

# A Practical Effort to Improve ICT Competency by Compulsory ICT Use in Teaching Practice

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**Abstract:** At the Shinshu University Faculty of Education, student teachers are required to use ICT equipment in classes during their student teaching practicum. We surveyed and analyzed the change in ICT competency before and after teaching practice. Two abilities were improved dramatically, which were the Ability to Use ICT in Researching, Preparing, and Assessing Teaching Materials and the Ability to Use ICT when Teaching in the Classroom. In particular, the students just before teaching practice did not extend at all to the average value of the Japanese in-service teachers in March 2007. However, after teaching practice, it was higher than the average values of the latest Japanese in-service teachers. We found that teacher students have been able to improve ICT competency by the compulsory ICT use during only one-month student teaching practicum.

## Introduction

### Promotion of ICT-Use Education in Japan

The environment surrounding children has changed massively, and in the 21st century it is vital that children are able act by thinking for themselves, and moreover that they acquire a ‘zest for life’, whilst helping and cooperating with others. It is necessary to provide them with an education that both respects the diversity of individual children and allows them to exhibit their various strengths, whilst at the same time enables children who have different backgrounds and different capabilities to generate new values through cooperation. In Japan, collaborative and interactive classroom innovation is being promoted through ideas and improvement of instructional methods and the instructional system, including the active use of ICT (Information and Communication Technology).

The Second Basic Plan for the Promotion of Education (MEXT: Ministry of Education, Culture, Sports, Science and Technology 2013) was approved by the Japanese Cabinet, which “aims as soon as possible for all teachers

to be able to teach with the use of ICT, and will take the necessary measures to improve teachers' use of ICT in the classroom". Improvement of ICT use instructional skills is not only desired of incumbent school teachers. In Japan, one of the global human resource development items is "ICT education as a national strategy," and all teachers are working toward acquiring ICT use instructional skills that correspond to the children's development stage. This means that "there will be an emphasis on teaching with the use of ICT in the teacher training curriculums of universities, and in teacher recruitment examinations and license renewal training", and that it has been decided that teaching with the use of ICT will be improved in university teacher training courses.

### **ICT-Use Education in Student Teaching Practicum**

With this background in mind, in Shinshu University's Faculty of Education requires its third-year students to conduct a class using ICT at least once during the one-month student teaching practicum; this fosters students' ICT use instructional skills (Fujii *et al.* 2016 & Morishita *et al.* 2016). The year 2015 marks the third year since we mandated the use of ICT in teaching practice, and 94.9% of student teachers have used ICT to teach during teaching practice. 78.4% of student teachers "gained a more favorable impression of the use of ICT in teaching" through teaching practice, and many student teachers felt that "ICT heightened the interest of children, it increased their motivation to learn, and it led children to learn independently." In addition, 97.2% of student teachers remarked that they "would use ICT, if an ICT setting was available, once [they] become teacher[s]." Use of ICT in teaching practice has made students aware of ICT and it has revolutionized their attitudes towards the educational use of ICT.

### **Research Purpose**

MEXT originally mandated the use of ICT in teaching practice in order to improve the ICT competency of students in departments of education. Thus, the Ministry's action is pointless if teaching practice fails to improve the ICT competency of student teachers. Accordingly, one aim of the current study was to examine the ICT competency of students in departments of education before and after teaching practice. Another aim of this study was to ascertain changes in ICT competency in light of the level of competency before and after teaching practice.

### **Research Approach and Objective**

The ICT Competency Standards for Teachers in Japan were used to measure ICT competency of students. These standards are based on an annual study of ICT competency among elementary, middle, and high school teachers nationwide by MEXT. The standards are in the form of a checklist of 18 items grouped into five categories labeled A-E [each category concerns a teacher's ability to use ICT in different situations] (Appendix Table). Teachers rate themselves on each item using a 4-point scale from "quite capable" (4 points) to "somewhat capable" (3 points), "somewhat incapable" (2 points), and "highly incapable" (1 point).

This study surveyed 254 student teachers in 2015. Student teachers at the Shinshu University Affiliated Schools practiced teaching for a week in late June and three weeks from late August-mid-September, for a total of four weeks. In order to examine changes in ICT competency as a result of teaching practice, student teachers were surveyed twice, once in early June immediately prior to teaching practice and once in late September immediately after teaching practice. Valid responses to both surveys were received from a total of 234 respondents (valid response rate: 92.1%), and changes in ICT competency were analyzed.

### **Results and Finding**

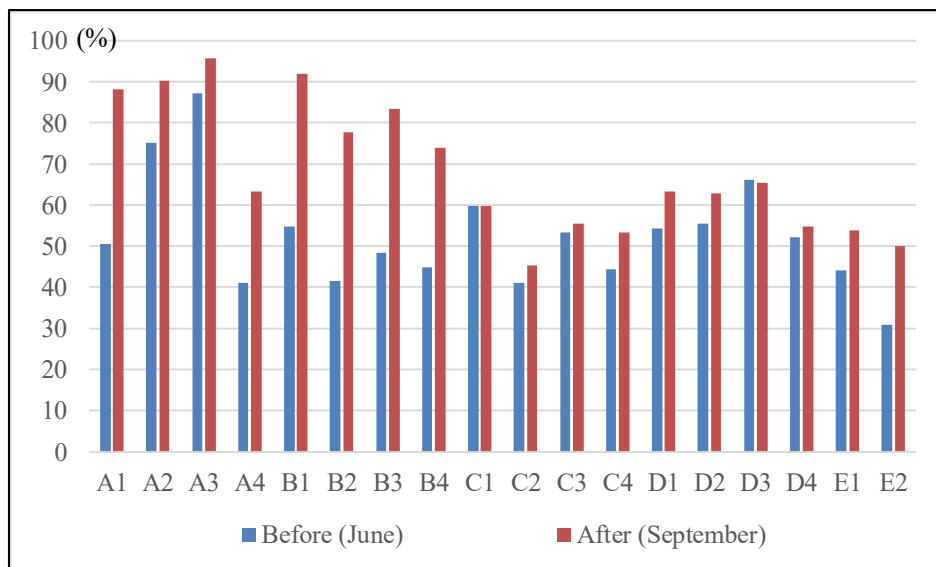
#### **What Items on the Checklist Did Student Teachers Change?**

Figure 1 compares the percentage of respondents who answered that they were "quite capable" or "somewhat capable" of using ICT in given situations described by the 18 items on the checklist before and after teaching practice. Scores on the checklist were examined using a t-test. Results before and after teaching practice revealed significant differences in responses to items A1, A2, B1, and B3 at a significance level of .01 and significant differences in

responses to items A2 and B2 at a significance level of .05. In addition, responses to item B4 tended to change significantly before and after teaching practice.

The score for item A1 increased the most. Scores for items B1-B4 increased about 30 points. Item A1 measures a teacher’s ability to plan the use of ICT in teaching. Since we mandated the use of ICT in teaching practice, student teachers must use ICT to teach. However, student teachers are taught that “ICT should not be used merely for the sake of doing so,” so they must devise ways to use ICT in order to instruct schoolchildren more effectively. Accordingly, student teachers attempt to determine “when to use ICT” and “how to use ICT” with schoolchildren in mind. As a result, student teachers become able to plan the use of ICT from various perspectives in order to increase the effectiveness of instruction.

Items B1-B4 measure a teacher’s ability to use ICT in class. Many student teachers were able to use ICT to effectively present material in order to heighten the interest of schoolchildren, to help them clearly grasp topics, and to expand their thinking and increase their understanding. During teaching practice, 72.9% of student teachers prepared text or images on a notebook or tablet computer and they then used an electronic blackboard or overhead projector to show that material. For student teachers, using ICT to enlarge or present material is one way to embark upon teaching. Results revealed that such an approach was the first step towards increased ICT competency.



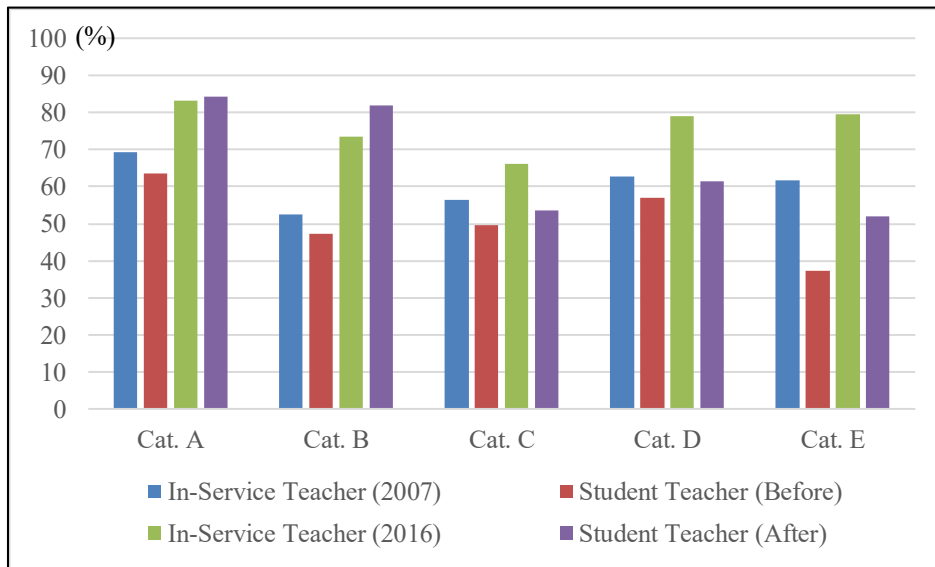
**Figure 1: Changes in ICT Competency Before and After Teacher Practice**

### How Did Student Teachers Improve Their ICT Competency?

Figure 2 shows the average percentage of respondents who answered that they were “quite capable” or “somewhat capable” of using ICT as described in each of the five categories on the checklist. Data on the ICT competency of in-service teachers from March 2007, when surveys of ICT competency started, and March 2016, when the latest survey was conducted, are shown to allow comparison of the ICT competency of in-service teachers and student teachers.

Results indicated that ability measured by the Ability to Use ICT in Researching, Preparing, and Assessing Teaching Materials (category A) and the Ability to Use ICT when Teaching in the Classroom (category B) improved dramatically. In specific terms, the ICT competency of student teachers prior to teaching practice fell far below the average level of ICT competence of in-service teachers in Japan in 2007. However, the ICT competency of student teachers after teaching practice exceeded the average level of ICT competence of in-service teachers in 2016. Thus, many student teachers have used ICT in teaching, even if only once, since we mandated the use of ICT in teaching practice. In the past, teachers needed 10 years to become competent at using ICT, but this period has now been reduced to just four weeks. The current results revealed that the ICT competency of students in departments of education has greatly improved. That said, changes in the Ability to Teach Student how to Use ICT (category C) and in the Ability

to Teach Ethical ICT Behavior (category D) were not noted. Ways to foster ICT competency in order to foster information literacy and to support collaborative learning by schoolchildren are open to discussion.



**Figure 2:** Comparison of the ICT Competency of In-Service Teachers and Student Teachers

## Conclusion

An aim of this study was to ascertain changes in ICT competency before and after mandated use of ICT in teaching practice. The ICT Competency Standards for Teachers were used to measure the ICT competency of student teachers. Results revealed that the ability of student teachers as measured by the Ability to Use ICT in Researching, Preparing, and Assessing Teaching Materials (category A) and the Ability to Use ICT when Teaching in the Classroom (category B) improved dramatically and that student teachers attained the level of ICT competency of in-service teachers in a short period of time. Student teachers had improved ability to plan the use of ICT in teaching and improved ability to use ICT to effectively present materials, so mandated use of ICT in teaching practice has borne fruit.

However, their ability to use ICT to support active learning by schoolchildren did not change. This precludes an education whereby children with different backgrounds and varied levels of ability collaborate to gain new insight. Results revealed the prejudice that “use of ICT = enlarging and presenting material,” so topics for the future are destroying the preconceptions of students in departments of education with regard to how ICT should be used in teaching and expanding the extent to which student teachers use ICT in teaching.

## Acknowledgements and Additional Statement

We would like to thank Shinshu University students. This study was supported by Japan Society for the Promotion of Science (JSPS) KAKENHI Grant-in-Aid for Young Scientists (B) JP15K21249 and Grant-in-Aid for Scientific Research (B) JP26282050. In addition, this study was done when Associate Prof. Fujii was at Institute of Education, Shinshu University in 2015.

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**Appendix Table: The ICT Competency Standards for Elementary School Teachers (translated by Shimizu *et al.* 2008)**

(A) Ability to Use ICT in Researching, Preparing, and Assessing Teaching Materials	
A1	I plan when and in what settings it would be good to use computers, the Internet, and other technologies to enhance the educational effect.
A2	I use the Internet, CD-ROMs, or other ICT sources when gathering resources and materials to use in my classes.
A3	I use word-processing, presentation, or other kinds of software when creating print-outs or presentations needed in my classes.
A4	To enhance my student evaluations, I use a computer, digital camera, or other device to manage and tally student work, learning progress, grades, etc.
(B) Ability to Use ICT when Teaching in the Classroom	
B1	To enhance pupil interest in learning, I present material in the most effective way using a computer or some other display device.
B2	To ensure that each and every pupil clearly grasps the problem or issue at hand, I use a computer or other presentation device to present material as effectively as possible.
B3	To explain in an easy-to-understand way and provoke deeper thinking and understanding by pupils, I use a computer or other presentation device to present material as effectively as possible.
B4	In an effort to have knowledge really stick with pupils when summarizing lessons, I use a computer or other presentation device to present material in an easy-to-understand way.
(C) Ability to Teach Student how to Use ICT	
C1	I teach pupils so they can use computers and the Internet to collect and select information.
C2	I teach pupils so they express their own thoughts in sentences using word processing software, or represent research information as tables or figures using a spread sheet application.
C3	I teach pupils using computers, presentation, and other software so they can make easy-to-understand presentations and express themselves.
C4	Using learning software, the Internet, and so on, I teach pupils by going over lessons repeatedly and practicing until the knowledge is firmly implanted and they become proficient.
(D) Ability to Teach Ethical ICT Behavior	
D1	I teach pupils to take responsibility for the information they send and their behavior in the information society, so they can exchange information considering the other person.
D2	As members of the information society, I teach pupils to observe proper rules and etiquette, and collect information and distribute information accordingly.
D3	I teach pupils how to understand the correctness and safety of information they find on the Internet and to take care of their health when using the Internet.
D4	I teach pupils basic knowledge of pass words, the importance of themselves and others, and other aspects of data security.
(E) Ability to Use ICT for School-Related Matters	
E1	I collect information I need for division of school duties and class management from the Internet, and then create documents and other materials using word processing software, spreadsheet applications, and so on.
E2	I seek to use the Internet, school network, and so on to exchange and share essential information to coordinate and cooperate more closely with teachers, guardians and the community.