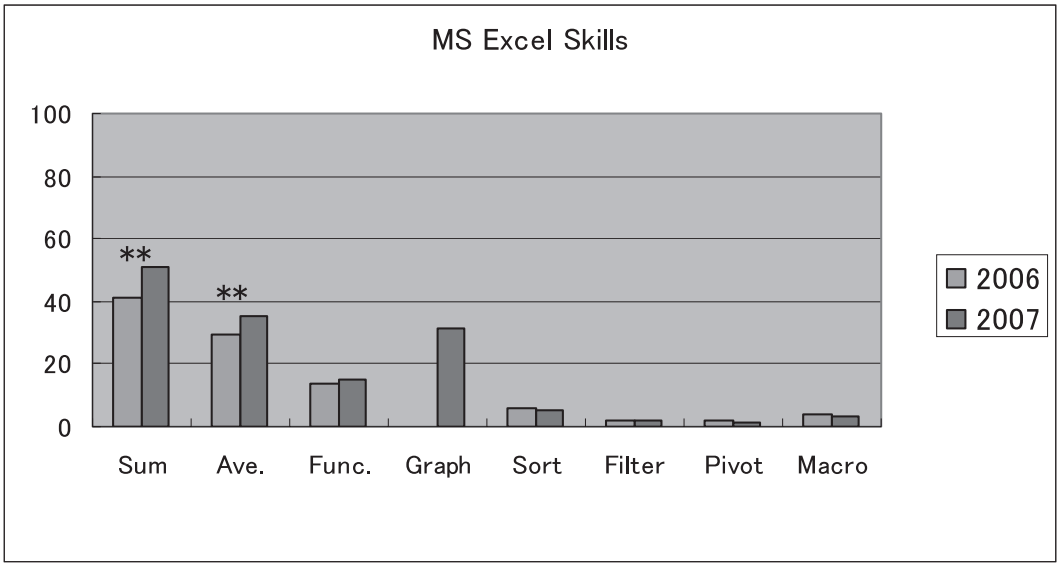

Figure 2: MS Excel Skills

According to Tab. 1, the ratio of students who can use "Word processors" is high compared to those who can use other application software. Moreover, 50% or more students answered that they could perform easy processing tasks involving the use of "Bold, Italic, Underline, etc."; "Items"; and "Pasting Images." However, they could not perform difficult and unfamiliar Word processing tasks such as using the "Drawing" and "Table of contents" options (Fig. 1). Moreover, we found that students were less familiar with other application software because their acquisition rates with regard to these software did not exceed 50%, except in the case of "Sum" in MS Excel (Fig. 2).

Consequently, a key feature of the students' understanding of their literacy was that their awareness of being able to use information and computers was little decline; on the contrary, the scores on items related to easy knowledge and skills improved significantly with each successive year (**p < .01, *p < .05, +p < .1). Although the students' improvement was evident, the items for which the acquisition rates exceeded 50% numbered only 13 out of 54. That is, students' awareness that they possessed basic computer literacy was low in this 2-year period.

Next, to substantiate the effectiveness of subjective evaluation, we will discuss the results of the objective test held in 2007, and clarify the relationship between the two evaluation methods. We applied IRT to analyze the objective test (Tab. 2).

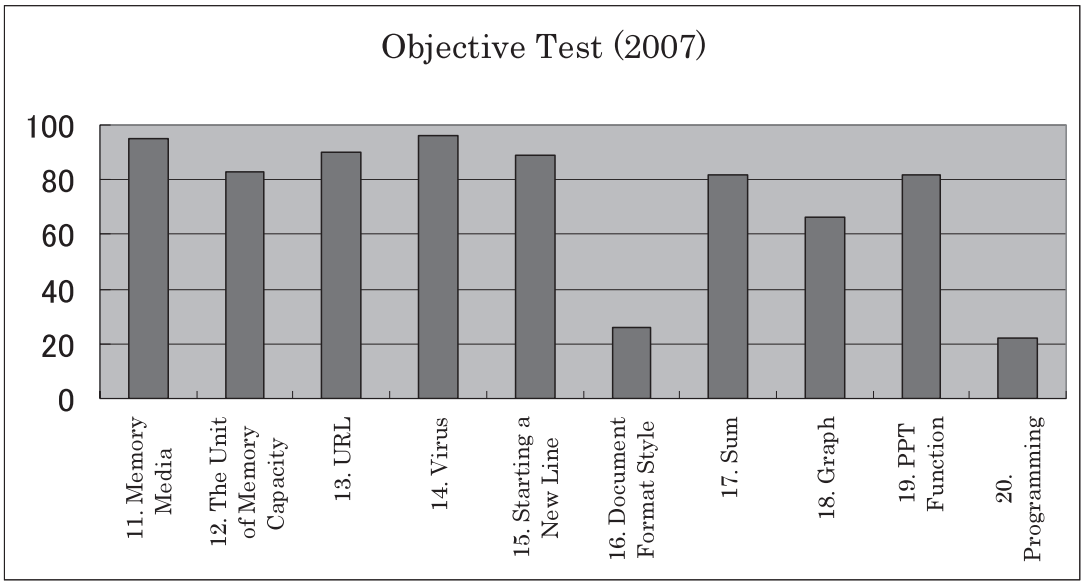

Figure 3: Objective Test (2007)

Fig. 3 indicates the passing rates on this test. The rates were generally high, and this is substantiated by the minus points that were obtained with regard to the difficulty level of many items (7/10), which is a parameter of IRT.

Moreover, this was different from the subjective evaluation in that many of the problems were easy. Further, it is evident that 6 problems (Problems 3, 4, 5, 7, 8, and 9) were appropriate, whereas 4 problems (Problems 1, 2, 6, and 10), for which the discrimination was a < .50 or for which the difficulty was 4.00 < |b| should have been excluded (Roznowski 1989). These 6 problems could sensitively discriminate between students who had a low level of literacy and those who could not solve the problems because of their low level of difficulty.

Further, a correlation between the total points on the subjective questionnaire and objective test is 0.249**. Due to the weak correlation, we cannot draw a definite conclusion about the reliability and validity of the subjective evaluation only from this result.

No.	Slope (discrimination)	Location (difficulty)	
Problem 1	0.1	0.17215	Discrimination = low
Problem 2	0.45883	–2.26047	Discrimination = low
Problem 3	0.54925	–2.69037	Discrimination = high
Problem 4	1.3742	–2.27255	Discrimination = high
Problem 5	0.71307	–2.11332	Discrimination = high
Problem 6	0.14842	4.11726	Discrimination = low, difficulty = difficult
Problem 7	0.75659	–1.49741	Discrimination = high
Problem 8	0.93184	–0.60918	Discrimination = high
Problem 9	0.82089	–1.40239	Discrimination = high
Problem 10	0.32904	2.39315	Discrimination = low

Table 2: The parameters of IRT

Objective / Subjective	High discrimination (6 problems)	Theta (ability parameter)	Total points on objective test	Low discrimination (4 problems)
Sum of points on questionnaire	0.275**	0.267**	0.249**	0.108**

Table 3: Types of points on the objective test and the changes in correlation coefficients

According to Tab. 3, it appears that the correlation coefficients are affected by the discrimination of the problems of the objective test. The correlations have a tendency to become strong when the discrimination is high. This indicates that a subjective evaluation is not always unreliable and invalid because the correlations change depending on whether or not the objective test is appropriate. Moreover, although our results indicate that the correlation is weak, it is clear that the students, to say the least, do not have much confidence with regard to their basic computer literacy. Therefore, a subjective evaluation by students is very important and a discussion of the learning contents and teaching methods based on the evaluation results is essential.

In conclusion, we argue that subjective evaluation is effective and useful in the field of information technology education because the degree of students' confidence is evident and, to some extent, so is their performance. Further, such methods have benefits such as being quick and easy to conduct and placing little burden on students.

References

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