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## Investigation of the Development of Educational ICT Courses on Pre-Service Teachers' Education Curricula

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INVESTIGATION OF THE DEVELOPMENT OF EDUCATIONAL ICT COURSES  
ON PRE-SERVICE TEACHERS' EDUCATION CURRICULA

by

Sayuri Kojima

A thesis submitted to the Graduate College  
in partial fulfillment of the requirements  
for the degree of Master of Arts  
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# INVESTIGATION OF THE DEVELOPMENT OF EDUCATIONAL ICT COURSES ON PRE-SERVICE TEACHERS' EDUCATION CURRICULA

Sayuri Kojima, M.A.

Western Michigan University, 2014

Considering the 21<sup>st</sup>- century children's characteristics and needs, teachers need to realize the importance and necessity of educational technology integration, and understand how to use technology to facilitate student-centered instruction and achieve meaningful outcomes. Also, teacher education colleges need to provide pre-service teachers with practical activities using educational technologies prior to their teaching career. This will encourage new generation learners to learn with technology.

This study was conducted at a national university in Japan with 67 pre-service teacher participants. The five central research questions of this study were specifically focused assessing the course takers' learning expectations in educational technology content, technological skills, and learning environments, through their respective teacher education program. This study addresses the questions, "What skills and applications do pre-service teacher think will improve/enhance the Media Tool course and, thus, help them to further develop their technology skills?" and "Do the skills that pre-service teachers perceived they learned through the Media Tool course align with the Japanese National Standards of Teachers' Pedagogical Skills in ICT?"

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Sayuri Kojima

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## **CHAPTER I**

### **INTRODUCTION**

#### **Statement of the Problem**

The new generation of students born after 1980, “Digital Natives” or “Net Generation” (Chen, Lim, & Tan, 2010, p.631; Kumar, & Vigil, 2011, p.144), have brought new educational needs, such as solving problems, taking initiative, using higher-order critical thinking skills, offering diverse perspectives, and working together (Reigeluth, 2002). Moje claims that the current teaching technique “is outdated in helping children meet their full educational potential, and needs to be replaced to better meet the needs of today’s students” (as cited by Leneway, 2014, p. 1). Each child should be allowed to progress and learn at different rates and pursue different goals at the same time in a new kind of transformed classrooms. However, it is not easy to design and implement new educational curricula and change traditional instruction to meet the learners’ needs. Considering the 21<sup>st</sup>- century children’s characteristics, teachers need to realize the importance and necessity of educational technology integration. Teachers should also understand how to use technology to facilitate student-centered instruction and achieve meaningful outcomes (Ertmer, & Ottenbreit-Leftwich, 2010).

Information and Communications Technology (ICT) is thought of as a set of tools that allows teachers to create learner-centered environments and guide learners on the

sideline in the classrooms (Reigeluth, 2002). Technologies can also be the methods for problem-based learning, project-based learning, simulations, customized tutorials, peer-assisted learning, and self-regulated learning (Reigeluth, 2002). If students expect these learning styles and use technologies in their classrooms, teachers need to train and master how to effectively integrate technologies into classes to meet these students' needs. Therefore, teachers are the key to successfully use technologies in education (Fisher, 2000; Teo, Lee, and Chai, 2008). According to Teo, Lee, and Chai (2008), "no matter how sophisticated and powerful the state of technology is, the extent to which it is implemented depends on teachers having a positive attitude toward it" (p. 129). Teachers need to understand their new roles to have positive attitudes for new generation students in the 21<sup>st</sup> century. There is significant evidence from a study by Leneway (2014), stating that teachers who possess both confidence and competence in their uses of technologies can have a positive impact on the students' analytical skills, such as thinking ability by comparing, contrasting, evaluating, synthesizing, and applying research.

However, throughout the decades, studies have stated that teachers do not have sufficient time, opportunities, and confidence to learn and practice teaching and learning technologies (Austin, 2004; Yigit, & Ozturk, 2012). Also, because of their limited time for preparing and personal preferences, teachers often skip over materials and lesson plans designed in curriculum guidances. Even if teachers might believe in ICT as a set of tools that helps them to support students more professionally and efficiently, they are likely to hesitate in integrating the tools into classes for a variety of reasons, which includes their lack of confidence and knowledge (Ertmer, & Ottenbreit-Leftwich, 2010).

More teachers, including experienced teachers, need to be trained to be aware of the necessity of ICT for the 21<sup>st</sup> century children's learning. In addition, teachers need to prepare to use technology more frequently in the classes based on the pedagogical competence gained from their teaching experiences.

When we think about teacher's development in knowledge, self-efficacy, pedagogical beliefs, and culture on technology integration, the best approaches for teachers to achieve these types of changes are professional development programs and teacher education programs (Ertmer, & Ottenbreit-Leftwich, 2010). As noted earlier, teachers need to be aware of the need and importance of technology, establish belief, and build confidence on the uses of technologies through opportunities, such as professional development programs. However, an analysis on data collected by Leneway et al. (2012), from three urban and one rural school district, during a four year period, through the Department of Education GEAR UP project at Western Michigan University, significantly showed that "teachers in this large study did not generally perceive professional development as currently offered by the schools to be of help regarding their "readiness" to use technology in the classroom" (Leneway, 2014).

Furthermore, effective training in teacher education programs will impact pre-service teachers' practical competencies on technology for teaching in the classrooms (Teo, Lee, and Chai, 2008). Pre-service teachers should have the opportunity to get familiar with different technologies and implement technology knowledge (TK) as well as improve pedagogical knowledge (PK) throughout the programs. The trained teachers will encourage their students to take initiative in learning with the technologies and skills

to survive the 21<sup>st</sup> century life (Graham, Borup, & Smith, 2012). Pre-service teachers also need to prepare to deal with the pressures that they will face when they start their teaching careers by acquiring pedagogical knowledge, and building confidence and belief on using educational technologies prior to graduating (Ertmer, & Ottenbreit-Leftwich, 2010). However, research studies in the past decades have concluded that teacher education curricula are not sufficient for pre-service teachers to train and practice the knowledge acquired. Also, teacher educators do not use enough technologies in their coursework (Austin, 2004).

Thus, as noted earlier, in order for teachers to encourage new generation learners to learn with technologies, teacher education colleges need to provide pre-service teachers with additional support prior to their teaching career (Yigit, & Ozturk, 2012).

### **Purpose of the Study**

The purpose of this research is to assess pre-service teachers' current learning of educational ICT knowledge and skills, in an educational technology course at a teacher education college in Japan, and to seek the proper learning contents for pre-service teachers in teacher education curriculum in Japan. The pre-service teacher participants completed the Media Tool course before going to their practice teachings. Therefore, the pre-service teachers have limited pedagogical knowledge (PK) to some extent, through the experiences of the teaching practice as well as technology knowledge (TK). In addition to what they learned in the course, this research explores what they expect to learn on ICT tools and ICT knowledge for teaching and learning. The study seeks to find



what types of Web 2.0 and ICT competencies needed for their future jobs as teachers. Moreover, this research assesses if the Media Tool course provides sufficient education to meet the Japanese national goals and standards of teachers' technical competences. This study will help university administrators in Japan on developing teacher education curricula to produce new teachers for new generation learners.

### **Research Questions**

According to the Center on Education and Training for Employment (1995), assessing learners' present level of achievement is the first necessary step in preparing sufficient instruction for the learners' effective learning environments. Therefore, first of all, the investigator will clarify what the survey participants had learned on ICT tools throughout an educational technology course, called Media Tool course, at a teacher educational college in Japan. Also, this investigator will explore the coursework characteristics in the course to understand in what types of learning environments the course takers learned about ICT throughout the coursework.

As noted earlier, assessing learners' present level of achievement is the first necessary step in providing sufficient learning environments. In the same way, conducting needs assessments is the first step to develop a program and course curriculum (Center on Education and Training for Employment, 1995). Therefore, this research survey will assess the course takers' learning expectations in educational technology content, technological competences, and learning environments, through their teacher education program, addressing the question, "Do the skills that pre-service

teachers perceived they learned through the Media Tool course align with the Japanese National Standards of Teachers' Pedagogical Skills in ICT?"

Lastly, this research aims to assess if the pre-service teachers' technological competencies, after taking the Media Tool course, aligns with the desired goals and standards for teachers' technical skills. Standards, which were set by the Japanese government in education and curriculum for developing course curriculum, are the basis for evaluating if the curriculum taught aligns with the written curriculum of schools that follow the set standards closely. In this study, the investigator used the standard established by the Ministry of Education, Culture, Sports, Science and Technology (MEXT).

Overall, the four research questions in this research are set:

1. Of the 10 items that comprise the Media Tool course, which ones did pre-service teachers perceived they learned?
2. Of the 15 items that describe the Media Tool course, which, according to pre-service teachers' perceptions, are the actual ones and the most effective ones in the knowledge-acquisition process?
3. What skills and applications do pre-service teacher think will improve/enhance the Media Tool course and, thus, help them to further develop their technology skills?
4. Do the skills that pre-service teachers perceived they learned through the Media Tool course align with the Japanese National Standards of Teachers' Pedagogical

Skills in ICT?

### **Null Hypothesis**

The hypothesis of this research is that the Media Tool course does not provide pre-service students with the needed knowledge and skills for using technology for teaching and learning in the classroom.

### **Assumptions**

This research's assumptions are:

- Pre-service teachers have access to the needed technology in their future classrooms.
- The Japanese National Standards of Teachers' Pedagogical Skills in ICT was set by the MEXT through valid research.
- Pre-service teachers will have varying knowledge on technology at the commencement of the Media Tool course.
- That the program sample is representative of a larger population of teacher educational programs in Japan.

### **Limitations**

There were three limitations in generating the results of this case study. The first limitation was that only one university served as a school site for this case study. In addition to the number of school sites, there was limited sampling ( $N=67$ ). With a limited number of school sites and samples, it would be difficult to detect and refer to the research results to enhance an educational technology course at a teacher education

college in Japan. Additional samples and cooperation of teacher practice programs need to be explored.

Another limitation was that this study focused on pre-service teachers' perceptions on the Media tool course. Collecting teacher educator's and in-service teachers' perceptions on using technologies to support pedagogical practices in a classroom would further clarify concrete needs and demands of course development.

An additional limitation was that the technology knowledge of the pre-service teachers was not determined prior to the commencement of the Media Tool course. The data would validate the need for pre-service teachers' improvement.

### **Definitions of Terms**

**Pre-service teachers.** Students who study in the teacher education programs.

**In-service teachers.** Teachers who already work at schools.

**ICT.** Information and Communication Technology.

**PK.** Pedagogical knowledge.

**TK.** Technology knowledge.

**MEXT.** Ministry of Education, Culture, Sports, Science and Technology in Japan.

## **CHAPTER II**

### **LITERATURE REVIEW**

#### **Introduction**

The new generation of students after 1980 is called “Digital Natives” or “Net Generation” (Chen, Lim, & Tan, 2010,p; Kumar, & Vigil, 2011,p). They grow up with digital technology, and fundamentally differ from the previous generations. The Digital Natives prefer to receive information quickly, have a low management for lectures, and use communication technologies to obtain information and share ideas via social and professional interactions (Chen, Lim, & Tan, 2010). They handle technologies quickly in their daily lives and expect to use new technologies in their education, actively rather than passively. Additionally, learning with technologies also has positive impact on learners’ communication skills, collaboration skills, problem solving skills, responsibility for learning, and achievement (Peterson, 2010). Considering this, teachers must combine technology and their pedagogical skills together and play an important role in enacting curricula to address the needs of today’s children. However, there are several serious barriers to transform teaching and learning with digital technologies, such as cost, time, professional development, policies, and more. Furthermore, relatively teachers lack of confidence in integrating technologies into their classrooms, and pre-service teachers do not have sufficient programs to cultivate technology skills for their future classes.

Given these situations, it is necessary to develop and transform curricula in teacher education programs for pre-service teachers to enhance educational technology skills and knowledge as well as improve pedagogical knowledge, for their future job as a teacher.

### **Effectiveness, Necessity, and Benefit of Educational Technology**

**Net Generation and educational technology.** The children in the Net Generation grow up surrounded by technologies like computers, video games, smart phones, on-line communication devices, and internet. These technologies are the media of choice for them (Leung, 2004). They tend to prefer independent learning style, and ask for greater variety of communication forms in their learning unlike traditional learning methods (Barnes, Marateo, & Ferris, 2007). According to Barnes, Marateo, & Ferris (2007), the 21st century students need “self-learning opportunities, interactive environments, multiple forms of feedback, and assignment choices that use different resources to create personally meaningful learning experiences” (p. 2). Also, learners in the New Generation progress at different rates to achieve each different goal at the same time in active learning not passive, and prefer a customization learning style rather than a standardization learning style (Reigeluth, & Joseph, 2002). The traditional instruction, teacher led learning, is not sufficient to meet needs of 21<sup>st</sup> century learners. According to Reigeluth & Joseph (2002), “it is not an exaggeration to say that technology is indispensable for allowing us to transform teaching and learning to better meet our children’s needs in the information age” (p.10).

Leneway (2014) addresses the question what impacts on the transformation of a

classroom with digital technologies for the children's needs. As noted earlier, instructors should be on the sideline in the classroom and support students to increase their great skills to survive in 21<sup>st</sup> century life. Leneway (2014) states that educational technology integration can promote the change from instructor led to student centered classrooms. He also concludes that students' achievements and skills, including collaboration skills, problem solving skills, responsibility, analytic skills, creative thinking skills, and communication skills, improve when the learners are engaged, and "engagement often results from providing opportunities that comes with many forms of digital technologies for student to take greater responsibility for their own student centered learning" (Leneway, 2014, p.14).

**Constructivism and educational technology.** Given the educational technology integration for the learners in 21<sup>st</sup> century, what type of perspective should be the basis for teachers to transform the classrooms? How should teachers and school leaders rethink their understanding of learning and prepare for a new educational system?

Several research studies have put emphasis on constructivist learning over the last a few decades (Şahin, 2003). Wilson (2012) states that constructivism learning theory is based on the following principles:

1. Learning is an active process of making meaning in the experiences and interactions with the real world.
2. Learning improves through planned problem solving and critical thinking activities, encouragement, and comprehension in experiential practices of

societies.

3. Learning is a collaboration, interaction, and interpretive discussion among the learners' social environment.
4. Reflection, assessment, and feedback through learning activities are extremely important.
5. Learners should realize their responsibility of learning and the learning process.

In the constructivist learning style, learners tend to take initiative in attending class activities using collaboration and interactivity (Şahin, 2003). Students are also encouraged to have discussion in addition to their critical and creative thinking for solving problems in the constructive learning process. Thus, constructive teaching makes it possible for students to learn actively through meaningful activities, not passive learning from teachers and textbooks, while meeting the learners' needs as stated before.

Also, the technology integration into the learning environment will support the building of a constructive learning style (Şahin, 2003). Technology can be a supportive tool for learners to access more rich learning contexts, have interactions among peers, and conduct collaborative discussions for solving problems inside and outside of classrooms. As noted earlier, technology is an ideal tool that changes instruction in classrooms. Gagliardi (2007) describes some effective roles of technology for teaching and learning such as the following:

- Technology supports learners to represent their knowledge, ideas, understandings, and beliefs.



- Technology can be an informational device to help search for new information, connecting learners with learners' prior knowledge, ideas, understandings, and beliefs, and constructing them.
- Technology makes learners face meaningful problems, situations, and contexts and share beliefs perspectives, opinions, disagreements, and comments for others.

Thus, integrating educational technology into classes based on constructivism is beneficial for learners to improve their achievements and necessary skills. Constructive teaching encourages effective technology usage, which can expand the possible instructional approaches with technologies for constructivist teachers. Also, to answer the question how should teachers and school leaders rethink their understanding of learning and prepare for new educational system, teachers and instructors need to be aware that constructive learning with technologies allows learners to support each other and learn collaboratively using information from individuals, to achieve their own learning goals and solve problems (Roberto, 2002; Gagliardi, 2007).

**Web 2.0.** As noted earlier, technology integration benefits students by improving the learners' necessary skills and achievements. Especially, collaborative learning benefits achievement by learning new ideas and information shared by peers. Williams and Johnson, Jonson and Smith argued that “studying collaboration found benefits of students working together including increased achievement, engagement, and pro-school attitudes” (as cited by Leneway, 2014, p.8).

According to Anderson (n.d.), “Web 2.0 tools utilize individual and group contributions to create value”. Web 2.0 is described as a platform for a host of commercial, entertainment, and learning applications. Web 2.0 tools for education can be used by both learners and teachers. Integrating Web 2.0 tools into classes can be the groundwork of “learning analytics”, “open content”, and “remote laboratories” (Johnson et al., 2013, p.4,5). For example, Social Book-marking helps users to collect their favorite websites and resource on the internet and put them in order in a platform by the tags system. The users also can see the other users’ pages and share each information, materials, and sources together. The users can make a network with others and effectively learn from these common materials via each platform (L. LeFever, & S. LeFever, 2007b). As another example, wikis and blogs allow users to add values by comments, edits, deletions of errors, and saves, and the users collaboratively create effective informational pages (Anderson, n.d.; L. LeFever, & S. LeFever, 2007ac). In 21<sup>st</sup> century, blog is likely to be used as professionally and personally, unlike 20<sup>th</sup> century using purpose such as newspapers that were just professionally written and published to the users. In the new way of using blog, the users can inspire and motivate each other by reading, quoting each personal blog and linking them together.

Thus, Web 2.0 tools are effective for group collaborative use. Also, learning content, resources, and data are broadly opened and shared for users’ easy access by using Web 2.0 tools. Most general learning activities in classrooms are conducted within a closed classroom, but Web 2.0 tools can open the class environment and connect learners to the world outside of the classroom. This effectively benefits their learning.

According to Anderson (n.d.), using Web 2.0 can offer the new opportunities for learners to manage their learning and access their necessary information, resources, tools, and services. Moreover, Web 2.0 tools encourage learners' expressive capacities, easily create communities for collaborative activities and knowledge shares, and offer learners with settings for attracting audiences to their products. All features of Web 2.0 are based on constructivism learning theory that is noted earlier. Moreover, Web 2.0 tools and applications are highly accessible, light, and low-cost, which support users to effectively prepare for life-longer learning.

### **In-service Teachers' Situations**

**Technology plan.** Given the effectiveness, necessity, and benefit of educational technology, teachers and school leaders should be encouraged to improve their instructional technology knowledge and skill and to build new school system and curricula with technologies (Bradshaw, 1997). Schools and school districts should collaboratively create organized educational technology plans declaring school visions and goals on technology integration. This technology plan could support the teachers on taking initiative to create change. Visualizing, planning, and financing a technology for classrooms are necessary steps for long-term technology plans to successfully achieve the goals. Furthermore, technology plans need to be created in terms of a partnership of school staff, students, parents, and community since each of the stakeholders has important roles to collaboratively accomplish school missions and transform learning.

One of the categories in a technology plan should be for teacher educational

technology. Teachers and school staffs who generate a technology plan need copious time to develop and master the effective practical use of technologies for reflecting on technology-based learning approaches through effective teacher professional development (TPD) for ICT (Vrasidas & Mclsaac, 2001). In-service teachers are required to take time and have incentives to participate in lifelong professional development activities based on the technology plan. Unless teachers are comfortable with technologies and familiar with strategies to usage strength of each technology for instructional programs, teaching and learning environment are not likely to change (Vrasidas, & Mclsaac, 2001). Therefore, teachers need to strive to cultivate technology integration knowledge and skill along with educational technology plans.

Educational technology plan ideally includes summary, stakeholder groups, vision statement, mission statement, goals, objectives, need assessment, general issues, conclusion and recommendations, acceptable use policy, technology and learning statement, technology standards, technology models for teaching and learning, staff development, technical support, budgets, and timeline. However, they are diverse depending on schools and the school districts. For example, compared Portage public schools 2011-2014 technology plan in Michigan (Vomastek & Rasmussen, 2012) and Miyagi prefecture ICT plan in Japan (2007), the former describes more technical service and policies to achieve the goals. On the other hand, the latter focuses on the results of effort and future problems, but not the specific goals and objectives, budget, and technical service. The positive impacts on technology integration could depend on an educational technology plan for school staff members, students, school areas, and

communities.

**Professional development.** As noted earlier, schools and the districts should share and provide teacher professional development (TPD) with instructors and school staff members, so that more instructors can challenge new instructive approaches with technologies to meet their students' needs. TPD is groundwork for teachers and school staff members to overcome barriers on the transformation of classrooms. According to Hooker (2008), TPD can be assigned into three broad categories: standardized TPD, site-based TPD, and self-directed TPD. First, standardized TPD typically characterizes a centralized approach such as workshops and training sessions. This TPD is characterized by offering new concepts, ideas, knowledge, instructional methods, and skills to large teacher populations throughout a country and region. Teachers are most likely to bring what they have learned back to their schools and classrooms after participating in workshops with less communication and collaboration between teachers. Also, the knowledge and ideas that they learned in the workshops flow from the top through less experienced instructors to the target group. Therefore, what they bring back is typically unsuitable for a wide range of situations or problems. Moreover, there is no continuity of support between workshops. Therefore, it is difficult to effectively transform schools and classes. On the other hand, local professionals in specific fields often conduct site-based TPD in local places such as schools, resource centers, and teachers' colleges. Also, this TPD focuses on a "more gradual process of learning, building master of pedagogy, content and technology skills" through continuing learning opportunities and collaborative approaches (Hooker, 2008). This TPD style also focuses more on individual

teachers' problems and local issues on new techniques for classroom practices. Teachers and participants bring their own perspectives and values underlying their practice, and form framework for understanding practice throughout established teacher communities. In the third TPD, self-directed TPD, teachers are independently encouraged to initiate and design their own professional development by sharing resources and plans as well as discussing solutions and results. Teachers, who take initiative in attending this style TPD and learning new perspectives and ideas from on-line communities of teachers, would be models of lifelong learning. Thus, TPD can be evaluated based on successive supports from teachers' instructors and their collaborative learning approaches. Professional development has to be designed, implemented, and evaluated to meet the needs of particular teachers in particular situations in order to have a positive impact (Kedzior, & Fifield, 2004). For example, a TPD about ICT needs to be designed for positively impacting school staff members' pedagogical skills, collaborations with colleagues, and technical knowledge, so that the participants can deepen their students' understanding and increase the students' motivation to learn with ICT tools. Furthermore, Kedzior and Fifield (2004) introduce Cognitively Guided Instruction (CGI) approaches, a model of TPD.

Kedzior and Fifield (2004) explained about CGI:

In CGI, teachers create models of how students think and solve problems. Teachers use these models of student thinking to develop instructional materials that address students' learning needs. CGI provides opportunities for teachers to deepen their own understandings of subject

matter, while they develop ways to teach it more effectively. (p. 3)

According to Kedzior and Fifield (2004), teachers with the CGI approach have the greatest impact on students' basic skills, confidences, and reasoning and problem-solving performances. It is most important that TPD coordinators and planners design frameworks for teachers to have individual access to effective materials, resources, and ideas. Hence, they are encouraged to solve individual problems in practice and improve the current situations.

However, there are barriers to deliver effective professional development to teachers. Most teachers have positive attitudes and perceptions toward using technology. However, educators and presenters need to deal with various barriers, such as a concern about cost, anxiety of time to cover classes, and management of personal time in the process of learning new technology (Pierce and Ball, 2009). Especially, in-service teachers do not think they have sufficient time for the practices to attend the professional development or facilitate their career development (Yigit, & Ozturk, 2012). They may regard teaching students to use educational technology as a time-consuming task. In-service teachers also tend to be irritated at thinking about where else they could be using their slight spare time more wisely. Vrasidas and Melsaac (2001) suggest that professional development programs for educational reform require increased funding and strong determination of all people involving the educational systems. It will be one of the solutions to allow teachers paid time to participate in professional development activities. "Changing the teacher competition structures and providing incentives can encourage teachers to participate in professional development activities throughout their careers and

develop lifelong learning skills” (Vrasidas & Melsaac, 2001, p.130). Thus, presenters of professional development should be mindful of barriers and present solutions for dealing with the barriers.

As noted earlier, the TPD presenters should provide sufficient professional development models for teachers to familiarize themselves with advanced instructive approaches to meet current students’ needs. However, in-service teachers realize that they do not have necessary technological competencies and feel comfortable to use them, and nor do they have necessary specific trainings to experience new technologies in the classrooms (Yigit, & Ozturk, 2012). Insufficient-content professional development has negative impact on in-service teachers’ reactions to educational technology integration. Pierce and Ball (2009) suggested that “professional development for teachers needs to address attitudes and perceptions as well as technological skill development” (p. 315). Hence, a successful transition from a traditional learning and teaching environment to a new meaningful one with technology requires teachers’ positive preparation and initiative. However, according to research by Piece and Ball (2009), nevertheless teachers expect students to enjoy learning and deepen their understanding with technology, only 57 % of secondary mathematics teachers ( $n=91$ ) agreed that learning with technology would result in increasing their students’ motivations to learn mathematics. Furthermore, “many K-12 teachers are currently more comfortable with text-based instruction and communication and may feel ill-equipped to harness the learning potential of visually based learning” (Leneway, 2014).

Therefore, TPD should provide teachers with effective experiential activities that



can validate their classroom practices with technology, and address teachers' attitudes and perceptions on educational technology integration for dealing with the barriers, this can end up increasing teachers' confidence and can-do attitude on educational technology integration.

### **Higher Education and Technology**

New ICT tools impacting the future of higher education will enable more learning opportunities. More universities around the world have recently provided online courses, online degree programs, and distance learning (Economist Intelligence Unit, 2008). Online courses allow the learners, such as single mothers, working professionals, and non-traditional students, to advance their careers and academic status without disrupting their lives. It is a perfect choice to get a degree, diploma, or certification that they need for their future, without going to classrooms. Some programs mix on-line learning and physical face-to-face learning, called blended learning. In addition to full online course and blended learning, there is flipped learning in which students prepare for classes by watching videos and reading new content as homework, and learn in the classes with project-based learning and personalized remediation. Gonick (2013) states that "within the next year or two, more than 50 million diverse open educational learners will find compelling motives to access the single largest, dynamic body of student-centered learning materials available". Thus, the communication technologies, such as online-collaboration tools, learning software, and learning management systems, are expected to improve academics in the future (Economist Intelligence Unit, 2008).

Today, universities' challenges are not only to provide students with satisfactory education in their fields, but also to develop their technology skills and knowledge required in the relative workplaces. Employers expect graduates to have necessary technology skills before starting working in their organizations. The Economist Intelligence Unit conducted a survey on the future of higher education to 289 executives from higher education and corporate settings. The executives responded to a question, "with regard to the following, how well prepared do you feel your country's university and college students are to compete in today's global marketplace?" Most of the percentage of responds was expertise in field of study (25%), followed by technology skills (19%), communication skills (14%), and critical thinking (13%). Moreover, The Partnership for 21 Century Skills informed us of five skills needed to survive and succeed in 21<sup>st</sup> century career and life from 1) the skill to solve complex problems, 2) the skill to think divergently and creatively, 3) analytic skills, 4) collaboration skills, and 5) communication skills (as cited by Leneway, 2014). Furthermore, considering employability and job-readiness skills, students need to be very familiar with not only collaboration but also independent decision-making through higher education programs with technology. Therefore, the future of higher education needs to prepare learners in the 21<sup>st</sup> century to be specialized through advanced curricula and teaching methodologies.

However, while universities think technologies and online courses as having a positive impact on students' academic and vocational success, university faculties and administrators recognize diverse passionate and hesitant attitudes toward the goal of integrating technologies into courses (Economist Intelligence Unit, 2008). The biggest

concern among higher education executives is cost. The budget of technologies is diverse depending on school type, such as private and public. Technology consulting, technology coordinator, and universities need to build collaborative teamwork for producing desired budget for fitting each situation and problem (Frazier, 2012). The technology coordinator also collects data as inventory and conducts professional development statistics with the planning committee of organization, assesses administrative, curricular, and infrastructure needs for developing funding that adequately meets the needs (Frazier, 2012). In addition to cost, universities challenge encouraging faculty members to adapt new technology to their teaching style. Not all faculty members follow the latest teaching style with technology, and some faculty members in tenure prefer traditional modes of instruction. They lack educational technology abilities. Experienced faculty members with technologies, who are familiar with the field, can support and stimulate the other faculty members by sharing new insights, values, and behaviors, and informing local digital conversion plans. Additionally, university's challenge for new instructive approaches with technologies is to build strategic leadership, which effectively drives organization, and set organized policies for avoiding a disruptive innovation in ways not anticipated. Higher education executives highly expect university information officers to develop university's key decision-making team, and lead to move the university forward with technology (Economist Intelligence Unit, 2008). A lack of appropriate instructional design staff members and the other technological support issues can delay the adoption of new technologies. Also, the adequate policies need to be set for preventing students' cheating, plagiarism, and on-line legal issues, and making students to understand

intellectual proper right and net-moral. Hence, universities challenged to deal with these situations and barriers are generating opportunities for faculties and university staff members, who have each specific background to support the university innovation to collaborate.

Given the technological innovation, the needs of net generation, and the required 21<sup>st</sup> century skills from companies around the world, higher education needs to promote educational systems for university innovation. Furthermore, university staff members, such as faculty members and administrators, should be aware of the new technological innovations and the possible impacts on learning opportunities for influencing the future of higher education.

### **Current Educational Situations with Technology in Japan**

The government in Japan aims to reach higher equipment rates that the other developed countries have achieved, addressing intelligible and visual classes with effective educational technologies such as computers and interactive whiteboards (Oogawara, 2010). The network environments at schools have been rapidly developed, such as intra-school LAN in classrooms and connection to the fast Internet (Oogawara, 2010). Numbers of students per a computer at overall elementary, middle, and high schools are decreasing year by year, and more teachers' official business computers and information management systems have been integrated into schools. Digital textbooks have shown great impact on the practical use of technologies for teaching and learning in educational environments in Japan (Oogawara, 2010). However, there are still gaps in the

maintenance and equipment rates between school regions. Metropolitan districts especially, are lagging behind in computer equipment in schools. Furthermore, Japan is still technically lagging behind in equipment and practical use of educational technology in schools, compared to the United States, the United Kingdom, and South Korea.

With a cross cultural comparison study on the current education state in Japan and the United States, Susono, Shimomura, and Trelfa (2003) revealed the following points; where information technology education conducted at schools in the United States was superior to the one in Japan:

- More connections to the Internet in ordinary classrooms and special classrooms via intra-school LAN.
- The number of computers at the school library.
- Setting media specialists at schools.
- More laptops used by students in a classroom.

Also, teacher education colleges in the United States provide pre-service teachers with adequate system infrastructures and services, to which Japan should refer for enhancing the curricula and programs at universities of education. Nagata (2006) reported about electronic teaching portfolios (e-portfolio) in the school of education at University of Wisconsin-Madison, aiming to enact the integration of the online teaching portfolio system into teacher education programs in Japan. According to her, one of the main purposes of creating e-portfolios was to improve ICT skills. Through the process of creating an e-portfolio, the pre-service teachers can train their necessary ICT knowledge

and skills, such as access to the necessary information and creating documents and materials using ICT tools. Additionally, Watari and Nakajima (2007) reported that the Center for Teaching and Learning (CTL) at Stanford University provided all of the faculty members and teaching assistants with effective and flexible Faculty Development (FD). The FD includes sufficient individual support and practical workshops on course design using useful technologies to support learning environments for students. On the other hand, according to Watari and Nakajima (2007), the current FD in universities in Japan is constructed around a lecture meeting style, and the faculty members do not perceive that the FD is meaningful to develop their abilities. Considering these comparisons, it is also obvious that schools and universities of education in Japan are lagging behind in supporting learning environments for all learners, including children, faculty members, and pre/in-service teachers, compared to the United States.

However, as noted earlier, more schools and regions in Japan are trying to integrate new technologies and transform learning environments. More teachers and schools have challenged to combine a blackboard and an interactive white board in classrooms for presenting understandable class contents (Shimane Prefecture Educational Center, 2012). In addition to interactive white boards, teachers who are aware of the effectiveness of educational technologies, also integrate document cameras, digital cameras, video cameras, projectors, digital televisions, notebook computers, digital textbooks, and tablets into their classrooms. A report by Shimane Prefecture Educational Center (2012) also claims that teachers who effectively use ICT for learning are encouraged to take professional development related to ICT practical uses for providing

more comprehensible classes with technologies. As an example, the experienced science teachers in a class that uses technology would provide students with visual learning to understand abstract objects and motions through the use of interactive white boards, document cameras, personal computers, projectors, and digital cameras. Another example is with arithmetic teachers, where first-grade students are encouraged to do exercises to increase their proficiency, using personal computers. In a music class by using projector and document camera, instructors reduce time for preparing an enlarged copy and large papers of lyrics and codes. Also, the students can be encouraged to participate in the class activities. Thus, this Shimane prefecture wants to familiarize teachers with effective technologies for integrating them into their classrooms, such as in the teaching of Mathematics, English, History, and Special Education.

Furthermore, along with popularization of digital textbooks, internet at schools and homes, software for education, and Open Educational Resources (OER), flipped learning courses have become popular from elementary to higher education in Japan (Shigeta, 2013). As noted earlier, flipped learning is that students learn on new contents by digital materials, such as videos, as their homework, and bring the knowledge and ideas to their classes and learn in the classes by project-based learning, discussion, problem-based learning, and personalized remediation. For the past five years, flipped learning has come under the global spotlight, especially in Western countries. Although the number of the examples of flipped learning is still limited in Japan, several schools and universities currently have integrated it into learning environments (Shigeta, 2013). For example, all newly-enrolled students from 2013 at Kinki University High School

purchased iPad, and used it in English and Mathematics class by flipped learning. The school introduced Learning Management System (LMS) for sharing digital materials with the students. As a result, in both of the English and Mathematics classes, students could have more time to have collaborative activities among themselves, and enhance their skills and knowledge. The activities increased communications between students and teachers as well. The flipped learning also promoted the progress of the classes. As a result of another example, Hokkaido University could enhance students' discussion performances by integrating flipped learning. Students could be encouraged to attend the course as well (Shigeta, 2013). Thus, the current practices of flipped learning in Japan have clarified that teachers can “humanize classrooms” (Khan, 2011) by using technology, instead of the traditional “one-size-fits-all lectures” where students have no interaction with each other (Khan, 2011).

As previously mentioned, schools and universities in Japan have challenged themselves to integrate new technologies into learning environment over the past decades. However, the number of OER in Japanese language is limited, compared with the quality and quantity of OER in Western countries (Shigeta, 2013). Teachers need to enhance their skills to create their own digital materials by such as Camtasia Studio. Service of repository for OER, that the other teachers can access, is also required to promote this innovation. Thus, overall, schools and universities in Japan are still technically lagging behind in equipment, practical use of educational technology, and learning effective and have several considerations for transferring learning environments with new educational technology, such as cost for technology integration, information-security management,



and instructors' expertise in making effective new learning environments.

### **Current Curricula of Teacher Education**

**Technological Knowledge (TK), Pedagogical Knowledge (PK), and Content Knowledge (CK).** TPACK framework was originated from the technological knowledge (TK), pedagogical knowledge (PA), and content knowledge (CK) (Mishra, & Koehler, 2006). The interaction among TK, PK, and CK determines how effect technology integration will be (Chai, Koh, & Tsai, 2010). TK has become important when pre-service teachers make connections between TK, PK, and CK and TPACK. Literature to date has reported that teachers who have gained greater proficiencies in technological skills compel to integrate technology into learning environment (Chai, Koh, & Tsai, 2010). However, knowledge of technology, such as how to use technologies, is only the groundwork (Ertmer, & Ottenbreit-Leftwich, 2010). Teaching with technology requires teachers to further developed pedagogical skills. In-service teachers who have vast pedagogical experiences and knowledge will more effectively integrate technology into their classrooms. Pierson (2001) observed that teachers with vast experience and PK tend to make the pedagogical-technology connection, and often use technological tools for teaching. On the other hand, he also found that teachers with limited PK cannot make such a connection even if they have vast TK. "The focus on technological skills can become increasingly important when teachers gain a certain comfort level with their pedagogical skills" (Chai, Koh, & Tsai, 2010, p. 70). Additionally, to use technology to optimize student learning, teachers need CK; based on which, teachers can decide on most apposite ICT resources to enable the students to achieve the learning goals (Ertmer,

& Ottenbreit-Leftwich, 2010). As noted earlier, the acquirement of reliable and valid PK is prerequisite for pre-service teachers to increasing TAPCK. The future developed ICT course should strongly help pre-service teachers to develop pedagogical base before instruction in technological tools. The course should also provide design activities which facilitate pre-service teachers to make relations between PK, TK, and CK (Chai, Koh, & Tsai, 2010).

When considering the ICT course impacting on development of pre-service teachers' knowledge, up to date, teacher educators still need to debate and consider what compose a good educational technology program, and re-design the curriculum in terms of TPACK. Chai, Koh, and Tsai (2010) concluded that "a better understanding of the relationships between TPACK constructs can inform the design of ICT programs for both pre-service and in-service teachers" (p. 71).

**Informal vs. educational use.** In the several decades, researchers have studied on pre-service teachers' skills, attitudes, and beliefs for technology. Recently, pre-service teachers are likely to pay attention toward new technologies such as Web 2.0 for creating learner-centered environment. However, these studies have revealed that pre-service and in-service teachers do not have sufficient competencies of using technologies for educational purpose in their fields. Chen, Lim, & Tan (2010) researched pre-service teachers' ICT experiences and competencies and found that there are still a gap between pre-service teachers' daily ICT using competencies and that of ICT for teaching and learning. Among new-generation pre-service teachers ( $n=1554$ ), more than 80% of them have familiarity with the access to media consumption tools, such as sending/receiving

emails, chatting online, social networking website, participating in message boards, watching videos/videocasts, listening to music/ audio podcasts, reading online news, and searching information online. On the other hand, the research revealed that over 70 % of the pre-service teachers had not used ICT devices for learning and teaching in their classrooms, such as storyboarding/comics creation tools, visual learning and conferencing platforms. Kumar & Vigil (2011) also compared pre-service teachers' formal use of different technologies and their educational use, including online forums, social bookmarking, Google Docs, Blogs, Wikis, Podcasts, and online videos. The researchers found that pre-service teachers more often used these new technologies for the informal purposes than for the formal purposes in their teaching activities. Non-educational purpose uses of technologies, such as social communication and entertainment, are more common and general among pre-service teachers, and they do not have sufficient ideas how to best use the ICT competencies for teaching and learning (Kumar & Vigil, 2011).

**Curricula and teacher educators.** When considering the teacher education program and its curriculum that are associate with pre-service teachers' knowledge and skills of using technology, teacher education college courses do not provide pre-service teachers with sufficient practice to cultivate technology skills in their future classrooms (Wild, 1995; Chen, Lim, & Tan, 2010; Kumar & Vigil, 2011). As noted earlier, Pre-service teachers learn to use technologies informally rather than creating and implementing online teaching content through their teacher education programs.

One of the strategies for reducing the gap between what they know and what they

do is associated with their confidence, or self-efficacy, for performing the task successfully (Ertmer, & Ottenbreit-Leftwich, 2010). Experiential practices within the college classroom and through field experiences will help students to develop skills using technology as an instructional tool, which coincidentally helps students deal with their fears of changing and making mistakes.

Şahin (2003) suggested that teacher education programs should provide learner-centered environments based on constructivism so that pre-service teachers can build confidence through field experiences developing their skills. He explored pre-service teachers' perceptions in the Instructional Technology and Material Development course, and revealed that over 90% of the pre-service teachers ( $n=80$ ) expect being active in their courses through the learning process. As noted earlier, constructivism learning approach can make it possible for pre-service teachers to learn actively through experiential trainings, and each learner can gain personal mastery.

Additionally, to help pre-service teachers gain their necessary skills, knowledge, and perspectives, teacher education programs need to provide them with more opportunities to see instances of technology integration. "The more examples our pre-service teachers observe, the more likely they will gain both the knowledge and confidence they need to attempt similar uses of technology in their own classrooms" (Ertmer, & Ottenbreit-Leftwich, 2010, p.269). While pre-service teachers have to be aware of new technologies, and adopt them to both personal and educational use for their future students, as noted earlier, teacher educators' technology uses in the course activities are also one of the strategies for gaining pre-service teachers' educational

technology abilities (Vrasidas, & Melsaac, 2001; Chen, Lim, & Tan, 2010; Kumar, & Vigil, 2011; Yigit, & Ozturk, 2012).

Findings, by Wild in 1995, were actually inconsistent with the above quotations. Wild (1995) conducted questionnaires to pre-service teachers ( $n=161$ ) who had experienced teaching practice after taking university ICT courses. In the study, he revealed that 83 % of education major students did not make any use of ICT at all during their teaching practice, and 91 % of them did not use ICT tools for personal work, such as lesson preparation during the teaching practice. The survey data also showed that 72% of supervising teachers had used ICT tools at least once during the period of the teaching practice that the pre-service teacher participants in the study attended. The findings did not coincide with the previous indication that there was a positive association between supervising teacher use and student use of ICT on practice. However, the educators in the 21<sup>st</sup> century have highlighted that teacher educators need to provide pre-service teachers with more educational projects that require pre-service teachers to create content using pedagogical methodology and new technologies for activities such as brainstorming, collaboration, communication, and presentation (Kumar, & Vigil, 2011).

Moreover, Etoh, Imada, Suzuki, & Nakamoto (2011) researched Japanese pre-service teachers' expectations to the teacher educational programs. They concluded that pre-service teachers highly desire to acquire licenses and certifications, learn new knowledge and technical academic knowledge, and deepen knowledge. The study suggested that teacher educators and course designers should consider what students are expect to learn, and how the educators and designers can make pre-service teachers feel

the “newness” through coursework.

As noted earlier, pre-service teachers do not have sufficient confidence and competencies to use new technology in their future job as a teacher. Therefore, changing and developing teacher education program and curriculum, including teacher educators’ uses of technology in curriculum, will enable pre-service teachers to have familiarity with different ICT devices and applications for teaching, as well as pedagogical beliefs and practice (Vrasidas, & Mclsaac, 2001; Wild, 2006; Chen, Lim, & Tan, 2010; Kumar & Vigil, 2011; Yigit, & Ozturk, 2012).

Considered all of the three points, educational technology effectiveness, impractical and insufficient curricula for pre-service teachers, and current inflexible conditions for in-service teachers, it is likely important to develop teacher education curricula and programs with emphases on practical activities with technologies for teaching and learning.

## **CHAPTER III**

### **RESEARCH DESIGN AND METHODOLOGY**

#### **Introduction to the Chapter**

The purpose of this study was to obtain an understanding of pre-service teachers' current learning on educational technology at a teacher education college in Japan, and assess if the Media Tool course provides sufficient education to meet the Japanese national standards of teachers' technical skills. Understanding pre-service teachers' expectations to learning educational technology and the actual learning situation will assist university administrators and faculty members in providing leadership for enhancing curricula.

Chapter three is organized into eight sections. They include: (1) introduction to the chapter; (2) research question; (3) research design; (4) data collection procedure; (5) human subjects review; (6) samples; (7) instrument; and, (8) data analysis.

#### **Research Questions**

According to Center on Education and Training for Employment (1995), assessing learners' present level of achievement is the first necessary step in preparing sufficient instruction for the learners' effective learning environments. Therefore, first of all, the investigator will clarify what the survey participants had learned about ICT tools

throughout an educational technology course, called Media Tool course, in a teacher educational college at a national university. Also, this investigator will explore the coursework characteristics of the course to understand in what types of learning environments the course takers learned about ICT through the coursework.

As noted earlier, assessing learners' present level of achievement is the first necessary step in providing sufficient learning environments. In the same way, conducting needs assessments is the first step to develop program and course curriculum (Center on Education and Training for Employment, 1995). Therefore, this research survey will assess the course takers' learning expectations in educational technology contents knowledge, technological skills, and learning environments, through their teacher educational program, addressing a question, "what do students want to learn in the Media Tool course?" and "how do students want to learn in the Media tool course?"

Lastly, this research aims to assess if the pre-service teachers' levels, after taking the Media Tool course, align with desired goals and standards of teachers' technical skills. Standards set by the government in education and curriculum for course curriculum are the basis for evaluating if the taught curriculum are align with the written curriculum of schools that follows the set standards closely. In this study, the investigator used standards established by the Ministry of Education, Culture, Sports, Science and Technology (MEXT).

Overall, the four research questions in this research are set:

1. Of the 10 items that comprise the Media Tool course, which ones did pre-



service teachers perceived they learned?

2. Of the 15 items that describe the Media Tool course, which, according to pre-service teachers' perceptions, are the ones most effective in the knowledge-acquisition process?
3. What skills and applications do pre-service teacher think will improve/enhance the Media Tool course and, thus, help them to further develop their technology skills.
4. Do the skills that pre-service teachers perceived they learned through the Media Tool course align with the Japanese National Standards of Teachers' Pedagogical Skills in ICT?

### **Research Design**

A combination of quantitative and qualitative instruments was employed to conduct the study through the questionnaire. The combination of quantitative and qualitative methods, or what is known as mixed methods research (Gall, M., Gall, J., & Borg, W., 2007), was used in the study to compensate for what is hard to do with a mono-method research. A questionnaire designed to gather data on the current teacher education curriculum phenomenon will be administrated to pre-service teachers. This research was conducted with a non-experimental one-group post-survey design.

### **Data Collection Procedure**

This study procedure is composed by four primary steps: (1) deciding samples, (2) obtaining permissions to recruit samples, (3) accessing to Human Subjects

Institutional Review Board (HSIRB), and (4) collecting survey questionnaires.

**Step 1: Deciding samples.** The pre-service teachers who had completed a course related to educational ICT tools, experienced teaching practice were adequate for this research since the targets should have had a certain degree of technological and pedagogical knowledge. Moreover, the target should have been aware of educational problems that could be solved with educational technologies, through their academic learning and pedagogical experiences, since the investigator wanted the study participants to associate education and effectiveness of technologies. Consequently, junior and higher level students in educational department of a certain national university were chosen as a convenience sample.

**Step 2: Obtaining permissions to recruit samples.** The investigator emailed faculty members who opened seminars to pre-service teachers fitting in the research conditions as the convenience sample, to obtain their permissions to the survey. The email mainly explained the purpose and targets persons of this study. Each faculty member, who had responded the email, confirmed the pre-service teachers' intentions to participate in the survey. Each of the faculty members contacted back for settling the date to conduct the survey during a section in their seminars, if they verified their students' intentions to participate in the survey.

**Step 3: Accessing the Human Subjects Institutional Review Board (HSIRB).** The Human Subjects Institutional Review Board (HSIRB) is a local review board, protects the rights and welfare of human subjects in research conducted under the

guidance of Western Michigan University. To access HSIRB forms, the investigator submit protocol and application materials for review to HSIRB chair. After revising several parts on the materials following guidance from HSIRB, the investigator obtained a project approval form informing a permission of implementing the research as described in the application.

**Step 4: Collecting survey questionnaires.** The investigator visited one session of each seminar under permission from the faculty, and conducted the survey to collect the questionnaires. The investigator explained about the survey and study sharing an introduction letter on the questionnaire with the participants. Once the potential participants decided to join the research, the student participants filled out a short survey. It took about less than 15 minutes for each participant to finish the questionnaires.

### **Human Subjects Review**

As required by the Western Michigan University, an institutional process review was completed for this case study. The participating school site in Japan did not have this process requirement; however, permissions through email were secured from the university's principal and the faculty members authorizing participation in the study. An email explaining the purposes and process of this study was sent to each of the 14 seminars' faculty members, and they explained the junior and higher level students in their seminars to obtain permission from the participants. The email to one faculty member for the survey instrument may be viewed in Appendix A as an example.

The introductory letter explaining the purposes of this study were checked by the

participants before starting the survey. Also, the letter denoted that all participants could answer questions that they felt comfortable responding, and they could choose to stop participating in the study at any time for any reason, without any prejudice or penalty. The introductory letter also the participants would be able to receive the study results if they would like to. The informed consent letter for the survey instrument may be viewed in Appendix B.

A copy of the Western Michigan University Human Subjects Institutional Review Board (HSIRB) Approval letter may be found in Appendix E.

## **Samples**

**Selection of the participants.** The participants in the study were pre-service teachers in a teacher education program of a national university in Japan. There are three main reasons to have selected participants; they had, to some extent, 1) technological skills and knowledge, 2) pedagogical knowledge, and 3) comprehension of educational problems. First, the university opens the Media Tool course in which students are involved in several ICT tools. All of the participants are required to take this course in their first two semesters. The Media Tool course is set in the curriculum at the university by law to graduate from a teacher educational college in Japan. In Japan, a pre-service teacher at a teacher educational college is not depicted a student who will certainly become teachers in their future. Students in a teacher education department in Japan are required to take necessary courses to graduate and obtain a teaching license from a board of educational in their school district. The Media Tool course is one of the required

mandatory courses for the students to obtain the license. Therefore, they had completed the course before the survey and learned about ICT tools.

The investigator focused on junior and higher level students as the participants in this study, since they had already an experience of teaching practice related to their own specialized majors; the investigator inferred that they had a deeper understanding on pedagogical situations and needs. The investigator obtained permissions from the participations through the faculty members who were in charge of 14 kinds of seminars. Each seminar accommodates only 1 to 10 students, and all junior and higher level students are assigned into one seminar in accordance with the students' desires. The seminar's purpose is to develop students' skills and knowledge of educational research, following their own interest topic for their graduation thesis. Each seminar is managed by one faculty in specialized educational fields. The 14 seminars' faculty members, who authorized the survey, belong to the following 12 educational majors: (a) Cross-Cultural Studies, (b) Japanese, (c) English, (d) Health and Physical Education, (e) Natural Science, (f) Arithmetic/Mathematics, (g) Preschool Education, (h) Clinical Pedagogy, (i) School Psychology, (j) Special Education, (k) Home Economics, and (l) Social Study. Under guidance of each professor, the participants prepared for investigating appropriate basic research, based on their topics for their thesis, and analyzing the data. Hence, the participants comprehended educational problems, that they would need to solve or research, throughout the seminar.

Consequently, overall the participants were invited to this study for the following reasons:

- The pre-service teachers had taken a course involved to ICT tools.
- The pre-service teachers have practical teaching experiences and a certain degree of pedagogical knowledge.
- Each student had defined their own research problems in their specialized fields, and may be able to associate these problems with effectiveness of educational ICT tools for teaching and learning.

**Samples data.** There was one person who did not satisfy the condition of the study, so the investigator deleted that person's data, which result in the reduction of the sample size to 67 ( $N=67$ ). Since senior level students had prepared for the Teacher Employment Examination, senior level students were 29 (43.3%), which was slightly less than the participants from junior level students, 38 (56.7%). Each of the participants are in educational majors of Cross-Cultural Studies, Japanese, English, Health and Physical Education, Natural Science, Arithmetic/Mathematics, Preschool Education, Clinical Pedagogy, School Psychology, Special Education, Home Economics, or Social Study. All of the participants had teaching practice in at least one kindergarten school, elementary school, middle school, high school, special support education school, or others for about one month throughout their junior to senior school year. Some students electively attended more than one school to obtain other kinds of school teaching licenses or/and gain experience value.

### **Instrumentation**

In this study, a questionnaire was administered for collecting the data following

the four research questions: 1) Of the 10 items that comprise the Media Tool course, which ones did pre-service teachers perceived they learned?; 2) of the 15 items that describe the Media Tool course, which, according to pre-service teachers' perceptions, are the ones most effective in the knowledge-acquisition process?; 3) What skills and applications do pre-service teacher think will improve/enhance the Media Tool course and, thus, help them to further develop their technology skills?; 4) Do the skills that pre-service teachers perceived they learned through the Media Tool course align with the Japanese National Standards of Teachers' Pedagogical Skills in ICT?

This questionnaire was developed by this investigator to perceive the pre-service teachers' learning in ICT tools through an educational technology curriculum. The questionnaire was composed of 28 questions including multiple choice items and open-ended questions:

- Survey Questions one through four were for describing the samples in this research.
- Survey Question five was a multiple choice question to indicate what ICT tools the survey participants think they learned about, through the educational technology course. The answer choices of ICT tools were selected as representations of Web 2.0 tools.
- Survey Question six, a multiple choice question, focused on clarifying the pre-service teachers' perceptions of the Media Tool course's characteristics. This question's choices were developed referring to tables that were presented as "the perception of 3rd grade students" and "the perception of 4th grade

students” in a report by Sahin (2003).

- Survey Question seven was also a multiple choice question with the same choices as Question six. This survey question developed on Research Question two, asked about the pre-service teachers’ expectations for course characteristics.
- Survey questions eight through 25 were retrieved from the National Standards of Teachers’ Pedagogical Skills in ICT, which was established by the Ministry of Education, Culture, Sports, Science and Technology (MEXT), to develop on Research Question four which indicates if what the students learn in the Media Tool course aligns with The National Standards of Teachers’ Pedagogical Skills in ICT.
- Lastly, the survey questions 26 through 28 were open-ended questions, which were to answer Research Question three, “what skills and applications do pre-service teacher think will improve/enhance the Media Tool course and, thus, help them to further develop their technology skills?”, to understand their expectations regarding learning contents, ICT tools, and technical skills. The pre-service teacher participants were allowed to write multiple answers.

The investigator also developed this questionnaire aiming to improve coursework and instructional approaches to teach educational technology in teacher educational program in the future by referring to the data. The questionnaire may be viewed in Appendix C. The National Standard for Teachers’ Pedagogical Skills may be viewed in Appendix D.



## **Data Analysis**

The questionnaire survey in this study has totally 28 questions. The data in the survey questions one through 25 were analyzed using SPSS. Also, the open-ended questions, or the qualitative data, in Question 26 through 28 were analyzed using deductive approaches. The data about the samples, their school years, majors, and information on their teaching practice, were analyzed from the research questions one through four. The analyzed data was summarized in tables showing frequency and percentage. When analyzing the data of the pre-service teacher participants' major, the investigator merged Japanese and English majors into a unit of category, named Language, to reduce the numbers of the categories. Similarly, the investigator did the same to the following two pairs of the majors, Natural Science and Mathematics majors, and Preschool Education and Clinical Pedagogy. Twelve categories of major were collapsed to nine categories, cross-cultural studies, language, health and physical education, science and mathematics, preschool, clinical pedagogy and psychology, special education, home economics, and social study. Correspondingly, in analyzing data for describing frequency and percentage of subjects that the participants taught during their teaching practice, the categories were also merged. The original number of the categories was 20 since subjects' content varies between grade levels. For analyzing the data, the investigator combined similar subjects, such as geography, history, chemistry, biology, and physics. The 20 categories of subjects were collapsed to nine categories, Art/Calligraphy, Physical Education, Music, Life Environment Studies/ Vocational-Technical Education/Moral Education/ Home economics, Social Studies, Mathematics,

Science, Language, and others. Each data analysis to answer Research Questions one through four will now be explained in detail.

**Analysis for research question one.** Research Question one focuses on understanding what pre-service teachers learned in a course related to ICT tools. The data of the survey question five (what ICT did you learn in the Media Tool course?) was analyzed by descriptive statistics showing frequency and percentages of ICT tools that the participants think they learned throughout the course. Since there were missing data in the survey Question five, the investigator looked at the valid percentage for making the percentages be equal.

**Analysis for research question two.** The pre-service teacher participants were surveyed about their perception of the Media Tool courses' characteristics by analyzing data from the survey Question six and seven, to answer Research Question Two: Of the 15 items that describe the Media Tool course, which, according to pre-service teachers' perceptions, are the actual ones and the most effective ones in the knowledge-acquisition process? The survey Question six focuses on figuring out the actual course characteristics, while the survey Question seven focuses on ones demanded by the pre-service teachers. The analyzed data were described with the frequency and percentage. Since the data from the survey Question six and seven also included missing data, the valid percentages were taken as real percentage values for each choice. The questions' choices on the course characteristics were same, so that this research clarified which are the actual ones and most effective in the knowledge-acquisition process.

**Analysis for research question three.** Research Question three, “what skills and applications do pre-service teacher think will improve/enhance the Media Tool course and, thus, help them to further develop their technology skills?”, was developed with data from opened-ended survey Questions 26, 27, and 28. All of the three questions were examined through qualitative data analysis approach. They were analyzed by emergent category of response. The investigator took each individual’s answers and coded them just once for the most comprehensive category into which any of its codes fell. The qualitative data analysis was employed after conducting the quantitative data analysis for an in-depth understanding of the study results.

**Analysis for research question four.** Chi-square goodness-of-fit tests for the survey questions eight through 25 was used to determine if the number of observed frequencies for improved skills were different from the expected values between “yes” and “no” responses, to answer Research Question four: “Do the skills that pre-service teachers perceived they learned through the Media Tool course align with the Japanese National Standards of Teachers’ Pedagogical Skills in ICT?” The adjusted significance level is 0.0027. This significant level was calculated by using Bonferroni correction in order to prevent the inflated Type I error; which was 0.05 divided by the number of tests. Therefore, the new adjusted significance was  $\alpha=0.05/(25-8+1)=0.0027$ . Also, each of the questions has: “Yes”, “No”, and “I do not know”. The investigator omitted a number of occurrences of “I do not know” answers from the data of the 17 sub questions, and conducted the Chi-square test of Goodness fit between “yes” and “no” for each of the survey questions eight through Question 25. Where significant differences were detected,

the investigator also calculated effect size, using statistics  $w$  suggested by Cohen (1988). Interpretation of the magnitude of  $w$  was indicated to the values, .10, .30, and .50 correspond with small, medium, and large effect, respectively.

### **Summary of the Chapter**

The purpose of the research was to assess pre-service teachers' current learning on educational ICT knowledge, skills, and abilities at a teacher education college in Japan, and to seek proper instruction on educational ICT tools in a teacher education curriculum addressing the learners' needs and national standards. This knowledge and findings will assist administrators at a teacher educational college in providing leadership for enhancing a curriculum with technologies. This chapter defined the design of this case study, research procedure, samples, and instrument to answer the research questions. Chapter four describes the data results of this research.

## **CHAPTER IV**

### **DISCUSSION OF THE FINDINGS**

#### **Introduction to the Chapter**

The purpose of this chapter is to present the findings that the investigator has discovered from the data addressing the four research questions: 1) Of the 10 items that comprise the Media Tool course, which ones did pre-service teachers perceived they learned?; 2) Of the 15 items that describe the Media Tool course, which, according to pre-service teachers' perceptions, are the actual ones and the most effective ones in the knowledge-acquisition process?; 3) What skills and applications do pre-service teacher think will improve/enhance the Media Tool course and, thus, help them to further develop their technology skills.; 4) Do the skills that pre-service teachers perceived they learned through the Media Tool course align with the Japanese National Standards of Teachers' Pedagogical Skills in ICT? This chapter will provide detailed information about each of the four research questions that guided this case study.

#### **Description of Participants**

The data for this study was collected from pre-service teachers who are junior and higher level at a teacher education college in Japan. Junior and higher level students at this university have taken a course related to ICT tools, and experienced teaching

practice at schools. Sixty seven pre-service teachers completed the questionnaire survey. Junior level pre-service teachers were 38 (56.7%) and senior level students were 29 (43.3%).

The participants were divided between the educational majors of Cross-Cultural Studies, Japanese, English, Health and Physical Education, Natural Science, Arithmetic/Mathematics, Preschool Education, Clinical Pedagogy, School Psychology, Special Education, Home Economics, or Social Studies. Table 1 lists the participants by their majors. As indicated by Table 1, the majority of the survey participants, or 28.4 %, belonged to the Clinical Pedagogy and School Psychology majors.

Table1

*Participants' Major*

Students	Frequency	Percent
Clinical Pedagogy, and School Psychology	19	28.4
Science and Mathematics	14	20.9
Language	12	17.9
Social Study	6	9.0
Cross-Cultural Studies	5	7.5
Preschool	4	6.0
Special Education	3	4.5
Health and Physical Education	2	3.0
Home Economics	2	3.0
Total	67	100

All of the participants had teaching practice in at least one kindergarten school, elementary school, middle school, high school, special support education school, or others for about one month throughout their junior to senior school year. Table 2 shows detailed information on the kind of schools, where they had been for the teaching practice, reported by the survey participants. In the others category (3.0%), there was one pre-service teacher who had experienced teaching practice at a children's nursing home, and one pre-service teacher had done it at the Maternal and Child Living Support Facility.

Table 2

*Schools for Teaching Practice (N=67)*

Student	Frequency	Percent
Kindergarten	5	7.5
Elementary School	34	50.7
Middle School	31	46.3
High School	3	4.5
Special Support School	5	7.5
Others	2	3.0

Depending on their major and the kind of school where they trained, the participants also taught several subjects during their teaching practice. Table 3 displays detailed information on the subjects that the participants were assigned with during their training. The majority of the participants, 56.7%, taught Language during their teaching practice. Also, 50.7 % of the survey participants were assigned with Mathematics classes, including Arithmetic for elementary school level. Moreover, all of the four participants (6.0%) who taught “other” were pre-service teachers who went to special support

education schools for their teaching practice.

Table 3

*Subjects during Teaching Practice (N=67)*

Student	Frequency	Percentage
Art/Calligraphy	7	10.4
Physical Ed.	15	22.4
Music	14	20.9
Life Environment/VTE/Moral/Home Eco	30	44.8
Social Study	15	22.4
Math	34	50.7
Science	15	22.4
Language	38	56.7
Others	4	6.0

### **Findings for Research Question One**

Research Question one focuses on assessing which ICT tools pre-service teachers thought they learned in the Media tool course. The pre-service teacher participants were surveyed about the types of ICT tools that they had learned in the Media Tool Course through their curriculum. The participants were asked to check all applicable categories in the survey question. Table 4 lists the ICT tool types that the participants thought they learned in the course. Sixty seven pre-service teacher participants ( $N=67$ ) answered this survey question. Based on the table, the majority of the pre-service teachers think that they learned Word (86.2%) and PowerPoint (73.8%) through this course. Also, 27.7% of the participants thought they used and learned Excel. However, no participant thought the



course provided a chance to learn Interactive Whiteboard, Social Bookmarking, Screencast, or Audio Podcast. Others (7.7%) included email.

Table 4

*Types of ICT Tools Learned by the Participants (n=65)*

ICT tools	Frequency	Valid Percentage	Missing
Word	56	86.2	2
PowerPoint	48	73.8	2
Excel	18	27.7	2
Blog/RSS	5	7.7	2
Others	5	7.7	2
Photo sharing	1	1.5	2
Interactive Whiteboard	0	0.0	2
Social Bookmarking	0	0.0	2
Screen Cast	0	0.0	2
Audio Podcast	0	0.0	2

## Findings for Research Question Two

**Actual coursework characteristics by pre-service teachers.** As noted before, constructive learning has a positive impact on learners' achievement, collaboration skills, critical thinking, problem solving skills, and responsibility. The pre-service teachers were surveyed about their perception of the Media Tool course's characteristics, in terms of constructive teaching and learning, to answer Research Question two: of the 15 items that describe the Media Tool course, which, according to pre-service teachers' perceptions, are the actual ones and the most effective ones in the knowledge-acquisition process? The participants were asked to check all categories that applied. Table 5 lists the coursework characteristics in order of frequency. Sixty three pre-service teacher participants ( $N=67$ )

answered this question. As the table shows, 81.0% of the participants ( $n=63$ ) answered that learners produce assignments as an individual work through this course. Also, 28 pre-service teacher participants (44.4%) perceive that the lessons are learned individually in this coursework. Also, 33.3% of the participants believe that the learners learn actively in the course. On the other hand, only one participant (1.6%) perceives that learners prepare group assignments in this course. Only four pre-service teacher participants (6.3%) think that learners share ideas and cooperate in groups. All participants agree that this course was not designed based on group learning or group lectures.

Table 5

*The Coursework Characteristics That the Participants Perceived ( $n=63$ )*

Coursework Characteristics	Frequency	Valid Percentage	Missing
Producing assignments as an individual work	51	81.0	4
The lessons are learned individually	28	44.4	4
Learn Actively	21	33.3	4
Meaningful learning for future teaching	15	23.8	4
Learners can develop theoretical knowledge	11	17.5	4
The lecture's content is important for assignment	8	12.7	4
Prior-knowledge is needed	7	11.1	4
This lesson is useful for developing education	7	11.1	4
Instructor's main role is guiding students in the learning	5	7.9	4
Lessons are pleasant and enjoyable	4	6.3	4
Learners share ideas and corporate in groups	4	6.3	4
Effort is very import for success in this course	4	6.3	4
The preparation of assignment are done in a group	1	1.6	4
This course was designed based on group learning	0	0	4
Group lecture	0	0	4

Moreover, only four pre-service teachers (6.3%) reported that this course requires effort

to complete assignments, and only seven participants (11.1%) perceived that this lesson is useful for developing education. Only seven of the pre-service teacher participants (11.1%) thought they are required to use prior-knowledge to succeed in this course. Fifteen pre-service participants (23.8%) think that this is a meaningful learning for future learning. Additionally, only four participants (6.3%) reported that the lessons were pleasant and enjoyable.

**Demanded coursework characteristics by pre-service teachers.** Table 6 shows how the pre-service teacher participants wanted to learn in the Media Tool course. It presents a descriptive statistical analysis with frequency and percentage of the demanded characteristics of the course. As the table shows, 57.6% of the pre-service teacher participants wanted to learn actively throughout the coursework. Also, the majority of the participants, or 78.8%, demanded for the course to provide a meaningful learning for their future teaching. Similarly, 60.6% of the participants wanted to connect what they learned in the course with their prior pedagogical knowledge, and 57.6% of them asked for useful lessons for developing education throughout the course. However, at the same time, only 7.6% of the pre-service teacher participants demanded for the course to need some effort to succeed. On the other hand, 45% of the pre-service teacher participants demanded for the course to be pleasant and enjoyable.

Considering individual learning and group learning, both of the frequencies are relatively low. Taking a look at the frequency of participants who preferred individual learning, only 12.1 % of the pre-service teacher participants ( $n=66$ ) answered that they

wanted to learn the lessons individually in the Media Tool course. Similarly, only 16.7% of them want to produce their assignment for the course as an individual work.

Table 6

*The Coursework Characteristics Demanded by the Participants (n=66)*

Coursework Characteristics	Frequency	Valid Percentage	Missing
Meaningful learning for future teaching	52	78.8	1
Prior-knowledge is needed	40	60.6	1
This lesson is useful for developing education	38	57.6	1
Being active	38	57.6	1
Lessons are pleasant and enjoyable	30	45.5	1
Instructor's main role is guiding students in the learning	24	36.4	1
The development of theoretical knowledge	19	28.8	1
The lecture's content is important for assignment	17	25.8	1
Learners share ideas and corporate in groups	13	19.7	1
Producing assignment as an individual work	11	16.7	1
The lessons are learned individually	8	12.1	1
The preparation of assignment are done in a group	7	10.6	1
Group lecture	7	10.6	1
Effort is very important for success in this course	5	7.6	1
This course was designed based on group learning	2	3.0	1

However, in taking a look at the frequency of the participants who agreed that the preparation of assignments should be in group, it was also low (10.6%). 19.7% of the participants demanded the sharing of ideas and cooperating in groups during the coursework. Also, only two pre-service teacher participants (3.0%) answered that the Media Tool course should be based in group learning, and only seven of the participants

(10.6%) asked for group lectures throughout the course.

### **Findings for Research Question Three**

As noted earlier, conducting needs assessments is the first necessary step to develop program and course curricula. To answer Research Question three: what skills and applications do pre-service teacher think will improve/enhance the Media Tool course and, thus, help them to further develop their technology skills; the survey's results clarify the pre-service teachers' learning expectations on learning educational technology throughout the Media Tool course, in terms of situational usage, ICT tools, and ICT skills.

**Desired situational usage.** The pre-service teacher participants were asked to write in what kind of situations they were interested on integrating ICT tools for their future classes. Table 7 shows the coding, frequencies, and categorization for the open-ended responses to the situational usage questions. The middle column of Table 7 shows the complete list of initial codes assigned. The left-hand column of Table 7 shows how many respondents gave the answers with the code. In the end, all of the initial codes are assigned into four categories, visual learning, motivational situation, informational management, and time saving.

The first category includes responses that commented on supporting learners' understanding with technologies by presenting visual materials and models. The majority of pre-service teacher respondents, or 89.0%, are interested in utilizing ICT tools for supporting learners to deepen understanding with visual learning technology. Seventeen of the pre-service teacher participants (30.9%) wanted to use ICT tools to show learning

material that is difficult for the instructor to physically bring to the classroom ( $n=55$ ); according to the responses, this type of usage was related to science and mathematics subjects. A pre-service teacher participant wrote the following:

I want to develop my science class utilizing ICT tools to visually show experiment procedures and the instruments that are difficult to prepare and conduct in a real classroom. If we can share simulations in class, students can familiarize themselves with the content.

Another participant responded that “sometimes, it is hard to bring learning materials to the classroom, but when the learners visually refer to the objects, we can enhance their interest.” Also, six mathematics/science-major participants (10.9%) commented about presenting graphs, tables, diagrams, and charts to deepen learners’ understanding. A mathematics-major participant mentioned:

In mathematics class, I like to show materials, graphs, and diagrams. Especially, I am interested in showing the actual movement and change in a graph. I want to explain a complicated content, which is hard to show on a blackboard, with graphs, diagrams, and chart that I can digitally transfer to screens.

Similarly, another mathematics-major participant answered “I am interested in showing diagrams about a content which is hard to explain with words. Three-dimensional models would be helpful to understand content which is hard to display on a

plane geometry.” There were also responses about visual learning for other subjects such as music, physical education, history, geography, and calligraphy.

Additionally, there were two responses, based on the respondents’ experiences during their teaching practice, associating special education and visual learning:

Special education frequently requires visual learning, using tools such as video, pictures, and animations. During my teaching practice, at a special education school, I used an Interactive Whiteboard to present visual materials in class. I want to utilize these ICT tools for special education after becoming a teacher.

In all, 3.6% of the respondents answered that they wanted to use ICT tools used in special education to provide visual learning environments.

Moreover, ten of the participants (18.1%) were interested in sharing learning material, opinions, and data in a whole classroom. A pre-service teacher participant answered that “I am interested in sharing individual notebooks and summarized memos from a small-group scale to a whole classroom scale.” Also, another participant responded that “I want students to share information in the whole classroom and deepen their understanding together by presenting visual materials such as a map or a picture in the classroom.” The participants felt that sharing learning material and peers’ comments helps learners to visually learn and understand about the subject.

The second category consists of responses where the pre-service teacher participants were interested in attracting the learners’ attention and motivating learners to learn by

Table 7

*Frequencies for Qualitative Data on Situational Usage of ICT Tools (n=55)*

N	Initial Code Description	Group Coding Category (%)
		Visual learning (89.0)
17	Hard to access to tangible learning material	
7	Deepen understanding of complicated contents	
6	Graph, table, diagram, and chart	
6	Share learners' opinions	
3	Learners need to understand physical phenomena	
3	Share learning materials, documents, pictures, and videos	
2	Visual learning for special education	
2	Display instructions for classwork	
1	Hard to explain with words	
1	Learning together in a class	
1	Share notebooks	
		Motivational situation (18.1)
5	Attract learners' attentions	
2	Motivate learners to learn	
2	Quick research	
1	Change learning atmosphere	
		Information management (3.6)
1	Record learners' daily activities	
1	Manage students' individual information	
		Time saving (3.6)
2	Saving time to write down on a blackboard	

a. All responses are coded; the participants were allowed to response with multiple answers.

b. Proportion of sample when each individual's response is categorized only once, by highest level code within it.



utilizing ICT tools. For example, a pre-service teacher participant responded that “I want to share videos as introductions to attract students’ attention.” Also, another participant wrote that “English class at an elementary school requires being active in a group rather than individual learning. Therefore, I want to interest each of the learners in the group by introducing and sharing the foreign cultures visually with ICT tools.” The participants, whose responses were assigned into this second category, believed that ICT tools provided learners with unique learning environments and transform the learning atmosphere. For example, two of the participants (3.6%) mentioned that student could enhance their capacity to gather information from the internet during a class work whenever they have questions. In all, 18.1% of the respondents fell into this category.

The third category expands the concept of information management. One of the pre-service teacher participants mentioned that “I believe recording students’ daily activities can help us to design courses. We can provide each student with an appropriate and effective guide.” This category also included another response about management of learners’ information. Overall, 3.6% of the respondents fell into this category.

This final category for situational usage of ICT tools is for respondents who commented about time savings. One respondent answered that “Based on my teaching practice experience, it took time to write all the information on a blackboard. Therefore, I am interested in using technologies to save time.” Similarly, another respondent mentioned the following:

When I shared students' comments in the class, it took time to write all the comments. So, I want to use an Interactive Whiteboard to save time. Also, Interactive Whiteboards allow us to add comments and notes clearly on the screen.

In all, there were only two respondents who fell into this category (3.6%).

**Desired ICT tools.** Next, the pre-service teacher participants were surveyed about educational ICT tools that they would like to learn in the Media Tool Course. The participants were allowed to write multiple answers. Table 8 shows the frequencies and categorization for the open-ended responses to educational ICT tools. The left-side column of Table 8 shows how many respondents wrote the tools' names as ICT tools that they wanted to learn in the Media Tool Course.

As Table 8 shows, the most frequent ICT tool was the Interactive Whiteboard/Digital textbook (45.6%). Several respondents supported the answers by stating "I want to learn practical uses and examples of Interactive Whiteboards in education." A respondent answered "I have not used an Interactive Whiteboard or digital textbook in practice even though they have been getting popular in education."

The second most frequent response was about ICT tools for presentations, such as projector/screens and PowerPoint. The respondents gave a reason for their answers; "to effectively attract the listeners' attention." Other respondents gave reasons such as "to share bulletin boards, graphs, and learning material simultaneously with the whole class by using projectors." Also, another respondent gave the following reason for learning

ICT tools for presentation; “to effectively guide and support students to present what they have learned to their classmates.” Overall, a total of 36.9% of the respondents commented on ICT tools for presentations.

Table 8

*ICT Tools that the Participants Wanted to Learn (n=57)*

N <sup>a</sup>	ICT Tools	Frequency (%) <sup>b</sup>
26	Interactive Whiteboard/ Digital textbook	45.6
14	Projector/Screen	24.6
8	Phone/Tablet/Computer	14.3
7	PowerPoint	12.3
6	Excel	10.5
5	Word	8.8
4	Illustrator/ Video editor	7.0
3	Skype/Twitter	5.2
2	Software for graphing	3.5
1	Website development software	1.7

a. All responses are assigned; the participants were allowed to response with multiple answers.

b. Proportion of sample when each individual’s response is categorized only once, by highest level code within it.

Moreover, the responses about Excel (10.5%) were supported with explicit reasons; “to manage data” in terms of official affairs and classroom management.

Additionally, Word (8.8%) was for a reason “to report information.” Another respondent stated that “I want to practice spreadsheet since we have not had any assignment for producing spreadsheet in the course. I have never managed data and dealt with it, so I feel uneasy about my future.” Furthermore, all respondents who

commented on tablets referred to the iPad and related educational software applications. Totally, 14.3% of the respondents commented on phones, tablets, or computers as ICT tools that they wanted to learn. Lastly, mathematics-major respondents (3.5%) commented on graphing software as an ICT tool that the respondent wanted to learn, such as “I want to learn about effective uses of graphing software like Geogebra.”

**Desired ICT skills.** Lastly, the pre-service teacher participants were surveyed about educational ICT skills that they would like to improve throughout the Media Tool course. The participants were allowed to write multiple answers again. Table 9 shows the coding, frequencies, and categorization for the open-ended responses to technical skills that they want to improve. The middle column of Table 9 shows the complete list of initial codes assigned. The left-hand column of Table 9 shows how many respondents gave the answers with the code. In the end, all of the initial codes are assigned into seven categories, 1) supports of visual learning, 2) information system management, 3) creating skills, 4) supports of collaborative learning, 5) research skills, 6) information literacy, and 7) designs of courses.

Table 9

*ICT Skills that the Participants Wanted to Learn (n=60)*

N <sup>a</sup>	Initial Code Description	Group Coding Category (%) <sup>b</sup>
14	Teachers' presentation skills	Supports of visual learning (50.0)

Table 9 – continued

7	Skills for visually and aurally supporting learners' understanding	
7	Attracting attentions and motivate learners to learn with technologies	
1	How to effectively use Interactive Whiteboard	
1	Skills for supporting students with disabilities with iPad	Information system management (6.0)
2	Efficiently work on official affairs	
1	Managing learners' information	Creating skills (32.0)
9	Creating intelligible learning materials	
4	Simplifying complicated information	
2	Succinctly informing learners	
1	Creating educational games	
		Supports of collaborative learning (10.0)
2	Sharing information in the whole class	
1	Learners actively learn together	
1	Learners and instructors learn together	
1	Management of collaborative learning environment	
		Research skills (8.0)
2	Skills to guide research learning	
2	Skills to search for appropriate documents	
		Information literacy (4.0)
2	Associating ICT tools and ethical education	
		Designs of courses (8.3)
2	Students can transmit opinions in a class	

Table 9 – continued

2 Timing for integrating technologies

1 Learners can have more time to think of solutions

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- a. All responses are coded; the participants were allowed to response with multiple answers.
- b. Proportion of sample when each individual's response is categorized only once, by highest level code within it.

The first category includes responses that talked about skills to support visual learning. The most frequent ICT skills that the pre-service teacher participants wanted to learn was effective presentation skills (23.3%). A majority of the respondents wrote only “presentation skills”, however, a few respondents stated details, such as “I want to learn approaches to make an intelligible presentation to students with ICT tools”. Related to effective presentation skills, seven pre-service teacher participants required to improve skills for visually and aurally supporting learners' understanding (11.6%). One of the respondents gave the reason to improve the skills by stating: “so that learners can think of problems with more real images, and acquire a great knowledge”. These responses were related to mathematics, science, social study, and English subjects. The following response was in terms of mathematics: “skills to visually promote understanding on problems concerning diagrams and quantities”. Another respondent answered in terms of English language education: “I want to learn effective ICT skills to enhance students' speaking skills, such as familiarizing themselves with native pronunciation”. A respondent, who taught history during the teaching practice, asked for improving skills for effective

visual learning on history. Half (50%) of the respondents fell in the first category.

In addition to the above two skills, skills for attracting learners' attentions and motivate learners to learn were also assigned into the first category, since the responses were answered in terms of presentation skills and visual learning. For example, a respondent stated that "I want to learn skills of using ICT tools so that I can present a class in which learners take an interest in learning contents". Another respondent required to improve ICT skills that help to encourage learners having weak scholarship to learn. Moreover, a respondent, who had taught social study during the teaching practice, stated about the skills in terms of history subject and game learning: "History is a difficult subject to approach. I want students to comprehend and enjoy history with game feeling by using ICT skills". These respondents were interested in effective approaches with ICT tools to attract learners' attention. Overall, 11.6 % of the respondents answered skills to motivate learning by using ICT tools.

Moreover, only one pre-service teacher participant commented about ICT skills that support special education. The respondent required to learn "how to use iPad to teach letters for students with learning disabilities". The participant went to special education schools for the teaching practice.

The category of information system management consists of responses that the pre-service teacher participants are interested in learning ICT skills that help to manage data and information. For example, a respondent stated "ICT skills that help

to efficiently perform division of duties of school affairs”. Another respondent also wrote “how to arrange data and information, such as grades and schedule, to efficiently progress the work utilizing a computer”. The responses were related to a skill for reducing an office work load. In all, 6.0% of the respondents fell into this category.

The third category is about creating skills. Totally 16 of the respondents commented about creating skills for teaching and learning (32.0%). The most frequent answer related to creating skills was “skills for creating intelligible learning materials” These respondents were interested in improving skills on creating graph, three-dimensional shape, tables, movies, and animations, as intelligible learning materials. Moreover, four respondents required to learn skills that help to simplify complicate information by using ICT tools (.06%). One participant stated that “I want to learn ICT skills to create games in which all learners in the class take part in activities, so that the learners take interest in learning”. All of their responses of ICT skills that were assigned into this category were associated with visual learning to promote understanding with ICT tools.

The fourth category is for respondents who wrote about ICT skills to support collaborative learning. One respondent stated “skills to support all learners to actively learn together”. Also, one respondent commented that “sharing information with everyone by using ICT tools, so that the classroom is not fixed on one person’s idea, and each learner can acquire knowledge and ideas from the peers’ different



viewpoints.” Moreover, a pre-service teacher participant commented about the Media Tool course in terms of collaborative learning: “I wanted to have time to share or present assignments in the course with the others, or refer to the others’ productions”. Another respondent was also interested in learning skills to manage the collaborative learning environments in the class. In all, 10.0% of respondents fell into this category.

The fifth category is about research skills. There were two types of instructor research skills. First one is skills to guide students’ research learning. Here is an example of such a response:

When I went to teaching practice at a middle school, a teacher assigned the students to conduct research learning and presentations using ICT tools. However, I did not feel that the teacher guided the learning well. Therefore, I want to learn skills to guide the learning and show a meaningful model of research learning and presentation of the results.

Another type of research skills is to search for appropriate documents for teaching and learning. A response of this example is the following:

I want to learn more about effective strategies for information retrieval, such as which keywords and phrases are better to reach the required information. The skills could be helpful for supporting and promoting students’ learning. Also, I want to know about useful

educational websites for teaching and learning.

Overall, 8.0% of the respondents fell into this category.

The category of information literacy consists of responses about education in information ethics. There were only two respondents who commented about the skills to teach information literacy (4.0%). One of the respondents gave examples of recent net problems, such as the Twitter and LINE applications. The respondent commented on the skills to teach correct treatments of information and guide students to safe information access.

The final category includes responses about designing courses with ICT skills. These ICT skills were more associated with pedagogical knowledge and skills. For example, a respondent commented “skills to design classes that students can transmit opinions throughout presentations”. Another respondents stated “skills to use ICT tools for different purposes in accordance to each course goal”. Overall, 8.3% of the respondents fell into the category.

### **Findings for Research Question Four**

As noted earlier, taught curriculum has to align with the written curriculum that follows the set standards closely. Research Question four asks “does what the students learned in the Media Tool course align with The National Standards of Teachers’ Pedagogical Skills in ICT?” The pre-service teacher participants were surveyed skills that they thought they had improved throughout the Media Tool

course. Table 10 Shows Goodness-of-Fit results for each skill. Each skill indicates the following:

- Skill 1: A skill to plan timings and ways to integrate ICT tools, such as a computer and the internet, for promoting educational effects.
- Skill 2: A skill to utilize ICT tools, such as the internet and CD-ROM, for collecting necessary teaching materials, resource, and information.
- Skill 3: A skill to utilize ICT tools, such as presentation software, for creating necessary materials and documents for teaching and learning in the classes.
- Skill 4: A skill to manage and calculate students' products, learning achievements, and grades by using ICT tools for enhancing the accuracy of evaluations.
- Skill 5: A skill to effectively present materials and documents to attract students' attentions and encourage them to learn by utilize ICT tools, such as a computer and presentation devices.
- Skill 6: A skill that effectively presents materials and documents for each student to clarify problems by utilizing ICT tools, such as a computer and presentation devices.
- Skill 7: A skill that effectively presents materials and documents to intelligibly explain and deepen students' considerations and understandings by utilizing ICT tools, such as a computer and

presentation devices.

- Skill 8: A skill that intelligibly presents materials and documents to fix students' knowledge in summarizing the learning contents.
- Skill 9: A skill that guides and supports students to collect and choose information by ICT tools, such as a computer and the internet.
- Skill 10: A skill that guides and supports students to summarize their ideas and thoughts in sentence with software, and to visibly graph the results of researching with spreadsheet.
- Skill 11: A skill that guides and supports students to visibly present and explain objects by using ICT tools, such as presentation software and the computers.
- Skill 12: A skill that guides and supports students to fix knowledge and master skills by repeating learning and practicing with ICT tools, such as software for learning and the internet.
- Skill 13: A skill that instructs students to have necessary responsibilities and duties on their behaviors in the information society, and to exchange information respecting human rights.
- Skill 14: A skill that instructs students to collect and send information observing rules and etiquettes as a member of the information society.
- Skill 15: A skill that instructs learners to recognize correctness and reliability of information and use the internet caring about their health.
- Skill 16: A skill that instructs students to acquire basic knowledge on

information security, such as importance of password and privacy

information.

- Skill 17: A skill that creates documents and materials for duties of official affairs and classroom management by collecting necessary information via the internet and utilizing spreadsheet.
- Skill 18: A skill that shares necessary information for strengthening cooperation between instructors, parents, regions by using the internet and campus networks.

Table 10

*Frequencies of Students by Answer for ICT Skills that the Participants Improved*

ICT Skills	Answer				$\chi^2$	df	Exact Sig.
	Yes		No				
	Observed	Expected (.05)	Observed	Expected (.05)			
Skill 1	23	27.0	31	27.0	1.185	1	0.341
Skill 2	33	30.0	27	30.0	0.600	1	0.519
Skill 3	49	32.0	15	32.0	18.063	1	0.000*
Skill 4	14	30.5	47	30.5	17.852	1	0.000*
Skill 5	17	27.5	38	27.5	8.018	1	0.006
Skill 6	13	26.5	40	26.5	13.755	1	0.000*
Skill 7	17	28.0	39	28.0	8.643	1	0.005
Skill 8	16	27.0	38	27.0	8.963	1	0.004
Skill 9	25	30.0	25	30.0	1.667	1	0.245
Skill 10	13	29.0	45	29.0	17.655	1	0.000*
Skill 11	20	28.5	37	28.5	5.07	1	0.033
Skill 12	12	29.0	46	29.0	19.931	1	0.000*
Skill 13	25	27.5	30	27.5	0.455	1	0.590
Skill 14	39	31.0	23	31.0	4.129	1	0.056
Skill 15	31	30.5	30	30.5	0.016	1	1.000
Skill 16	33	29.0	25	29.0	1.103	1	0.358

Table 10 – continued

Skill 17	12	27.5	43	27.5	17.473	1	0.000*
Skill 18	10	25.5	41	25.5	18.843	1	0.000*

*Note.* Numbers in parentheses, (), are expected proportions.

\* $p = <.0027$

A Chi-square goodness-of-fit test was used to determine if the number of observed frequencies for improved skills were different from the expected values between “yes” and “no” responses. The test was conducted using an alpha of .0027. The null hypothesis was that the frequencies would be as follows: 27 Skill 1, 30 Skill 2, 32 Skill 3, 30 Skill 4, 27.5 Skill 5, 26.5 Skill 6, 28 Skill 7, 27 Skill 8, 30 Skill 9, 29 Skill 10, 28.5 Skill 11, 29 Skill 12, 27.5 Skill 13, 31 Skill 14, 30.5 Skill 15, 29 Skill 16, 27.5 Skill 17, and 25.5 Skill 18. The assumption of an expected frequency of at least 5 per cell was met. The assumption of independence was met via random selection.

As shown in Table 10, there were statistically significant differences between the frequencies of pre-service teacher participants by answer between “yes” and “no” for Skill 3, and what would be expected ( $\chi^2_{(1, n = 64)} = 18.063, p = .000$ ). Thus, the null hypothesis that the number of the observed frequencies for Skill 3 parallels the expected one was rejected at the .0027 level of significance. The effect size was 0.531, and interpreted using Cohen’s guide (1988) as a large effect. This suggested that the frequency of pre-service teacher participants who answered “yes” ( $n=49$ ) for the skills was statistically significant higher than “no” ( $n=15$ ).

Similarly, the number of the observed frequencies by answer for Skill 4 were

also statistically different from the expected one ( $\chi^2_{(1, n = 61)} = 17.852, p = .000, w = .540$ ). Thus, the null hypothesis that the number of the observed frequencies for Skill 4 parallels the expected frequencies was also rejected at the .0027 level of significance. It suggests that the frequency of the participants who answered “no” ( $n = 47$ ) for Skill 4 was higher than “yes” ( $n = 14$ ).

Table 10 also showed that there were significant differences between the frequencies of the participants by answer for Skill 6 and what would be expected ( $\chi^2_{(1, n = 53)} = 13.755, p = .000, w = .509$ ). It appears that the frequency of the participants who answered “no” ( $n = 40$ ) for the skill was higher than “yes” ( $n = 13$ ). The statistical results for Skill 10, ( $\chi^2_{(1, n = 58)} = 17.655, p = .000, w = .551$ ), indicated that the frequencies of the participants by answer were also statistically different from what would be expected as well. This suggests that the frequency of the participants who answered “no” ( $n = 45$ ) for the skill was higher than “yes” ( $n = 13$ ). Moreover, for Skill 12, the frequencies of pre-service teacher participants by answer were statistically different from the expected one ( $\chi^2_{(1, n = 58)} = 19.931, p = .000, w = .586$ ). This appears that the frequency of the participants who answered “no” ( $n = 46$ ) for this skill was higher than “yes” ( $n = 12$ ). Furthermore, the statistical results for Skill 17, ( $\chi^2_{(1, n = 55)} = 17.473, p = .000, w = .563$ ), indicated that the frequencies of the participants by answer were statistically different from what would be expected as well. This means the frequency of the participants who answered “no” ( $n = 43$ ) was statistically higher than “yes” ( $n = 12$ ). Lastly, for Skill 18, there was also a significant difference

between the frequency of the participants by answer and what would be expected by chance ( $\chi^2_{(1, n=51)} = 18.843, p=.000, w=.607$ ). This appears that the frequency of the participants who answered “no” ( $n=41$ ) for this skill was statistically higher than “yes” ( $n=10$ ).

### **Summary of the Chapter**

The purpose of this chapter was to present the findings for the four research questions that framed this study. Data from the survey questions were examined and discussed in both narrative and graphics forms. Research findings that are associated with each of the Research Questions were also identified. Chapter Five will explore the findings that were clarified in this chapter in more details, and present the conclusions and recommendations.



## **CHAPTER V**

### **SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS**

#### **Introduction to the Chapter**

The purpose of this chapter is to present the conclusions and recommendations drawn from the data analysis to answer the four research questions in this study. The chapter consists of the following five sections: (1) summary of the study; (2) research questions; (3) conclusions and recommendations; (4) recommendations for future research; (5) final thoughts.

#### **Summary of the Study**

The purpose of this research is to assess pre-service teachers' current learning on educational ICT knowledge and skills in a teacher education college's educational technology course, and to seek the proper learning contents for pre-service teachers in a teacher education curriculum. Teachers must combine technology and pedagogical skills together to play an important role in enacting curricula that addresses the needs of today's children. Prensky (2011) states "as educators we have to know what is going on this online life because that's where the kids are most involved and engaged". Therefore, since more children are involved in playing with technological equipment in their daily lives, it is necessary to develop and transform curricula in teacher education programs for

future student teachers. This study will help university administrators on developing teacher education curricula to produce required new teachers for new generation learners.

### **Research Questions**

This study investigated pre-service teachers' perceptions about an educational technology course at a national teacher educational college. For the purpose of this study, junior and higher level students, who had, to some extent, technological skills and knowledge, pedagogical knowledge, and comprehension of educational problems, were the objects of this research. The survey was developed to answer the following four research questions:

1. Of the 10 items that comprise the Media Tool course, which ones did pre-service teachers perceived they learned?
2. Of the 15 items that describe the Media Tool course, which, according to pre-service teachers' perceptions, are the actual ones and the most effective ones in the knowledge-acquisition process?
3. What skills and applications do pre-service teacher think will improve/enhance the Media Tool course and, thus, help them to further develop their technology skills?
4. Do the skills that pre-service teachers perceived they learned through the Media Tool course align with the Japanese National Standards of Teachers' Pedagogical Skills in ICT?

## Conclusions

The conclusions are drawn from the findings of the four research questions in this study.

**Conclusions concerning learned contents (RQ1).** The following conclusion talks about what pre-service teachers at the national university learned throughout the Media Tool course.

*Conclusion 1-A: Pre-service teachers primarily learned Word, PowerPoint, and Excel throughout the Media Tool course.* This conclusion is based on Table 4 in chapter four. Responses to the survey question on ICT tools, which tools they thought they had learned throughout the Media Tool course, indicated that Word left the biggest impression on the majority of pre-service teachers, 86.2%. The ICT tool that left the second biggest impression was PowerPoint, 73.8 %. Excel followed PowerPoint by a considerable margin, 27.7%. However, only a few of the pre-service teachers stated they had learned about Blog/RSS, e-mail, and/or photo sharing. Moreover, the Media Tool course did not provide opportunities for learning about Interactive Whiteboards, Social Bookmarking, Screencast, and Audio Podcast.

**Conclusions concerning the knowledge-acquisition process (RQ2).** As noted earlier, constructive learning has a positive impact on learners' achievement, critical thinking, collaboration, problem solving skills, and responsibility. Wilson (2012) states that constructivist learning theory is based on the following principles:

- Principle 1: Learning is an active process of making meaning in the

experiences and interactions with the real world.

- Principle 2: Learning improves through planned problem solving and critical thinking activities, encouragement, and incomprehension in experiential practices of societies.
- Principle 3: Learning is collaboration, interaction, and interpretive discussion among the learners' social environment.
- Principle 4: Reflection, assessment, and feedback through learning activities are extremely important.
- Principle 5: Learners should realize their responsibility of learning and the learning process.

The following conclusions talk about pre-service teachers' perception on which course characteristics are the most effective in the knowledge-acquisition process, considering constructive learning. These conclusions are based on both of the findings of the actual and demanded characteristics of the knowledge-acquisition process.

***Conclusion 2-A: The Media Tool course is constructed around individual learning environment.*** From the actual course characteristics, the most compelling response was for completing their assignments individually, with 51 pre-service teachers ( $N=63$ ), or 81.0% of the respondents. Also, the second most frequent course characteristic was that the lessons were learned individually (44.4%). On the other hand, only one pre-service teacher ( $N=63$ ), or 1.59% of the respondents, thought the Media Tool course provided group-work assignments. Furthermore, no pre-service teacher thought the Media Tool course was created based on group learning and group lectures. These

findings concluded that the Media Tool course was designed for an individual learning environment, not for a group learning environment. The findings also reveal that this course is not based on constructive learning in terms of group-work lecture and collaborative learning.

***Conclusion 2-B: The minority of pre-service teachers demanded a group-work learning environment for the learning to be meaningful.*** Within questions referring to group learning environment, the most compelling response was for “learners share ideas and cooperate in groups”, with 13 pre-service teachers ( $N=66$ ), or 19.7% of the respondents. Also, the second most frequent demanded course characteristics were that “the preparation of assignment is done in a group” (10.6%) and “group learning” (10.6%). The research did provide enough information to conclude that the pre-service teacher participants desire to learn in a group learning environment.

***Conclusion 2-C: The Media Tool course needs to provide an active learning environment.*** Based on this research, the Media Tool course currently provides pre-service teachers with learning activities. The third most frequent course characteristic was for active learning, with 21 pre-service teachers ( $N=63$ ), or 33.3% of the respondents. Also, 38 pre-service teachers, ( $N=66$ ), or 57.6% of the respondents still demanded active learning through the course work.

***Conclusion 2-D: The Media Tool course should provide a pleasant, enjoyable, and meaningful learning experience to motivate pre-service teachers to repeat and practice their knowledge and skills for their future teaching.*** This conclusion is based

on the findings of the actual course characteristics and demanded characteristics. The findings of the actual course characteristics include the following; only 15 pre-service teachers ( $N=63$ ), or 23.8% of the respondents, answered that the Media Tool course was meaningful for future teaching; seven pre-service teachers ( $N=63$ ), or 11.1% of the respondents, reported that they had used prior-knowledge during the Media Tool course; seven pre-service teachers ( $N=63$ ), or 11.1% of the respondents, stated that the learning content would be useful to develop education in their future; and four pre-service teachers ( $N=63$ ), or 11.1% of the respondents, answered that the Media Tool course was pleasant and enjoyable. As expressed in these responses, the Media Tool course did not provide meaningful learning for pre-service teachers to improve their knowledge and skills for their future teaching.

On the other hand, according to pre-service teachers' perceptions, pre-service teachers disagreed with the current course characteristics. The most compelling response of demanded course characteristics was for meaningful learning for future teaching, with 52 pre-service teachers ( $N=66$ ), 78.8% of the respondents. Also, the other respondents include 40 pre-service teachers ( $N=66$ ), 60.7% of the respondents, asking for the use of prior-knowledge; 38 pre-service teachers ( $N=66$ ), 57.6% of the respondents, asking to learn useful contents for developing education; 30 pre-service teachers ( $N=66$ ), 45.5% of the respondents, asking for a pleasant and enjoyable learning experience. As expressed in these responses, including the responses for the actual course characteristics, the Media Tool course should provide pleasant, enjoyable, and meaningful learning processes to encourage pre-service teachers to develop their knowledge and skills for their future

teaching.

***Conclusion 2-E: In the Media Tool course, an instructor should play a guiding role for students in the learning process.*** This conclusion is based on a finding that only five pre-service teachers ( $N=63$ ), or 6.3% of the respondents, agreed that the instructor guided students in the learning process. However, 30 pre-service teachers ( $N=66$ ), or 45.5% of respondents, answered that instructors should play a role to guide them in the learning process. As reported in the findings, pre-service teachers perceive that the instructor's effective guidance is important in the knowledge-acquisition process.

**Conclusions concerning required learning contents (RQ3).** The following conclusions talk about what skills and applications will enhance the Media Tool course, and help pre-service teachers to develop their technology skills.

***Conclusion 3-A: Pre-service teachers want to improve ICT competencies and skills that are useful for developing visual learning environments throughout the Media Tool course.*** This conclusion is based on three elements; required situational usage, ICT tools, and ICT skills. The most compelling response to open-ended survey questions about required situational usages of ICT tools was that, a total of 49 pre-service teachers ( $N=55$ ), or 89% of respondents, wanted to use ICT tools for visual learning environments. These respondents believed that visual learning would deepen students' understanding of complicated contents and physical phenomena by presenting visual materials, such as graphs, tables, diagrams, and charts, to deepen learners' understanding. The most frequent response to the open ended questions was for presenting intangible

learning material, with 17 pre-service teachers, 30.9% of the respondents.

The conclusion is also based on the findings about ICT tools that pre-service teachers wanted to learn. The findings included 26 pre-service teachers ( $N=57$ ), or 45.6%, asking to learn about the Interactive Whiteboard/Digital textbooks; 14 pre-service teachers ( $N=57$ ), or 24.6%, asked to learn about projectors/screens; and seven pre-service teachers ( $N=57$ ), or 12.3%, asked to learn PowerPoint. As stated in their responses, pre-service teachers perceived that these ICT tools will enhance the Media Tool course, and, thus, help them to further develop their technology skills.

Also, the conclusion is based on responses to open-ended survey questions on ICT skills demanded by pre-service teachers. Totally, 30 pre-service teachers ( $N=60$ ), 50% of the respondents, reported that they wanted to improve skills to support visual learning. The responses included 14 pre-service teachers ( $N=60$ ), or 23.3%, asking to learn teacher presentation skills; seven pre-service teachers ( $N=60$ ), or 11.7%, asking to learn skills to visually and aurally support learners' understanding; seven pre-service teachers ( $N=60$ ), or 11.7%, wanting to attract the learners' attention and motivate learners to learn with technology; one pre-service teacher wanting to effectively use Interactive Whiteboard; and, one pre-service teacher wanting to learn skills to support students with disability by using iPads. As expressed in the responses, the Media Tool course should provide opportunities for pre-service teachers to learn about ICT skills and knowledge for supporting visual learning.

***Conclusion 3-B: Pre-service teachers suggested that the Media Tool course***



*should provide opportunities to improve their creating skills for educational materials and information management.* This conclusion is based on responses to the open-ended survey questions about required ICT skills. The most compelling response was for creating comprehensible learning material, with 16 pre-service teachers ( $N=60$ ), 32.0% of the respondents. This frequency was the most second frequent demanded ICT skills. These respondents demanded learning on how to create comprehensible learning material to simplify complicated information, succinctly informing learners. As expressed in the responses, the Media Tool course should be improved by integrating more activities where pre-service teachers create learning material using ICT tools.

**Conclusions concerning the national standards (RQ4).** The following conclusions suggest which ICT skills the pre-service teachers thought they improved throughout the Media Tool course. This will indicate if the Media Tool course was sufficient for pre-service teachers to conform to the National Standards of Teachers' Pedagogical Skills in ICT.

*What pre-service teachers learned in the Media tool course does not completely align with the National Standards of Teacher's Pedagogical Skills in ICT.* This conclusion was based on the findings from the following:

- The number of pre-service teachers who agreed that a skill to utilize presentation software, for creating necessary teaching materials, improved was significantly higher than those who said that it did not improve ( $\chi^2_{(1, n=64)} = 18.063, p = .000, w = .531$ ).

- The number of pre-service teachers who disagreed that they improved a skill to manage and calculate students' products, learning achievement, and grades by using ICT tools for enhancing the accuracy of evaluations, was significantly higher than those who said that it improved ( $\chi^2_{(1, n = 61)} = 17.852, p=.000, w=.540$ ).
- The number of pre-service teachers who disagreed that they improved a skill, to effectively present materials and documents for each student to clarify problems by utilizing ICT tools, such as a computer and presentation devices, was significantly higher than those who said that it improved ( $\chi^2_{(1, n = 53)} = 13.755, p = .000, w=.509$ ).
- The number of pre-service teachers who disagreed that they improved a skill, to guide and support students to summarize their ideas and thoughts in sentence with software, and to visibly graph the results of researching with spreadsheet, was significantly higher than those who said that it improved ( $\chi^2_{(1, n = 58)} = 17.655, p = .000, w=.551$ ).
- The number of pre-service teachers who disagreed that they improved a skill, to guide and support students to fix knowledge and master skills by repeating to learn and practice with ICT tools, such as software for learning and the internet, was significantly higher than those who said that it improved ( $\chi^2_{(1, n = 58)} = 19.931, p=.000, w=.586$ ).

- The number of pre-service teachers who disagreed that they improved a skill, to create documents and materials for duties of official affairs and classroom management by collecting necessary information via the internet and utilizing spreadsheet, was significantly higher than those who said that it improved ( $\chi^2_{(1, n = 55)} = 17.473, p = .000, w = .563$ ).
- The number of pre-service teachers who disagreed that they improved a skill, to share necessary information for strengthening cooperation between instructors, parents, regions by using the internet and campus networks, was significantly higher than those who said that it improved ( $\chi^2_{(1, n = 51)} = 18.843, p = .000, w = .607$ ).

Based on the results from the Chi-square goodness-of-fit test, the investigator concluded that pre-service teachers thought they improved only one skill, to utilize presentation software to create necessary teaching material, throughout the Media Tool course. Given conclusion one, the pre-service teachers perceived that they improved this skill by learning Word, PowerPoint, and Excel. However, based on the fourth and fifth findings above, pre-service teachers did not improve on skills to create materials utilizing spreadsheet programs and software for division of duties of official affairs, classroom management, and teaching. Therefore, it is concluded that the Media Tool course does not provide sufficient practice on Excel.

Moreover, according to the third finding above, the pre-service teachers did not improve on skills to utilize presentation devices to present materials and documents.

Therefore, it is also explained that the Media Tool course does not provide the pre-service teachers with the necessary practice on using presentation devices, even though they improved on skills to use presentation software to create learning materials through the course.

Therefore, the Media Tool course does not provide enough meaningful practice for pre-service teachers to achieve the National Standards of Teacher's Pedagogical Skills in ICT prior to their teaching career.

### **Discussion and Recommendations**

The study gathered survey data from pre-service teachers at a teacher educational college in Japan. This study addressed; what ICT tools and skills an educational technology course at a national university in Japan were providing, how the pre-service teachers learned throughout the course, what types of ICT tools and skills the pre-service teachers wanted to learn, what course characteristics the pre-service teachers desired, and what skills, that the pre-service teachers had learned, align with The National Standards of Teachers' Pedagogical Skills in ICT.

Overall, the Media Tool course mainly provided pre-service teachers with opportunities to practice how to use basic Word, PowerPoint, and Excel. Nevertheless the Media Tool course offered practical learning using those three software, which are useful for managing information and creating learning material. The pre-service teachers were not satisfied with the course activities, learning contents, and knowledge-acquisition process, in terms of the learning effectiveness for their future teaching.

Instructors in an educational technology course in a teacher education program, such as the Media Tool course at the national university, need to design the courses for pre-service teachers to be encouraged to actively practice their educational ICT knowledge and skills for their future teaching. Learning activities are extremely important to “engage students in higher order thinking skills of analysis, synthesis, and evaluation” (Gagliardi , 2007, p.86). The teacher educators in the courses should keep their guiding roles for pre-service teachers to think on solutions and produce advanced meaningful assignments based on discussion, collaboration, and group interaction. According to Gagliardi(2007), social interaction and collaboration over content and problems are necessary for the development and achievement of learners, which causes learners to see different points of view. Learners also benefit from the opportunity to review prior knowledge and connect it with new learning content, to make a meaningful interpretation in their learning process (Gagnon & Collay, 2001). Therefore, the Media Tool course learning opportunities for pre-service teachers should be a pleasant, enjoyable, and meaningful learning experience to motivate pre-service teachers to repeat and practice their knowledge and skills for their future teaching.

Lastly, based upon the responses from the respondents in my study, it appears that the Media Tool course is not sufficient for pre-service teachers to learn the tools and skills that are imposed by the Ministry of Education, Culture, Sports, Science and Technology (MEXT). Educational technology courses at the teacher education college, including the Media Tool course, should be redesigned to produce teachers, with improved necessary ICT skills, to address the needs of children in the new generation.

## **Future Research**

The design of this single site case study contributed to evaluate actual learning in an educational technology course and seek what pre-service teachers desired in a teacher education college at one university. The goal of this research was especially to seek which learning contents, practices, and knowledge-acquisition processes, best support pre-service teachers to improve necessary educational ICT knowledge and skills for their future. There is much more work needed to see the needs and demands of learning about educational technologies to develop a course at an education college, since the case study research is fundamentally limited in its ability to specify the result. The following recommendations for future research are encouraged:

1. This study should be conducted in additional teacher education colleges.

Every pre-service teacher from different universities will go out to the world after graduation and master their pedagogical knowledge and skills through on-site practice. Each university needs to reevaluate the curricula and course contents to see if the design aligns with the needs of current society. This will help course designers and administrators at the university to enhance their educational technology course, and assist pre-service teachers to further develop their technological skills before starting to work as a teacher in the world.

2. This study focused on pre-service teachers' perceptions on the Media tool course. However, the researcher should also survey teacher educators' and in-

service teachers' perceptions on using technologies to support pedagogical practices in the classroom. Conducting this research would further clarify concrete needs and demands of course development.

3. Since this research was conducted with a non-experimental post-survey design, a study should conduct a pre-survey on pre-service teachers' technological skills. Conducting the survey would further provide a more complete picture of the pre-service teachers' improvement throughout the course, and additional insight into the demands for course development.

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## **Appendix A**

### **Electronic Email to Professors**



I graduated from Shiga University in September, 2011 and I am currently enrolled in the Masters of Art in Educational Technology Program at Western Michigan University.

I would like you to cooperate with a research I am conducting and help me to recruit the students in your class. The aim of this research is to assume the pre-service teachers' experiences to learn about educational Informational Communication Technology (ICT) and seek the proper instruction for teaching educational ICT in a teacher education curriculum. The due date is on April, 2014.

I am thinking to conduct the survey to junior and upper level students who completed the Media Tool course and have pedagogical knowledge to some extends through teaching experiences in their teaching practices. Therefore, I would like the students in your course to join the survey research if you and they are interested.

The survey will take about 15 minutes to be completed. I will need to borrow the time that belongs to the class in order to conduct the survey and obtain the data needed from the participant students if you allow me to do so. I am planning to go back to Japan during this summer.

If you are interested in the survey and can cooperate with me, I would like to visit a session of your course and explain the students what the survey is about, and ask about participation at the same time. The participation is completely voluntarily.

Sincerely,

“突然の連絡、誠に失礼します。小嶋咲由里（こじまさゆり）と申します。私は2011年9月に滋賀大学教育学部（元メディア教育専攻）を卒業し、2012年9月から米国のウェスタン・ミシガン大学院で教育工学について学んでおります。

今回ご連絡をさせていただいた理由は、2014年4月提出予定の修士論文の研究において、滋賀大学教育学部の学生を調査対象としたいと考え、先生のご協力を得たいと考えたからです。私の研究の目的は、教育のためのICTに対する学生の意識調査を行い、彼らが大学の授業でどのようなICTに関するコースを求めているのかを明らかにすることです。

調査対象として、メディアツールの授業を履修済みで、教育実習に行ったことがあり、教育的知識がある程度ついた3回生以上の学生を想定しています。先生のゼミ所属の学生がこの条件にあてはまるのではないかと思います、先生がゼミで指導されている学生を対象にアンケート調査を実施させていただきたいと考えております。

本来ならば現時点で学生宛の調査依頼文や調査用紙の例をお送りすべきなのですが、所属大学院の手続きの関係上、依頼文および調査用紙はまだ作成できておりません。

この意識調査は10～15分ほどのお時間をいただければ回答できるようなアンケートとする予定です。授業時間内にお時間を頂戴することになるかと思いますが、どうか調査の実施にご協力をお願いしたいと存じます。

なお、今夏7～8月に日本に一時帰国します。その時に滋賀大学を訪問することを計画しております。先生のゼミ講義日にお邪魔させていただき、調査実施に少しかかりのお時間を頂ければと思っております。

先生におかれましてはお忙しいところ、誠に勝手なお願いではございますが、どうぞご検討のほどお願い申し上げます。”

## **Appendix B**

### **HSIRB Approval Letter**

# WESTERN MICHIGAN UNIVERSITY



Human Subjects Institutional Review Board

Date: October 23, 2013

To: Brian Horvitz, Principal Investigator  
Sayuri Kojima, Student Investigator for thesis

From: Amy Naugle, Ph.D., Chair

Re: HSIRB Project Number 13-07-11

This letter will serve as confirmation that the change to your research project titled "Investigation of the Development of Educational ICT Courses on Pre-service Teachers' Education Curricula" requested in your memo received October 22, 2013 (to add statistical consultants Marianne DiPierro and Haolai (Lincoln) Jiang) has been approved by the Human Subjects Institutional Review Board.

The conditions and the duration of this approval are specified in the Policies of Western Michigan University.

Please note that you may **only** conduct this research exactly in the form it was approved. You must seek specific board approval for any changes in this project. You must also seek reapproval if the project extends beyond the termination date noted below. In addition if there are any unanticipated adverse reactions or unanticipated events associated with the conduct of this research, you should immediately suspend the project and contact the Chair of the HSIRB for consultation.

The Board wishes you success in the pursuit of your research goals.

Approval Termination: July 9, 2014

251 W. Walwood Hall, Kalamazoo, MI 49008-5456  
PHONE: (269) 387-8293 FAX: (269) 387-8276

## **Appendix C**

### **Survey Questionnaire**

ICT: Informational Communication Technology

Q1. What is your current class status? 1. Freshman 2. Sophomore 3. Junior 4. Senior

Q2. What department do you belong to? \_\_\_\_\_

1. International Understanding
2. Language Education
3. Physical Education
4. Science/Math Education
5. Preschool Education
6. Clinical Pedagogy and School Psychology
7. Special Education
8. Life Technical Education
9. Social Studies

Q3. What grade level were you in charge of during your teaching practice? (Check all that apply and choose the year)

1. Kindergarten School
2. Elementary School
3. Junior High School
4. High School 1
5. Special Education School
6. Other, please explain:

Q4. What subjects did you teach in the teaching practice? (Check all that apply)

- 1 Art/ Calligraphy
- 2 Physical Education
3. Music
4. Life Environment Studies/ Vocational-technical Education/Moral Education/ Home Economic
5. Social Studies/Geography/ History/Civics
6. Arithmetic/ Mathematics
7. Science (Chemistry, Physics, Biology)
8. Japanese/English
9. Others, please explain

Q5 What ICT did you learn in the Media Tool course? (Check all that apply or none)

- |                           |                    |
|---------------------------|--------------------|
| 1. Excel                  | 8. Photo sharing   |
| 2. Word                   | 9. Audio Podcast   |
| 3. PowerPoint             | 10. Others, please |
| 4. Interactive Whiteboard | explain:           |
| 5. Blog/RSS               |                    |
| 6. Social Bookmarking     |                    |
| 7. Screen Cast            |                    |

Q6 Please select the items below that describe the Media Tool course. Please check all that apply.

1. The development of theoretical knowledge
2. The preparation of assignment are done in a group
3. Lecture in a group/
4. Being active
5. Prior-knowledge is needed from teaching education programs
6. Lessons are pleasant and enjoyable
7. Producing assignment as an individual work
8. Meaningful learning of teaching for your future students

9. The process is important for assessment
10. The lessons are learned by the individual
11. This lesson is useful for teaching development
12. Instructor's main role is guiding students in the learning
13. Sharing and cooperation within the group
14. This lesson are designed based on group learning
15. Effort is very important for success in this lesson

Q7 Please select the items below that describe how you would like the Media tool course to be. Please check all that apply.

1. The development of theoretical knowledge
2. The preparation of assignment are done in a group
3. Lecture in a group
4. Being active
5. Prior-knowledge is needed from teaching education programs
6. Lessons are pleasant and enjoyable
7. Producing assignment as an individual work
8. Meaningful learning of teaching for your future students
9. The process is important for assessment
10. The lessons are learned by the individual
11. This lesson is useful for teaching development
12. Instructor's main role is guiding students in the learning
13. Sharing and cooperation within the group
14. This lesson are designed based on group learning
15. Effort is very important for success in this lesson

What skills did you improve through the Media tool course?

1 Yes

2 No

3 I don't know

Q8. Did you improve a skill to plan timings and ways to integrate ICT tools, such as a computer and the internet, for promoting educational effects?

☐ Yes

☐ No

☐ I don't know



Q9. Did you improve a skill to utilize ICT tools, such as the internet and CD-ROM, for collecting necessary teaching materials, resource, and information?

- ☐ Yes ☐ No ☐ I don't know

Q10. Did you improve a skill to utilize ICT tools, such as presentation software, for creating necessary materials and documents for teaching and learning in the classes?

- ☐ Yes ☐ No ☐ I don't know

Q11. Did you improve a skill to manages and calculate students' products, learning achievements, and grades by using ICT tools for enhancing the accuracy of evaluations?

- ☐ Yes ☐ No ☐ I don't know

Q12. Did you improve a skill to effectively present materials and documents to attract students' attentions and encourage them to learn by utilize ICT tools, such as a computer and presentation devices?

- ☐ Yes ☐ No ☐ I don't know

Q13. Did you improve a skill that effectively presents materials and documents for each student to clarify problems by utilizing ICT tools, such as a computer and presentation devices?

- ☐ Yes ☐ No ☐ I don't know

Q14. Did you improve a skill that effectively presents materials and documents to intelligibly explain and deepen students' considerations and understandings by utilizing ICT tools, such as a computer and presentation devices?

- ☐ Yes ☐ No ☐ I don't know

Q15. Did you improve a skill that intelligibly presents materials and documents to fix students' knowledge in summarizing the learning contents?

- ☐ Yes ☐ No ☐ I don't know

Q16. Did you improve a skill that guides and supports students to collect and choose information by ICT tools, such as a computer and the internet?

- ☐ Yes ☐ No ☐ I don't know

Q17. Did you improve a skill that guides and supports students to summarize their ideas and thoughts in sentence with software, and to visibly graph the results of researching with spreadsheet?

☐ Yes ☐ No ☐ I don't know

Q18. Did you improve a skill that guides and supports students to visibly present and explain objects by using ICT tools, such as presentation software and the computers?

☐ Yes ☐ No ☐ I don't know

Q19. Did you improve a skill that guides and supports students to fix knowledge and master skills by repeating learning and practicing with ICT tools, such as software for learning and the internet?

☐ Yes ☐ No ☐ I don't know

Q20. Did you improve a skill that instructs students to have necessary responsibilities and duties on their behaviors in the information society, and to exchange information respecting human rights?

☐ Yes ☐ No ☐ I don't know

Q21. Did you improve a skill that instructs students to collect and send information observing rules and etiquettes as a member of the information society?

☐ Yes ☐ No ☐ I don't know

Q22. Did you improve a skill that instructs learners to recognize correctness and reliability of information and use the internet caring about their health?

☐ Yes ☐ No ☐ I don't know

Q23. Did you improve a skill that instructs students to acquire basic knowledge on information security, such as importance of password and privacy information?

☐ Yes ☐ No ☐ I don't know

Q24. Did you improve a skill that creates documents and materials for duties of official affairs and classroom management by collecting necessary information via the internet and utilizing spreadsheet?

☐ Yes ☐ No ☐ I don't know

Q25. Did you improve a skill that shares necessary information for strengthening cooperation between instructors, parents, regions by using the internet and campus networks?

- ☐ Yes                      ☐ No                      ☐ I don't know

Answer the questions below based on the experiences in teaching practice and educational problems that you have found on your specialized area.

- a) In what situations are you interested in using ICT for your future classes?  
(Example: presenting material and graphs, practicing pronunciation,  
understanding visually changes and unimaginative objects like the motion of  
the earth...)
- b) What other educational ICT devices would you like to learn in the Media Tool  
course?
- c) What other ICT skills would you like to learn in the Media Tool course?

ICT＝Information and Communication Technology (情報通信技術) / ネットワーク通信による情報・知識の共有のための技術。(例) コンピュータやインターネット技術

1. 学年 ( )年
2. コース ( )コース
3. 教育実習で担当した校種と学年
  - ☐ 幼稚園 3歳児・4歳児・5歳児
  - ☐ 小学校 1・2・3・4・5・6
  - ☐ 中学生 1・2・3
  - ☐ 高等学校 1・2・3
  - ☐ 特別支援学校
  - ☐ その他：担当した校種と学年を書いて下さい。  
( )
4. 教育実習で、どの教科を教えましたか？(当てはまるもの全てを選択)
  - ☐ 図画工作・美術
  - ☐ 技術
  - ☐ 体育
  - ☐ 地理
  - ☐ 音楽
  - ☐ 歴史
  - ☐ 生活
  - ☐ 公民
  - ☐ 道徳
  - ☐ 化学
  - ☐ 社会(小学校)
  - ☐ 物理
  - ☐ 家庭科
  - ☐ 英語
  - ☐ 算数
  - ☐ 数学
  - ☐ 理科(小学校)
  - ☐ 習字
  - ☐ 国語
  - ☐ その他：  
( )

5. メディアツール活用法の授業で、どの ICT について学びましたか？(当てはまるもの全てを選択、またはどれも当てはまらない場合は何も選ばないで下さい。)

- |                                      |                                    |
|--------------------------------------|------------------------------------|
| <input type="checkbox"/> Excel       | <input type="checkbox"/> スクリーンキャスト |
| <input type="checkbox"/> Word        | <input type="checkbox"/> 画像編集      |
| <input type="checkbox"/> PowerPoint  | <input type="checkbox"/> ポッドキャスト   |
| <input type="checkbox"/> 電子黒板        | <input type="checkbox"/> その他：      |
| <input type="checkbox"/> ブログ         | (                                  |
| <input type="checkbox"/> RSS         | )                                  |
| <input type="checkbox"/> ソーシャルブックマーク |                                    |

6. 以下の中から、メディアツール活用法の授業での活動の特徴に当てはまるものを選んでください。(当てはまるもの全てを選択、またはどれも当てはまらない場合は何も選ばないで下さい。)

- ☐ 理論的な知識を伸ばす
- ☐ 課題に対して、グループで準備を行う
- ☐ グループで講義を進める
- ☐ 活動的に学ぶ (受身でない)
- ☐ 他の教育に関する授業からの知識と関連付いている
- ☐ 快適で楽しい授業
- ☐ 個人単位の課題として、課題に取り組む
- ☐ あなたの将来の学生に教育を行う為になる、意味ある学習
- ☐ 授業の流れは、課題を行うために大切である
- ☐ 授業は個人単位によって学ばれる(グループ活動ではない)
- ☐ この授業は教育を発達させていくにとって効果的である
- ☐ 授業内で先生は、学生を導く役割を行う
- ☐ グループ内で共有し、協力する
- ☐ この授業はグループ学習である
- ☐ この授業で成功するには、努力が大変必要である

7. 以下の中から、メディアツール活用法の授業において、あなたが求める活動の特徴を選んでください。(当てはまるもの全てを選択、またはどれも当てはまらない場合は何も選ばないで下さい)

- ☐ 理論的な知識を伸ばす
- ☐ 課題に対して、グループで準備を行う
- ☐ グループで講義を進める
- ☐ 活動的に学ぶ(受身でない)
- ☐ 他の教育に関する授業からの知識と関連付いている
- ☐ 快適で楽しい授業
- ☐ 個人単位の課題として、課題に取り組む
- ☐ あなたの将来の学生に教育を行う為になる、意味ある学習
- ☐ 授業の流れは、課題を行うために大切である
- ☐ 授業は個人単位によって学ばれる
- ☐ この授業は教育を発達させていくにとって効果的である
- ☐ 授業内で先生は、学生を導く役割を行う
- ☐ グループ内で共有し、協力する
- ☐ 授業はグループ学習である
- ☐ この授業で成功するには、努力が大変必要である

8. メディアツール活用法の授業を通して、a)~r)の能力を伸ばすことが出来たと思いますか？

a) 教育効果をあげるには、どの場面にどのようにしてコンピュータやインターネットなどを利用すればよいかを計画する。

- ☐ はい ☐ いいえ ☐ わかりません

b) 授業で使う教材や資料などを集めるために、インターネットやCD-ROMなどを活用する。

- ☐ はい ☐ いいえ ☐ わかりません

c) 授業に必要なプリントや提示資料を作成するために、ワープロソフトやプレゼンテーションソフトなどを活用する。

- ☐ はい ☐ いいえ ☐ わかりません

- d) 評価を充実させるために、コンピュータやデジタルカメラなどを活用して児童の作品・学習状況・成績などを管理し集計する。
- ☐ はい ☐ いいえ ☐ わかりません
- e) 学習に対する児童の興味・関心を高めるために、コンピュータや提示装置などを活用して資料などを効果的に提示する。
- ☐ はい ☐ いいえ ☐ わかりません
- f) 児童一人一人に課題を明確につかませるために、コンピュータや提示装置などを活用して資料などを効果的に提示する。
- ☐ はい ☐ いいえ ☐ わかりません
- g) わかりやすく説明したり、児童の思考や理解を深めたりするために、コンピュータや提示装置などを活用して資料などを効果的に提示する。
- ☐ はい ☐ いいえ ☐ わかりません
- h) 学習内容をまとめる際に児童の知識の定着を図るために、コンピュータや提示装置などを活用して資料などをわかりやすく提示する。
- ☐ はい ☐ いいえ ☐ わかりません
- i) 児童がコンピュータやインターネットなどを活用して、情報を収集したり選択したりできるように指導する。
- ☐ はい ☐ いいえ ☐ わかりません
- j) 児童が自分の考えをコンピューターで文章にまとめたり、調べたことを表計算ソフトで表や図などにまとめたりすることを指導する。
- ☐ はい ☐ いいえ ☐ わかりません
- k) 児童がコンピュータやプレゼンテーションソフトなどを活用して、わかりやすく発表したり表現したりできるように指導する。
- ☐ はい ☐ いいえ ☐ わかりません

- l) 児童が学習用ソフトやインターネットなどを活用して、繰り返し学習したり練習したりして、知識の定着や技能の習熟を図れるように指導する。
- ☐ はい ☐ いいえ ☐ わかりません
- m) 児童が発信する情報や情報社会での行動に責任を持ち、相手のことを考えた情報のやりとりができるように指導する。
- ☐ はい ☐ いいえ ☐ わかりません
- n) 児童が情報社会の一員としてルールやマナーを守って、情報を集めたり発信したりできるように指導する。
- ☐ はい ☐ いいえ ☐ わかりません
- o) 児童がインターネットなどを利用する際に、情報の正しさや安全性などを理解し、健康面に気をつけて活用できるように指導する。
- ☐ はい ☐ いいえ ☐ わかりません
- p) 児童がパスワードや自他の情報の大切さなど、情報セキュリティの基本的な知識を身につけることができるように指導する。
- ☐ はい ☐ いいえ ☐ わかりません
- q) 校務分掌や学級経営に必要な情報をインターネットなどで集めて、表計算ソフトなどを活用して文書や資料などを作成する。
- ☐ はい ☐ いいえ ☐ わかりません
- r) 教員間、保護者・地域の連携協力を密にするため、インターネットや校内ネットワークなどを活用して、必要な情報の交換・共有化を図る。
- ☐ はい  
☐ いいえ  
☐ わかりません



9. 教育実習での体験や、自分の専門分野において注目している教育的問題を基に、以下の質問に答えてください。（いくつでも書いて下さい。）

a) 将来、どのような場面で ICT を導入したいと思いますか？

（例：資料やグラフを提示するとき。発音の練習を行う時。地球の動き方など理解しづらい変化や動きを視覚的に理解するとき。など）

b) メディアツール活用法の授業で、他にどのような教育のための ICT 機器を学びたいと思いますか？

c) メディアツール活用法の授業で、他にどのような教育のための ICT に関するスキルを学びたいと思いますか？

（例：児童がみんな一緒に活動的に学ぶためのスキル。数学において視覚的に理解しやすい授業づくりのためのスキル。プレゼンテーションのためのスキル。など。）

**Appendix D**  
**The National Standard for Teachers' Pedagogical Skills**

**A: The abilities to utilize ICT for researching teaching materials, preparing, and evaluating the instruction.**

1. The ability of planning for how and when you should utilize ICT like a computer and the internet to achieve the educational effects.
2. The ability to utilize ICT to collect the necessary teaching materials, resource, and information.
3. The ability to utilize ICT like presentation software for creating necessary materials and documents for displaying in the classes.
4. The ability to manage and accumulate students' products, learning contexts, and achievements by ICT to enrich the evaluations.

**B: The abilities to instruct by utilizing ICT in the classes.**

1. The ability to effectively present materials and documents for encourage students' learning interest and attentions by utilize ICT like a computer and a presentation device.
2. The ability to effectively present materials and documents for having each student have each problem awareness by utilize ICT like a computer and a presentation device.
3. The ability to effectively present materials and documents for explaining in better ways, promoting better understanding, and deepening students' considerations by utilizing ICT like a computer and a presentation device.
4. The ability to intelligibly present materials and documents for looking to students' establishing of the knowledge in summarizing the learning contents.

**C: The abilities to instruct students' ICT practical uses.**

1. The ability to guide and support students to collect and choose information by ICT like a computer and the internet.
2. The ability to guide and support students to summarize their ideas and thoughts in sentences with software and to organize the results of researching on tables, charts, diagrams, and graphs on spreadsheet programs and software.
3. The ability to guide and support students to effectively express and intelligibly explain objects by ICT like presentation software and the computers.
4. The ability to guide and support students to look to their establishing of knowledge and mastering of skills by repeating learning and practicing with ICT like software for learning and the internet.

**D: The abilities to instruct information morality.**

1. The ability to lead students to have the necessary responsibilities and duties of their behaviors in the informational society and to understand and respect human rights in an exchange of information.
2. The ability to lead students to collect and send information with understanding of the rules and manners on protection and handling of the information.
3. The ability to instruct students to use information correctly and safely with in-deep understanding of the reliability of information and the riskiness of cyber-crimes when they use the internet.
4. The ability to instruct students to safely use a computer and the internet with in-deep understanding of the basic knowledge about the importance of password and oneself and others' information security.

**E: The abilities to utilize ICT for official duties.**

1. The ability to create documents and materials for the division of duties of official affairs and the classroom management by collecting necessary information on the internet and utilizing spreadsheet programs and software.
2. The ability to look to the exchange and communization of required information by the internet and a campus network for strengthening the cooperation among the instructors, parents, and the region.

**A: 教材研究・指導の準備・評価などにICTを活用する能力**

1. 教育効果をあげるには、どの場面にどのようにしてコンピュータやインターネットなどを利用すればよいかを計画する。
2. 授業で使う教材や資料などを集めるために、インターネットやCD-ROMなどを活用する。
3. 授業に必要なプリントや提示資料を作成するために、ワープロソフトやプレゼンテーションソフトなどを活用する。
4. 評価を充実させるために、コンピュータやデジタルカメラなどを活用して児童の作品・学習状況・成績などを管理し集計する。

**B: 授業中にICTを活用して指導する能力**

1. 学習に対する児童の興味・関心を高めるために、コンピュータや提示装置などを活用して資料などを効果的に提示する。
2. 児童一人一人に課題を明確につかませるために、コンピュータや提示装置などを活用して資料などを効果的に提示する。
3. わかりやすく説明したり、児童の思考や理解を深めたりするために、コンピュータや提示装置などを活用して資料などを効果的に提示する。
4. 学習内容をまとめる際に児童の知識の定着を図るために、コンピュータや提示装置などを活用して資料などをわかりやすく提示する。

**C: 児童のICT活用を指導する能力**

1. 児童がコンピュータやインターネットなどを活用して、情報を収集したり選択したりできるように指導する。
2. 児童が自分の考えをワープロソフトで文章にまとめたり、調べたことを表計算ソフトで表や図などにまとめたりすることを指導する。
3. 児童がコンピュータやプレゼンテーションソフトなどを活用して、わかりやすく発表したり表現したりできるように指導する。

4. 児童が学習用ソフトやインターネットなどを活用して、繰り返し学習したり練習したりして、知識の定着や技能の習熟を図れるように指導する。

#### D: 情報モラルなどを指導する能力

1. 児童が発信する情報や情報社会での行動に責任を持ち、相手のことを考えた情報のやりとりができるように指導する。
2. 児童が情報社会の一員としてルールやマナーを守って、情報を集めたり発信したりできるように指導する。
3. 児童がインターネットなどを利用する際に、情報の正しさや安全性などを理解し、健康面に気をつけて活用できるように指導する。
4. 児童がパスワードや自他の情報の大切さなど、情報セキュリティの基本的な知識を身につけることができるように指導する。

#### E: 校務にICT を活用する能力

1. 校務分掌や学級経営に必要な情報をインターネットなどで集めて、ワープロソフトや表計算ソフトなどを活用して文書や資料などを作成する。
2. 教員間、保護者・地域の連携協力を密にするため、インターネットや校内ネットワークなどを活用して、必要な情報の交換・共有化を図る。

**Appendix E**  
**Informed Consent Document**

WESTERN MICHIGAN UNIVERSITY  
H. S. I. R. B.  
Approved for use for one year from this date:

JUL 09 2013

  
HSIRB Chair

Western Michigan University  
Educational Leadership, Research and Technology

**Principal Investigator:** Dr. Brian Horvitz

**Student Investigator:** Sayuri Kojima

**Title of Study:** Investigation of the Development of Educational ICT Courses on Pre-service Teachers' Education Curricula

You have been invited to participate in a research project titled "Investigation for Development of Educational ICT Courses on Pre-service Teachers' Education Curricula." This project will serve as Sayuri Kojima's thesis for the requirements of the Educational Technology program. This consent form will explain the purpose of this research project and will go over all of the time commitments, the procedures used in the study, and the risks and benefits of participating in this research project. Please read this consent form carefully and completely and please ask any questions if you need more clarification.

**What are we trying to find out in this study?**

This research explores student teachers' current learning situation about technology for teaching in the teacher education program. It also purposes to assess student teachers' expectations in learning technology for teaching in the future classrooms.

**Who can participate in this study?**

To participate in this study, you should have taken the Media Tool course at Shiga University and experienced the teaching practice.

**Where will this study take place?**

You will fill out the survey sheet in a classroom.  
The survey will take approximately 15 minutes to complete.

**What will you be asked to do if you choose to participate in this study?**

Participants will be asked to fill out a survey. The survey asks you about your own perspectives and experiences on educational technology in the Media Tool course. Only answer the question that you feel comfortable answering.

**What information is being measured during the study?**

In this survey, participants' own perspectives on the Media Tool course will be measured. Participants will present their own opinion. There is no right or wrong answers to these questions.



WESTERN MICHIGAN UNIVERSITY  
H. S. I. R. B.  
Approved for use for one year from this date:

JUL 09 2013  
x   
HSIRB Chair

**What are the risks of participating in this study and how will these risks be minimized?**

There are no known risks. None of the answers will be associated with any of your individual identification in any circumstances. Besides your school year, your identification will be kept anonymous.

**What are the benefits of participating in this study?**

You can receive the study results if you would like to. You may not be able to receive direct benefits from the study, but you can certainly contribute to the curriculum development of educational technology courses in teacher education programs.

**Are there any costs associated with participating in this study?**

No.

**Is there any compensation for participating in this study?**

No.

**Who will have access to the information collected during this study?**

The principal investigator and student investigator listed on top of this consent form will have access to the information.

**What if you want to stop participating in this study?**

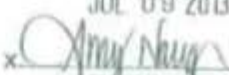
You can choose to stop participating in the study at anytime for any reason. You will not suffer any prejudice or penalty from your decision to stop your participation. You will experience NO consequences either academically or personally if you choose to withdraw from this study. The investigator can also decide to stop your participation in the study without your consent.

Should you have any questions prior to or during the study, you can contact the primary investigator, Sayuri Kojima at 269-993-1640 or [sayuri.kojima@wmich.edu](mailto:sayuri.kojima@wmich.edu). You may also contact the Chairperson of the Human Subjects Institutional Review Board at 269-387-8293 or the Vice President for Research at 269-387-8298 if questions arise during the course of the study.

This consent document has been approved for use for one year by the Human Subjects Institutional Review Board (HSIRB) as indicated by the stamped date and signature of the board chair in the upper right corner. Do not participate in this study if the stamped date is older than one year.

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I have read this informed consent document. The risks and benefits have been explained to me. I agree to take part in this study. By filling out and submitting the researchers' survey, I consent to the researchers using my data for their research.

JUL 09 2013  
x   
HSIRB Chair

Western Michigan University  
Educational Leadership, Research and Technology

指導教員: Dr. Brian Horvitz

調査員: 小嶋 咲由里

題名: Investigation of the Development of Educational ICT Courses on Pre-service Teachers' Education Curricula

この度は、私の修士論文における調査プロジェクト「Investigation for Development of Educational ICT Courses on Pre-service Teachers' Education Curricula」へのご協力を頂きたく、調査依頼状においてこのプロジェクトについての詳細を説明をさせていただきます。どうぞ、注意して御読みになり、深くご理解頂けるようご質問があればどうぞお尋ねくださいませ。

注: ICT=Information and Communication Technology (情報通信技術)/ ネットワーク通信による情報・知識の共有のための技術。(例) コンピュータやインターネット技術

この調査における目的

この調査の目的は、教育学部で学ぶ学生が、大学の授業でどのような ICT に関する知識や能力を発達させているかを明らかにすることです。またカリキュラム開発のために、教育学部で学ぶ学生が、教育実習の経験や自らが抱く教育的問題を基に、どのような ICT に関する授業を求めるかを判断することです。

この調査への参加者

この調査の対象者は、メディアツール教育の授業をすでに取り、教育実習に行ったことがあり、教育的知識がある程度ついた 3 回生以上の学生です。

調査場所

教室内において、およそ 15 分ほどで完成するアンケートに記入していただきます。

調査に承諾を得た場合

参加者は、アンケートの質問に回答します。このアンケートは、あなたのメディア・ツール教育の授業内での、将来指導に活用できるテクノロジーの教育に関する観点、経験や期待を問うものです。回答に、正解・不正解はありません。あなた自身の意見でお答え下さい。回答するにおいて、心地よく感じなければ回答しなくて結構です。

JUL 09 2013

x   
HSIRB Chair

#### 参加するにあたって考えられうるリスク

特にありません。全ての回答は、あなたの個人情報を連想させるものではありません。  
また、あなたの情報において、名は明かされません。

#### 参加するにあたっての利益

万が一、調査結果を要するようでしたら研究終了後にお渡し致します。おそらく、このアンケートを通してあなた自身が得る利益はありません、しかし、あなたのアンケート結果は、教育大学における教育のための ICT を扱う授業やカリキュラム開発に確実に貢献することになります。

#### アンケートの情報にアクセスできる人物

上記の指導教員と学生調査員 2 名のみが、アンケートの情報にアクセスします。

#### 万が一、この調査を途中で止めたくなくなった場合

どんな理由においても、この調査への参加はいつでも止めることができます。また、辞退した場合においても、なんらかの偏見やペナルティーを負う事は一切ありません。辞退を選ぶことで、なんらかの影響が教育面やプライベートに出ることも一切ございません。

万が一、何かご質問がございましたら [sayuri.kojima@wmich.edu](mailto:sayuri.kojima@wmich.edu) にて調査員へご連絡下さい。または、+1269-387-8293 にて Chair, Human Subjects Institutional Review Board、または調査内において何か疑問がありましたら、+1269-387-8298 にて副会長へご連絡下さい。

この調査依頼状は、Human Subjects Institutional Review Board (HSIRB) から調査許可が下りているものに 1 年間有効期限付きのスタンプが押されております。万が一、そのスタンプの情報が古ければ、調査に参加しないで下さい。

アンケートに回答し提出することによって、調査員があなたのアンケートデータを調査のために利用することを認めることになります。