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# A study on the improvement of digital literacy according to the change of circumstances
## -Focusing on Computer utilization subject

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**Abstract**

This study attempts to extract the characteristics, computer literacy, critical acceptance, and creative ability for digital information, included in H University's computer application course and then verify the effect of these characteristics on confidence (self-efficacy) that they can be solved when faced with a new problem. In addition, the purpose of this study was to compare and analyze how these characteristics affect self-efficacy according to the change of circumstances from the beginning of the semester to the end of the semester.

As a result of the analysis, it was found that creativity improves self-efficacy at the beginning of the semester, but creativity decreases self-efficacy in the moderating effect on situations. It can be said that the creativity is already equipped with the development of one-person media and SNS. Therefore, they have creativities at the beginning of the semester and improve their self-efficacy, but since they are not yet familiar with classes and have insufficient adaptation to the university such as Covid 19, it was found that the moderating effect of the situation on these creativities rather lowers the self-efficacy. At the end of the semester, it was found that critical accommodating ability and computer literacy improved self-efficacy by improving computer literacy while solving problems close to real life and performing tasks, has been shown to improve. This is because the computer utilization class mainly focuses on improving the critical acceptance ability and problem solving ability of digital information, can do. In this subjects, since the focus is on improving the critical acceptance and problem-solving ability of digital information, it can be said that the moderating effect of these factors as well as the utilization and critical acceptance ability improves self-efficacy at the same time.

It is meaningful that this study actually verified the improvement of digital literacy ability among college students that use digital information the most. A school in charge of nurturing future talents with these abilities can serve as an institution that nurtures the skills required by society, and society has the effect of reducing the cost of re-educating people who do not have these skills.

**Keywords**: *Digital literacy, Change of Circustances, Ability of computer utilization, Critical capacity, Creativity, Self-efficacy*

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# 상황변화에 따른 디지털 리터러시 향상에 대한 연구

## -컴퓨터 활용과목을 중심으로-

고윤정


## 국문요약

본 연구는 디지털 리터러시에 대하여 기존연구에서 제시한 여러 특성들 가운데 H대학교의 컴퓨터 활용과목에 포함된 특성으로서 디지털 정보에 대한 컴퓨터 활용능력, 비판적 수용능력, 창조능력을 추출하였고, 이 특성들이 새로운 문제에 부딪혔을 때 해결할 수 있다는 자신감(자기효능감)에 어떠한 영향을 미치는 지 검증하고자 하였다. 또한 학기초, 학기말에 대한 상황변화에 따라 이 특성들이 자기효능감에 어떻게 영향을 미치는 지 비교분석하고자 하였다.

분석결과 학기초에는 창조능력이 자기효능감을 향상시키는 것으로 나타났으나 상황에 대한 조절효과에서는 창조능력이 자기효능감을 감소시키는 것으로 나타났는데, 대학교 1학년생들은 이미 디지털에 익숙한 세대이고 대부분 디지털화된 정보를 수용하는데 익숙하고 1인미디어나 SNS의 발달로 창조능력이 이미 갖추어진 상태라고 할 수 있다. 그러므로 학기초에는 창조능력을 갖고 있으며 자기효능감을 향상시키나, 아직 수업에 익숙하지 않고 코로나19 등 대학교에 대한 적응이 미흡한 시기이므로 이러한 창조능력에 상황의 조절효과가 오히려 자기효능감을 오히려 떨어뜨리는 것으로 나타났다.

학기말 실제생활에 밀접한 문제들을 해결하고 과제를 수행하면서 컴퓨터 활용능력이 향상됨으로써 비판적 수용능력, 컴퓨터활용능력이 자기효능감을 향상시키는 것으로 나타났으며, 상황변화와 함께 비판적수용능력과 활용능력이 자기효능감을 향상시키는 것으로 나타났다. 이것은 컴퓨터 활용과목 수업에서 주로 디지털 정보에 대한 비판적 수용능력과 문제해결능력을 향상시키는데 초점을 맞추고 있기 때문에 활용능력 및 비판적 수용능력과 더불어 이 요인들에 대한 조절효과도 동시에 자기효능감을 향상시키는 것으로 나타났다고 할 수 있다. 기초적인 문제부터 실제 데이터를 활용하여 분석하고 시각화하는 과정을 통해 디지털 정보를 활용하고 비판적인 수용능력을 기를 수 있었다는 것을 알 수 있고, 학생들은 어떤 문제가 닥치더라도 해결해 나갈 수 있다는 자신감을 갖는다는 것을 알 수 있다.

본 연구에서 디지털 정보를 가장 많이 활용하고 있는 대학생들에게 디지털 리터러시능력향상에 대하여 실제 검증하였다는데 의의가 있다. 이러한 능력을 갖춘 미래인재양성을 담당하는 학교는 사회에서 요구하는 소양을 길러내는 기관으로서 역할을 할 수 있으며, 사회는 이러한 소양을 갖추지 못한 사람들을 재교육시키는 데 드는 비용을 절감할 수 있는 효과가 있다.


**주제어**: *디지털 리터러시, 비판적 수용능력, 컴퓨터활용능력, 창조능력, 상황변화*

## I. Introduction

As we enter a hyper-connected society, based on big data, the Internet of Things, and artificial intelligence, all fields of society are convergence, and the demand for new technology convergence is constantly emerging. In addition, SNS or app-based online communication and exchange are actively taking place, and the flow of change such as the reproduction, sharing and diffusion of various knowledge is accepted as a daily trend. Along with this trend, many people are falling into an information flood and their critical thinking ability is declining, and they view society from a narrow perspective, but individuals are not aware of it. At this point, digital literacy, which helps us to read, understand, integrate, and critically look at all digital information in our society, is becoming more important. Because college students accept a lot of information in digitized form rather than in document form, digital literacy skills for effective use of digitized information are needed more than ever. In particular, freshmen must adapt to the digital environment related to the university as they encounter new campus life and lectures using new programs and software for the first time after admission. It is expected.

ICT literacy or digital literacy is commonly suggested in studies on the core competencies of the future society. Among them, the 21st century learning framework presents information, media and technology skills as one of the core competencies(Battele for Kids, 2019). Also, World Economic Fortune (2015) mentions the importance of ICT literacy in Foundational literacies among 16 core competencies, The DeSeco project (OECD, 2005), which studied the conceptual framework of core competencies, also emphasizes the use of interactive tools such as language and technology. As such, it can be confirmed that digital literacy is a technical tool to acquire and utilize information and knowledge and an important ability to lead life.

Although there have been previous studies on ICT or digital literacy measurement (Nam, Ahn, 2016; Kwon, Hyun, 2014; Baek et al., 2009; Lee, 2007; Seo, 2003), existing studies have focused on digital literacy in computers, the Internet and technology. It focuses on the ability to utilize information and communication technology or to collect, analyze, and process information. Also, theories on digital literacy and studies applying them (Kwon and Kim, 2011; Oh, 2006; Seo, 2003; Yoo, 2001) are approaching from a more extended perspective, but digital literacy is mainly dealt with conceptually, so the practical level There is a limit to meeting the needs of this society by measuring and identifying areas that are lacking. In addition, most of the existing studies measure digital literacy for a limited time and do not consider the situational aspect. Therefore, it is necessary to draw meaningful results on the differences from previous studies by performing comparative analysis in consideration of changes in the situation. Therefore, it is necessary to draw meaningful results on the differences from previous studies by performing comparative analysis in consideration of changes in the situation. And, reconceptualizing the definition of digital literacy in this society and developing a measurement tool that matches it is meaningful in that it will become a cornerstone for realizing the core competencies required of future talents by reflecting the changes and demands of society.

Most of the existing studies have dealt with various groups from infants to the elderly (Kim, 2019; Ahn, 2019; Kim, 2015; Jeong, 2013; Im, 2008) or special temporary situations. However (Cho, Cho 2012; Park, Lee, 2006; Shin, 2014), the trend of this situation change is not considered. In particular, first-year university students are exposed to unfamiliar environments after graduating from high school and entering the university as new social workers. Also, rapid environmental change at the beginning of the semester is expected to

be greater than expected by participating in school events or programs and gradually adapting through various learning. Therefore, in this study, we recognize the need to analyze the influence of these situational change factors on improving digital literacy ability and try to verify it through a short-term longitudinal study.

As the subject of this study to focus on, first-year university students taking computer application courses are exposed to unfamiliar environments that they encounter for the first time as new social workers after graduating from high school. It takes them at least several months to adapt to the environment while experiencing campus life and new programs and lectures, and these changes are expected to have a significant impact on their digital literacy skills improvement.

In order to conduct this study, theoretical considerations on digital literacy and situation theory are first conducted, and then, subject characteristics, situation variables, digital literacy, and self-efficacy are reconceptualized based on prior research before conducting a survey. After deriving the items and interviewing relevant major professors to verify the conceptual validity, the items are to be confirmed. In order to analyze the trend of the effect according to the change of circumstances, we intend to conduct a short-term longitudinal study by asking twice at the beginning of the semester and at the end of the semester. Based on the collected questionnaires, the reliability, validity, and correlation of the items presented in the research model will be analyzed, and causality analysis will be conducted. Finally, through the overall structural verification of the soft hair model, along with the verification of the overall research model, the discussion points, implications, limitations, and future research directions are presented.

As this study suggests, it can be suggested that an educational program should be provided for college students to feel confident and satisfied with themselves by improving their digital literacy and freely communicating with others. It is expected that this study will be able to play a leading role in preparing various programs and lectures for cultivating digital literacy among university students who will live in the present and future. In addition, it is judged that it will contribute to nurturing talented people who will lead the future who can fully fulfill the roles required by society based on digital literacy.

## II. Literature Review

### IIa. Digital literacy

The modern society can be said to be a hyper-connected society in which all the worlds are connected by networks as networks between objects and artificial intelligence using big data are grafted into various fields beyond computers and human networks. Moore's Law, which suggests that the amount of data doubles every 18 months, is not 18 months, but is getting shorter and shorter, and many scholars have already argued that Moore's Law has been broken. In a hyper-connected society, as the amount of data is increasing exponentially as all things and networks are possible, the ability to critically accept, analyze, and utilize this big data to integrate and create according to the purpose is urgently needed. This is so-called digital literacy.

Digital literacy is a concept that evolved from literacy, and in the sense that literacy is the ability to read and write, it has been gradually expanded into visual literacy, television literacy, computer literacy, multimedia literacy, information literacy, information communication literacy, media literacy, digital literacy, and the like. Digital literacy requires a new form of literacy with the advent of new media. In a digital environment with

characteristics such as interactiveness and network, it is necessary to be able to select and use information critically, not just the ability to use specific information technology. In addition, not only the ability to combine one's own originality, but also the ability to solve problems with others is required, and the integrated literacy ability to understand and utilize such information while delivering and sharing various types of information is required(Ahn, 2006, 94).

Digital literacy is a concept that includes computer literacy, multimedia literacy, information literacy, information communication literacy, media literacy, etc. in order to adapt to the digital information-oriented knowledge society. To do this, it requires critical thinking skills from all users. Therefore, digital literacy can be said to be the ability to critically understand, evaluate, and integrate various types of information beyond the collection and use of digitized information (Yoo, 2001, 101 ; Seo, 2007, 32).

Digital literacy includes all existing literacy, and is continuous and multi-faceted, not a limited category. As well as various conceptual definitions of digital literacy, there are various assertions about the range of components of use ability required by digital literacy. Seo(2007) said that the components of digital literacy are directed toward an emancipatory cognitive perspective that emphasizes critical thinking and rational communication. He also suggested the implications of praxis-centered digital literacy learning in the social aspect, educational aspect, and individual learner aspect in a digital-centered knowledge-based society. From a social point of view, it awakens the importance of improving the critical consciousness of citizens who constitute society, and from an educational point of view, a learner-centered paradigm is systematically realized, is emphasizing.

Noh, Jeong, and Lee (2013) provide a tool that can evaluate capabilities such as ability to solve various problems in real life, creativity, critical thinking ability, analytical reasoning ability, and communication ability at a specific level according to the rapid change in information and communication technology. Explaining that ICT literacy is ICT literacy, he suggested that it should be measured by dividing the knowledge part about computers, the technology part that can be processed using computers, and the ethical attitude part toward computers. It can be seen that these two studies emphasized the ethical aspect as well as the aspect of using computers at the same time.

Shin and Lee (2019, 752) define digital literacy as 'as a member of a software-oriented society, convergence and complex understanding of various fields using information and communication and online services, and collaborate on complex problems by creating information and knowledge based on computational thinking. It has been reconceptualized as 'the ability to solve. Park and Choi (2018, 288) also pointed out that in order to nurture talents who will lead the intelligent information society in the era of the 4th industrial revolution, it is necessary to focus on promoting creativity and problem solving, away from the existing technology-oriented information education.

**IIb. Situation theory**

Situational theory focuses on how people perceive problem situations, and many studies have been conducted based on Situational Theory described by Grunig (1983). He suggests three independent variables: problem recognition, constraint recognition, and involvement recognition. First, problem recognition is refers to ‘the extent to which people stop doing what they are doing and think about the situation to the extent that they perceive that something is wrong or that the situation is not easily possible, that something needs to be done in a particular situation '. Therefore, high problem awareness means that when people

encounter a problem situation, they recognize the need to solve the problem based on their judgment on how important the problem is, and as a result, communication behavior such as more actively searching for information can be seen. Second, constraint recognition means that 'people have limited freedom to plan and execute their actions in certain situations'. Therefore, it was explained that when an individual encounters a certain problem situation and recognizes that it is difficult to understand or solve the situation, the recognition of the restriction will increase, and the communication motivation for solving the problem will decrease due to the increase of the awareness of the restriction. Third, level of involvement is defined as 'the degree to which people perceive how relevant they are to a particular situation'. Therefore, it is hypothesized that when the involvement is low, people may receive information about the situation without a pre-planned exploratory activity, or they may not engage in a series of activities such as seeking information.

Lee(2000) stated that the context-provided class based on the situational learning theory provides a specific and useful context so that the learner can feel interest, thereby bringing about a positive learning attitude, such as inducing curiosity in the learner. Park(2005) developed 'MMORPG', a situational learning system support system using computer science, by reconsidering situational learning theory from the perspective of instructional design and extracting major variables to be reflected in the system. Through this, a teaching-learning system in which knowledge can be acquired through subjective experience was constructed by composing a situation similar to reality, enabling interaction, and facilitating the construction of a context. Kang(2007) found that learning by applying situational learning had a positive effect on academic achievement, and Hong(2007) found that when the teacher presents an appropriate environment to the learner, the learner feels the need for the subject in the given situation and the learning He argued that the question of the root cause could be solved.

## III. Methodology

### IIIa. Research model

Combining previous studies to evaluate digital literacy improvement, digital literacy has various definitions of concepts and the range of components to measure it. Leo Casey와 Bertram C. Bruce (2011, 80) proposed a framework linking educational strategies and digital media for elementary school students, where five cycles of requesting, researching, making, discussing, and reflecting appear across the entire scope of digital literacy. maintained and can be strengthened. Lee et al. (2019, 217) presented a digital literacy curriculum framework, and the content areas consisted of digital technology understanding and use, digital consciousness/attitude, digital thinking ability, and digital practice competency. Based on this, educational standards for future-oriented literacy was presented. Kim and Ahn (2003, 10) developed a digital literacy checklist and classified it into computer literacy (information and communication technology and utilization), information literacy (information utilization and information creation), and knowledge literacy (information sharing and opinion exchange). Han et al. (2006, 29) composed the digital literacy framework into technical literacy (hardware, software, internet, digital technology), critical literacy (content, interface, user), and social literacy (communication, law, netiquette).

Among the studies that summarized the components of digital literacy, Kwon and Kim (2011) socially and culturally expand the characteristics of context, connectivity, and

interaction emphasized by social media, and structure the segmented concepts of learning activities in the extension line. The components of digital literacy were derived with compositional power, ripple power, and reflective power. Similarly, Seo and Kwon (2004) criticized the existing digital literacy learning process for not reflecting the characteristics of communication and participation, which are the fundamental attributes of digital media, but focused on using simple tools or acquiring related knowledge. And digital literacy learning was newly interpreted by combining the praxis perspective that can reflect the fundamental characteristics of digital communication and participation. In this study, among the characteristics suggested in previous studies on digital literacy, computer application ability, critical acceptance ability, and creativity for digital information were extracted as characteristics included in the computer application course of H University. The purpose of this study was to examine how it affects the confidence (self-efficacy) that one can do when faced with. In addition, the purpose of this study was to compare and analyze how these characteristics affect self-efficacy according to the change of circumstances from the beginning of the semester to the end of the semester.

This study aims to identify the following research topics based on existing research on digital literacy and situation theory.

Research problem 1. Do the abilities (utilization ability, critical acceptance ability, creativity) that can be obtained through taking computer application courses improve self-efficacy?

- Does the ability to utilize improves self-efficacy?
- Does critical acceptance enhance self-efficacy?
- Does creativity enhance self-efficacy?

Research problem 2. According to the change of situation (situation at the beginning of the semester, the situation at the end of the semester), how do the abilities (utilization ability, critical acceptance ability, creativity) that can be obtained through taking computer application courses affect the improvement of self-efficacy?

- Does the ability to utilize according to the change of the situation improve the sense of self-efficacy?
- Does critical acceptance enhance self-efficacy in response to changes in circumstances?
- Does creativity improve self-efficacy according to changes in circumstances?

**IIIb. Methodology**

This study aims to evaluate first-year university students taking computer utilization courses, from solving basic problems by considering the situation to solving problems of analyzing real data and visualizing it for a purpose, at the beginning of the semester (September) and the end of the semester (December). This study examines how the characteristics covered in this computer utilization course, i.e., computer utilization ability, critical acceptance of digital information, creativity, etc., improve self-efficacy to examine how self-efficacy is affected by circumstances. For this purpose, the study was conducted in the following way. The computer application course is a compulsory liberal arts course that all first-year students take. In the first semester, I tried to improve computer thinking ability using Excel and Scratch, and in the second semester, lectures on big data analysis were conducted using Python. This course will mainly help you develop your problem-solving skills.

First, based on the review of previous studies, questionnaire items such as computer utilization ability, critical acceptance ability, creativity, self-efficacy, and situation change were composed.

Second, the content validity of the questionnaire items was verified by interviewing major professors teaching related subjects, and the final items were derived by reflecting the reviews and opinions.

Third, two surveys were conducted at the beginning of the semester and at the end of the semester to verify the difference according to the change of circumstances. By applying situation theory, the situation of first-year university students (182 responders out of 214) was grasped more closely. In particular, they gradually adapt as they encounter new programs and lectures in a new environment they encounter for the first time at university, were comparatively analyzed. For the actual data, public data related to the population or region that can be accessed in our daily life were used.

Fourth, an exploratory factor analysis, correlation analysis, and reliability and validity analysis were performed on the three selected subject characteristics, situation change, and self-efficacy. The questionnaire is intended to be conducted on first-year university students taking computer science courses and consists of 7 points on a Likert scale ranging from 1 point of 'strongly disagree' to 7 points of 'strongly agree'.

## IV. Findings

### IV a. Reliability and Validity

Per Table 1, Cronbach's α was used to verify reliability. Analysis identified reliability among the five factors between .729~.862. Validity was analyzed by principal component analysis and varimax rotation, and results was disclosed validity as factors were .755~.929 more than 0.5 (Lee and Lim 2017). Since correlation with potential factors were good as all factors were less than 0.7, convergent validity and discriminatory validity were acquired.

In this study, self-efficacy consisted of the ability to solve any problem or situation on one's own, and the belief and confidence that one can achieve the goal set by one's self. Utilization ability is the ability to know how information technology is used in real life, to know what impact it has, and to solve real problems. Critical thinking ability was defined as the ability to critically accept information in comparison with fact-checking or other information, rather than accepting information unconditionally. The creativity was composed of the ability to create my own new contents using information technology.

[Table 1]. Reliability and Validity

| Variables | Items | Factor load | Cronbach' $\alpha$ |
|---|---|---|---|
| self-efficacy | self1 | .874 | .817 |
| | self2 | .869 | |
| | self3 | .865 | |
| | self4 | .907 | |
| | self5 | .755 | |
| | self6 | .841 | |
| utilization ability | pract1 | .846 | .729 |
| | pract2 | .857 | |
| | pract3 | .803 | |
| | pract4 | .817 | |
| critical capacity | critic1 | .823 | .752 |
| | critic2 | .755 | |
| | critic3 | .797 | |
| creativity | creat1 | .775 | .765 |
| | creat2 | .762 | |
| | creat3 | .795 | |
| condition | state3 | .903 | .862 |
| | state4 | .929 | |
| | state5 | .899 | |

### IV b. Correlation

Table 2 indicates the correlation of utilization ability, critical capacity, creativity, and self-efficacy in the proposed model.

[Table 2] Correlation

| Variables | self-efficacy r(*p*) | utilization ability r(*p*) | critical capacity r(*p*) | creativity r(*p*) |
|---|---|---|---|---|
| self-efficacy | 1 | | | |
| utilization ability | .347 (.000) | 1 | | |
| critical capacity | .170 (.022) | .329 (.000) | 1 | |
| creativity | .360 (.000) | .123 (.098) | .175 (.018) | 1 |

### IV c. Regression

### IV c-1. The beginning of the semester

As a result of a survey conducted at the beginning of the semester for students taking computer science courses, it was found that R=.493, R2=.243, and p=.000 for the research

model as follows, indicating that there is a causal relationship. In detail, it was found that creativity improves self-efficacy (p=.010). However, in the moderating effect on the situation, creativity was found to reduce self-efficacy (t=-2.477, p=.014).

First-year university students are already familiar with digital, and most of them are accustomed to accepting digitized information, and it can be said that they are already equipped with creative abilities due to the development of one-person media or SNS. Therefore, they have creativities at the beginning of the semester and improve their self-efficacy, but since they are not yet familiar with classes and have insufficient adaptation to the university such as Corona 19, it was found that the moderating effect of the situation on these creative abilities rather lowers the self-efficacy. It was found that the situation control effect on utilization ability, critical acceptance ability, utilization ability, and situation control effect on critical acceptance ability did not have any effect on self-efficacy.

Self-efficacy is a concept based on the old constructivist philosophy and based on J. Dewey's empirical learning theory (Dewey, 1963), and developed from the concept of self-efficacy among the social learning theories of Bandura (1986). It refers to an individual's beliefs about the ability to successfully perform a task or behavior. In addition, self-efficacy refers to the belief or expectation that an individual can overcome situations on their own and successfully perform tasks assigned to them (Korean Educational Psychology Association, 2006). The self-efficacy scale has been used in various ways (Kim, 2016, 18-23). In this study, the ability to solve any problem or situation on one's own, and the belief and confidence to achieve the goal set by one's self to the end were composed.

[Table 3] Overall model analysis result on causal relationship at the beginning of the semester

| Model | R | $R^2$ | standard error | F | *P* |
|---|---|---|---|---|---|
| 1 | .493 | .243 | .89659 | 9.381 | .000 |

* dependent variable: self-efficacy

[Table 4] Item analysis result on causal relationship at the beginning of the semester

| | B | standard error | *β* | t | *P* |
|---|---|---|---|---|---|
| **utilization ability** | .366 | .457 | .344 | .800 | .425 |
| **critical capacity** | .655 | .489 | .674 | 1.340 | .182 |
| **creativity** | .640 | .246 | .723 | 2.604 | .010 |
| **utilization ability × condition** | -.017 | .111 | -.090 | -.153 | .879 |
| **critical capacity × condition** | -.021 | .107 | -.123 | -.193 | .847 |
| **creativity × condition** | -.109 | .044 | -.980 | -2.477 | .014 |

* dependent variable: self-efficacy

**IV c-1. The end of the semester**

As a result of a survey at the end of the semester for students taking computer application courses, R=.647, R2=.418, p=.000, indicating that there is a causal relationship as a whole. .000), critical accepting ability (p=.000), situational adjustment effect on utilization

ability (p=.000), and situational adjustment effect on critical accepting ability (p=.000) were found to improve self-efficacy. However, it was found that creativity (p=.229) and situational control effect on creativity (p=.173) did not improve self-efficacy. This is because the computer utilization class mainly focuses on improving the critical acceptance ability and problem solving ability of digital information. It can be seen that through the process of analyzing and visualizing basic problems using real data, they were able to utilize digital information and develop critical acceptance, and students can see that they have the confidence to solve any problems they encounter. It can also be seen from the study that a class applying situational learning is effective in improving students' self-efficacy in academic performance (Kim, 2016). Situational learning presented in this study is set as a step-by-step learning that is progressively improved with a basic computer application course in the first semester and a big data analysis course in the second semester. Students gain a sense of achievement and confidence through basic learning and deep learning. As a result of the analysis, the moderating effect of situation and creative ability was found to be significant (p=0.10). On the other hand, it can be said that the moderating effect on creativity and creativity does not improve self-efficacy because there is a limit to improving the ability to produce collaboratively through team projects due to the COVID-19 situation.

[Table 5] Overall model analysis result on causal relationship at the end of the semester

| Model | R | $R^2$ | Standard error | F | *P* |
|---|---|---|---|---|---|
| 1 | .647 | .418 | .92432 | 20.742 | .000 |

[Table 6] Item analysis result on causal relationship at the end of the semester

| | B | Standard error | *β* | t | *P* |
|---|---|---|---|---|---|
| **utilization ability** | 3.699 | .686 | 3.345 | 5.390 | .000 |
| **critical capacity** | 2.522 | .600 | 2.453 | 4.202 | .000 |
| **creativity** | .465 | .385 | .489 | 1.206 | .229 |
| **utilization ability × condition** | .821 | .171 | 4.849 | 4.802 | .000 |
| **critical capacity × condition** | .672 | .149 | 4.087 | 4.519 | .000 |
| **creativity × condition** | .132 | .097 | .810 | 1.368 | .173 |

## V. Conclusion

This study is to analyze whether there is a difference in the improvement of digital literacy according to the situation of students taking computer utilization courses and whether this improved digital literacy ability improves this sense of self-efficacy. To this end, the characteristics of computer utilization subjects were analyzed through prior research, and questionnaire questions were developed based on previous studies on digital literacy ability and self-efficacy. The developed items were interviewed with relevant major professors to verify their conceptual validity. In addition, a questionnaire was conducted twice at the beginning of the semester and at the end of the semester for a short-term longitudinal study on situation change.

This study has the following academic significance. First, it can be said that the importance of digital literacy ability is being emphasized more than ever at this point where almost all information is digitized as we enter the hyper-connected age beyond the digital information age. Therefore, in this study, it is meaningful that the digital literacy ability was actually verified in college students, one of the classes currently using it the most. This study was made based on the lectures actually given to all first-year students. This study deals with basic computer tools in the first semester and verifies big data analysis using Python in the second semester. Therefore, the gradual improvement effect of computer-based liberal arts subjects was verified.

Second, it was investigated whether the digital literacy ability, which includes the characteristics covered in computer use subjects, had a positive effect on improving self-efficacy. Specifically, the critical acceptance ability for digital information, problem-solving ability and utilization ability, and creativities were presented as the main characteristics emphasized and dealt with in the computer application course, and it was verified that these characteristics improve self-efficacy.

Third, we found out it differs according to the characteristics (critical capacity, utilization ability, creativity) and circumstances dealt with in the computer usage subject, and the more one adapts to the environment and one's ability improves, the more confident they can solve any problems they encounter. Computer application is a compulsory liberal arts subject for first-year university students, and in particular, first-year students are exposed to a new environment of university after graduating from high school. At the beginning of the semester, especially when exposed to unfamiliar environments, everything becomes unfamiliar, awkward, and unstable. However, at the end of the semester, they will be immersed in the university environment to some extent, become stable and familiar, and form diverse communities such as peer groups. In addition, students will be equipped with the ability to use digital information, critically accept it, and creatively produce it through the process of analyzing and visualizing data from basic problems in class to real life data. It was identified that these situational changes have a positive effect on improving self-efficacy along with digital literacy skills. This suggests that the factor of situational change should not be overlooked and that it is an important variable that should be dealt with in subsequent studies. In particular, when organizing liberal arts courses, most of the courses that universities finish in one semester. Like computer-based subjects, it should be structured so that learning is carried out by stage and situation in consideration of subject characteristics and grade level.

Socially, it can contribute to: First, computer utilization courses, which are compulsory liberal arts courses for college students, are practice-oriented by their nature, so information technology utilization ability can be improved and it is easy to apply them in real life. In addition, through various multimedia data on the latest information and communication technologies, the importance can be recognized and accepted. By introducing flip-learning, students are provided with convenience by enabling prior learning and repeated learning, and using the learned information technology to create their own content. In summary, it can help cultivate the ability to produce the latest information technology information, information technology utilization ability, and content production. Students who develop these skills can go out into society, fulfill their assigned roles, and become talented people who are helpful to the organization.

Second, we identified the students who took the computer utilization class showed that the characteristics of the subject, such as critical receptive ability, utilization ability, and

creativity, improve digital literacy through situational change, and through this, improve students' self-confidence and self-efficacy. This means that you can feel confident and satisfied with yourself by improving your ability to use digital information and critically accept it by taking computer application courses. These courses will equip students with the ability to communicate with others, search for and integrate digital information and solve problems without difficulty, even when faced with other common problems. Through this, the school can play a role as an institution that nurtures the skills required by the future society, and society can reduce the cost of re-educating those who do not have these skills.

Third, it is meaningful that an educational program that can improve digital literacy was developed through this study and that students can actually experience in the actual educational field, thereby cultivating these abilities and gaining self-confidence. Therefore, it can be suggested that educational institutions should provide an educational program that equips both theoretical and practical skills by increasing the usability and applicability of training in parallel, rather than a simple theoretical lecture.

Since this study analyzed whether or not digital literacy skills are improved for students taking computer-using courses, there is a limitation in that it cannot be verified whether these skills can be improved through other courses. Therefore, it is necessary to conduct a comparative analysis on whether there is a difference in whether computer use subjects improve digital literacy ability by comparatively analyzing students who have taken computer application courses and other general theory lectures in the future.

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