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Analysis of the Degree to which ICT use by College Students in Departments of Radiology has on their Learning

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Abstract

Background/Objectives: As ICT has become more popular in the information society, radiology students have been increasing their use of IT devices in their studies. The purpose of this study was to analyze how much ICT use has been helping radiology students in Korea. **Methods/Statistical Analysis:** To accomplish the purpose of this study, a total of 650 college sophomores, juniors and seniors majoring in radiology were recruited through stratified sampling. The difference in awareness of the helpfulness of ICT use to their studies was then analyzed using one-way ANOVA (F-test) and χ^2, etc. **Findings:** The results showed that those students who are using ICT well received more benefit in class preparation, class activities and evaluation. In particular, ICT use proved to be helpful in improving their overall academic abilities. Among the range of class materials available, it was found that students preferred videos the most, followed by materials comprised of images and descriptions. **Application/Improvements:** There was also found a statistically significant difference in their preference depending on ICT use. It is necessary to help ensure that students can take advantage of a lot of ICT for their study.

Keywords: F-test, ICT, ICT Use, Radiology, Radiology Students

1. Introduction

The use of ICT(Information Communication & Technology) in the information society has become part of our daily lives. If people utilize ICT based on IT skills, they will be able to acquire and share information efficiently[1]. In general, ICT literacy can be said to be personal competency, not the use of ICT in education. It can be said that the use of ICT as teaching tools is different from the development of ICT skills[2,3].

As students can acquire more information if they use ICT well, it can also be expected to be effective in terms of academics[4,5]. As pointed out by Hüsing & Selhofer[6], the knowledge gap in the 1970's was directly related to the digital divide due to the use of ICT. Segments of the population with higher socio-economic status tend to acquire information at a faster rate than the lower status segments so that the gap in knowledge between these segments tends to increase rather than decrease[7]. In the information society, the knowledge gap mentioned by Tichenor et al. became directly related to the digital divide. In other words, if students have access to ICT, they can acquire and utilize more information. If it is difficult to access ICT, however, the opportunities to gain information may be reduced accordingly. The digital divide can be said to be the digital version of the analogous knowledge gap [8].

In relation to ICT, Wilson[9] emphasized the importance of different types of access such as cognitive access (ICT skills), design access (usability), content access (availability of relevant applications and information online), production access (capacity to produce one's own content), etc.

Knowledge management in an educational context can be defined as follows: "the systematic process of finding, selecting, organizing, distilling and presenting information in a way that improves a learner's comprehension and/or ability to fulfill his or her current learning objectives"[10]. In education, ICT can increase students' use of their knowledge, and contribute to enhancing the expertise

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of a certain discipline through convergence with other disciplines[11,12]. That is, if ICT cannot be used, it will be difficult to live in the information society.

Alienation from ICT in the knowledge information society means that the quality of life or opportunities to participate in society are not equal[13]. As digital divides are not unrelated to students' participation in society and academic achievement, it is certain that ICT literacy is an important competency that individual students must have[14].

This study takes into consideration the fact that hospitals must handle a variety of equipment and know to use each piece of equipment from its own unique mechanical/technical standpoint, but the basic ability to use ICT is required on many occasions. Particularly in case of radiology, the ability to handle a variety of equipment is required. It is not unrelated to the fact that if people have various ICT competencies, they will play a bigger role not only in their personal lives, but also in their professional ones[13]. Accordingly, the purpose of this study is to understand how the degree to which students of radiology use ICT helps their learning.

2. Research Methodology

The research methodology consists of the concept of ICT utilization, outline of survey tools, design of the investigation and data collection.

2.1 Concept of ICT Utilization

ICT utilization includes the following[14]:

First, students must be able to use ICT to search, collect and examine information. Second, they must be able to analyze the examined information, and extract information useful to themselves. Third, they must be able to compare, summarize and integrate information. Also, they must be able to generate new information from various kinds of data. Fourth, they must be able to sort, reorganize and document information. They must also be able to efficiently store documented information. Fifth, they must generate and share effective information through cooperation. They must also be able to exchange opinions about information with others.

The above was proposed by the Korea Educational Research and Information Service. Also, PISA (Programm for International Student Assessment) of the OECD[15], the educational testing service of the US[16], and ACER (Australian Council for Educational Research)[17] defined the ability to use ICT in a similar fashion. This study reviewed various studies on ICT use to grasp the meaning of ICT use in consideration of how it is defined in Korea.

2.2 Outline of Survey Tools

The survey tools of this study for investigating the degree to which the ICT use by college students in departments of radiology help their learning are as follows(see Table 1):The survey tools composed self-awareness, the degree to which ICT is helpful, the degree of inconvenience, and preferred media for their study.

Table 1. Outline of the survey

Classification	Key investigations /details of analysis
Self-awareness	• The degree of ability to use ICT - Use very well, use well, use, use a little
The degree towhich ICT is helpful	• Helpfulness of ICT use -When ICT use helps learning (during class preparation, during class, during preparation for evaluation) Degree of helpfulness depending on the stage of utilization of educational contents (search, data selection and judgment, data reorganization and development, overall satisfaction) Where it is helpful (improving learning ability, concentration, self-directed learning)
The degree of inconvenience	• Degree of inconvenience when service cannot be used - Very inconvenient, inconvenient and a little inconvenient
Preferred media	• Video, images +description, image, TEXT

2.3 Design of the Investigation

2.3.1 Subjects

The population of this study for analyzing the degree to which ICT use was helpful in their studies consisted of students majoring in radiology at 22 universities across Korea. The purpose of this study is to examine the degree to which students' ICT use helps their learning. Freshmen were excluded as they had spent only one semester in school.

2.3.2 Sampling Procedure and Data Collection

According to the 2013 annual report on universities in Korea, 22 universities have a department of radiology. The samples for this study were collected in consideration of the characteristics of universities and their regions. Multi-stage stratified cluster sampling was used in consideration of the size of the population.

Specifically, to select schools, this study determined the sample size of sophomores, juniors and seniors by grade as 10 per school. Accordingly, 30 students from each school were surveyed. More than 660 students were surveyed to ensure that the maximum sampling error was less than ±2.8% at a 95% confidence level. In other words, the number of samples from each school was proportionally allocated in consideration of the populationsize.

According to the sampling principle of this study, more than 220 effective samples were collected from each grade in college with a maximum sampling error of ±3.58% at a 95% confidence level.

The proportional allocation and random sampling procedure is described below:

Step 1: Select students from each school.

To survey a total of 660 students, 30 students from each of the 22 universities in Korea having departments of radiology were selected. At least 10 students were selected from each grade.

Step 2: The set sample sizes for each grade were randomly surveyed, i.e., 10~20 of the 30 students selected from each school were randomly sampled.

Step 3: Based on the allocation by school and grade, respondents were selected and surveyed.

2.4 Data Collection and Analysis

As for the data collection method, students were surveyed using self-administered structured questionnaires by visits to schools. That is, interviewers visited target schools, distributed questionnaires to students, and collected the completed questionnaires. The survey period was from September 22, 2013 to November 7, 2013.

A total of 720 questionnaires were distributed of which 693 were collected. 43 of the 693 questionnaires were excluded as they contained poor or inconsistent responses. Thus, a total of 650 questionnaires were analyzed.

SPSS 20.0 was used to analyze the data. The response frequency of each survey was cross-tabulated for each of the characteristics of respondents. A 5-point Likert scale was used with the survey results converted to a 100-point scale before analysis.

The expression for converting each rating scale to the 100-point scale was as follows:

[{1} over {Number of respondents} sum _{i=1} ^{Number of respondents}(Response value _{ i}-1)] x { 100} over {n-1 }(n : Number of rating scales)

As the respondents were divided into 4 groups in this study, F-test(one way ANOVA) was used. The specific expression is as follows(eq.1):

$$f(\omega)=c\frac{\omega\frac{m}{2}-1}{(n+m\omega)\frac{1}{2(m+n)}},c=\frac{(m)\frac{m}{2}(n)\frac{n}{2\gamma}\left(\frac{m+n}{2}\right)}{\gamma\left(\frac{m}{2}\right)\gamma\left(\frac{n}{2}\right)} \quad (1)$$

Also, the expression for the chi-square that tested the difference due to qualitative variables was as follow(eq.2):

$$X^2=\sum_{i=1}^{2}\sum_{j=1}^{2}\frac{\left(O_{ij-}\tilde{E}_{ij}\right)^2}{\tilde{E}_{ij}}=\sum_{i=2}^{2}\sum_{j=2}^{2}\frac{\left(n_{ij-}\frac{n_j\times n_j}{n}\right)^2}{\frac{n_i\times n_j}{n}}\sim x_1^2$$

$$G^2=2\sum_{i=1}^{2}\sum_{j=1}^{2}\frac{n_{ji}\mathrm{In}\,n_{ij}}{\left[\frac{n_i\times n_j}{n}\right]}\sim x_1^2 \quad (2)$$

3. Results

3.1 The Degree to which the use of ICT helps Learning

Students were asked to express their self-perceived level of ability to use ICT. The data from a total of 650 students was used. The results were as follows: 211 students responded 'used ICT very well,' 220 students 'used ICT well,' 145 students 'used ICT,' and 74 students 'used ICT a little'(cannot use ICT very well). That is, 85% of all students perceived themselves to be capable of using ICT above average.

First of all, this study examined the degree to which ICT use can be helpful in preparing educational contents. The results are shown below(see Table 2).

Table 2. Degree to which students' ability to use ICT helps classes

Classification	During class preparation	During class	During evaluation
Use very well	74.6	74.3	69.6
Use well	67.0	64.4	60.3
Use	58.5	55.6	53.9
Use a little	48.0	45.9	45.9
	F=74.436***	F=79.907***	F=49.536***

∗ n.s=non-significance, * p<.05, ** p<.01, ***p<.0.001

With regard to the degree to which the ability to use ICT is helpful during class preparation, the group which can use ICT very well scored 74.6 points out of a possible 100, the group which can use ICT to a certain extent scored 58.5 points, and the group which can use ICT a little scored 48 points. In other words, the students believed that as their ability to use ICT increases, ICT was more helpful to their class preparation.

What follows is the result of analyzing in which stage ICT use is helpful with regard to education (see Table 3).

Table 3. Helpfulness in utilizing educational contents

Classification	Search	Data selection and judgment	Data reorganization/ development	Overall satisfaction
Use very well	74.6	74.1	69.3	73.9
Use well	65.9	63.5	60.4	64.9
Use	57.3	55.4	52.8	57.1
Use a little	50.2	47.8	45.6	50.3
	F=52.930***	F=63.547***	F=52.188***	F=78.377***

∗ n.s=non-significance, * p<.05, ** p<.01, ***p<.0.001

The analysis showed that in the 'Search stage' the group which can 'use ICT very well' scored 74.6 points, whereas the group which can 'use ICT a little' scored 50.2 points. The differences were statistically significant at a significance level of .05. The group which perceived they could use ICT well thought that ICT was helpful to learning in terms of 'data selection and judgment,' 'data reorganization and development' and 'overall satisfaction.'

This study analyzed which part of learning ICT use is helpful with results as follows(see Table 4):

Table 4. Analysis of which part of learning ICT use is helpful to

	Helpful in improving learning ability	Helpful to concentration	Helpful to self-study
Use very well	70.4	67.6	66.7
Use well	63.9	59.0	58.8
Use	58.1	53.5	54.5
Use a little	53.8	50.3	49.5
Statistics	F=30.560***	F=26.610***	F=22.516***

∗ n.s=non-significance, * p<.05, ** p<.01, ***p<.0.001

This study analyzed which part of learning ICT use is helpful with results showing that the group which can 'use ICT very well' scored 70.4 points with regard to helping improve learning ability. The group which can 'use ICT very well' scored the highest with regard to 'helping concentration' and 'helping self-study.' The differences were statistically significant at a significance level of .05.

This study analyzed the level of inconvenience in case ICT cannot be used in relation to education with the results as shown Table 5.

Table 5. The level of inconvenience in case ICT cannot be used (Unit: %)

Classification	Very inconvenient	Inconvenient	A little inconvenient	Statistics
Use very well	50.4	40.9	8.7	χ^2=244.673 ***
Use well	61.3	20.2	18.5	
Use	46.8	8.8	44.4	
Use a little	27.7	3.1	69.2	

∗ n.s=non-significance, * p<.05, ** p<.01, ***p<.0.001

The analysis showed that 91.3% of the group which can use ICT very well responded, 'It will be very inconvenient.' On the other hand, only 30.8% of the group which can 'use ICT a little' responded that it will be inconvenient. The difference was statistically significant at a significance level of .05. That is, as the group which can use ICT well is accustomed to using ICT, it seems that this group feels a high level of inconvenience when they cannot use ICT.

3.2 Preferred types of ICT-relatedLearning Materials

This study analyzed the types of preferred learning materials related to ICT with results as shown(see Table 6)

Table 6. Preferred ICT-related materials (Unit: %)

Classification	Video	Images +description	Image	Text	Statistics
Use very well	58.3	20.8	18.1	2.8	χ^2=244.673 ***
Use well	62.8	23.0	12.1	2.1	
Use	52.7	22.5	21.7	3.1	
Use a little	53.3	31.1	11.1	4.4	

∗ n.s=non-significance, * p<.05, ** p<.01, ***p<.0.001

Students preferred video in general with 62.8% of the groupthat responded as 'using ICT well' preferring that medium (video). Also, most students preferred materials with 'images + descriptions' to images only.

4. Conclusions and Discussion

This study surveyed Korean college students majoring in radiology, and analyzed the differences in their perceptions of ICT use depending on their level of ICT use and their perception of ICT competency. A total of 650 students were included in the analysis with the results showing that the group that can use ICT very well responding that ICT is helpful to learning. That is, as they are using ICT well, they felt a higher level of inconvenience in case they cannot use ICT.

This study showed that ICT use was very helpful to students' learning. Considering that software has been increasingly emphasized recently, when students have basic ICT competency, it seems that they can make better use of ICT-related contents. It seems that how students in different grades in college perceive ICT use, and how much ICT-related competency they currently have are issues that need to be quantitatively evaluated in the future.

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