DESIGN AND IMPLEMENTATION OF A MULTIPURPOSE E-PORTFOLIO FOR CLINICAL CLERKSHIP IN A KOREAN MEDICAL SCHOOL ENVIRONMENT

by

YUNSEOK LEE

(Under the Direction of Ikseon Choi)

ABSTRACT

The goal of this study is to examine students and faculty's experiences with using an e-portfolio system in clinical clerkship and to propose recommendations for designing and implementing clerkship e-portfolio systems that can enhance users' clerkship experiences. This research focused on (1) identifying positive and negative experiences of students and faculty in using the e-portfolio system for clinical clerkship, (2) analyzing key themes obtained from the identified positive and negative experiences, and (3) to propose recommendations for successful design and implementation of clerkship e-portfolio systems.

The target population of this study consisted of a total of 108 third-year medical school students and 255 clerkship professors who had experienced the clerkship e-portfolio system during the clinical clerkship. Nine students and nine professors participated in the individual interviews. Also, 97 students completed a follow-up student online survey and 62 clerkship professors also completed a follow-up faculty online survey.

The analysis results of the interview data revealed various positive and negative

experiences of students and clerkship faculty in using the clerkship e-portfolio system. For students, the experiences included the following observations: convenience in use, writing up clerkship reports out of a sense of obligation, burdensome workload of paperwork, insufficient faculty feedback, lack of understanding of the value of the e-portfolio, lack of using tablets, lack of knowledge of assessment criteria, and issues in Internet and hardware infrastructure. For faculty, the analysis of their experience have yielded the following observations: sufficient storage space, no loss of clerkship data, lack of time for accomplishing e-portfolio works, and senior faculty's technological challenges.

Sixteen key themes that significantly affected students' clerkship and faculty's mentoring experiences were identified by analyzing the identified experiences in using the clerkship e-portfolio. Based on the analysis, 12 recommendations for designing and implementing improved e-portfolio systems for clinical learning environments were proposed.

Finally, further issues were discussed regarding the limited role of the e-portfolio system in promoting students' reflection cycle and the faculty's incomplete adoption of the clerkship e-portfolio.

INDEX WORDS*:* E-portfolio, Electronic Portfolios, Assessment, Reflection, Medical Education, Comprehensive Design framework, Clinical Clerkship, Clerkship E-portfolio

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YUNSEOK LEE

B.E., Kyunghee University, Republic of Korea, 2003

M.S., Ajou University, Republic of Korea, 2006

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YUNSEOK LEE

Major Professor	Ikseon Choi
Committee	Lloyd P. Rieber Kang Li Boyoung Yoon

Electronic Version Approved:

Suzanne Barbour
Dean of the Graduate School
The University of Georgia
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CHAPTER 1

INTRODUCTION

The process of learning produces artifacts of different types. The types of artifacts range from writing samples to evaluations and multimedia resources. A combination of the different types of artifacts, or a portfolio, can effectively demonstrate an individual's progress over his or her learning career. Likewise, purposeful collection of artifacts represents a learner's accomplishments and competencies in a discipline (e.g., Abrami & Barrett, 2005; Smith & Tillema, 2003). A portfolio can be defined as a deliberate collection of artifacts that show a person's learning journey, achievements, and competencies (Paulson, Paulson, & Meyer, 1991). An electronic portfolio (e-portfolio) is essentially a digital version of a paper-based portfolio (Butler, 2007).

The contents of portfolios are catered to the needs of the target audience, motivation for artifacts selection, and organization of artifacts. Therefore, portfolios and e-portfolios have been widely adopted for diverse purposes in a variety of educational fields, such as medicine, teacher education, engineering, music, and so forth (Wolf, 1989).

Recently, the use of portfolios has been in increasing demand in a variety of fields. Most teacher education programs in the United States have incorporated use of portfolios to facilitate student teachers' reflection and analysis of their teaching practices (Salzman, Denner, & Harris, 2002; Zeichner, & Liston, 1996; Zeichner & Wray, 2001). In undergraduate medical education, increased need for reflective practice and the movement toward competency-based medical education have called for the use of e-portfolios. E-portfolio systems covering similar

purposes—learning and assessment—have also been developed in undergraduate nursing education (Buckley et al., 2009; Driessen et al., 2005; Glen & Hight, 1992; Nursing and Midwifery Council, 2008) and other health professions such as physical therapy (Buckley et al., 2009; Paschal et al., 2002). Likewise, an e-portfolio can effectively demonstrate an individual's learning achievements and abilities with purposeful selection and organization of artifacts (Lorenzo & Ittleson, 2005).

E-portfolio systems have been designed and implemented for diverse purposes (Butler, 2007) in a range of classes, programs, and institutions. However, limited research has provided comprehensive design and implementation frameworks that integrate multiple purposes of e-portfolio systems. Several conceptual studies have proposed design frameworks or models to organize artifacts (e.g. Buzzetto-More & Alade, 2008; Rao et al., 2012; Wang, 2009). A few studies proposed computer and network technology such as semantic web and cloud computing as a way to structure and maintain artifacts (Kim, Ng, & Lim, 2010). However, most studies have examined ways to guide an institution's decision-making in adoption of e-portfolio systems, construct e-portfolios' artifacts in a structured way to enhance student learning, provide guidelines for a particular purpose, or report lessons learned from the authors' practices (e.g., O'Sullivan et al., 2012; Wall, Higgins, Miller, & Packard, 2006; Kabilan & Kahn, 2011).

Problem Statement

One of the critical problems in the e-portfolio systems implemented in previous studies is the lack of comprehensive considerations of e-portfolios' multipurpose nature in design and implementation processes. Most previous e-portfolio systems were designed and implemented for a particular purpose or a target audience (Butler, 2007; Lorenzo & Ittleson, 2005). Thus,

systems that are unfit for a specific purpose or a target audience may yield critical problems such as discontinuous use, and decrease of learning effectiveness. For example, when an e-portfolio is designed mainly for one of four major stakeholders: students, instructors, institutions, and employers, students often stop using e-portfolios immediately after graduating from a program or even after completing a course (Zeichner & Wray, 2001). Insufficient consideration of an e-portfolio's multiple uses can cause lack of perception of an e-portfolio's value, superficial levels of reflection, and low levels of engagement in students (Buzzetto-More & Alade, 2008; Lorenzo & Ittleson, 2005). All in all, incomprehensive designs of e-portfolios inhibit continuous and effective use of e-portfolios. Therefore, research in comprehensive design and implementation frameworks is necessary for successful implementation of e-portfolio systems in institutions.

Moreover, each educational field has distinctive features that should be deliberately considered in the design and implementation processes of e-portfolio systems. While one comprehensive framework cannot integrate all of the unique features of various educational fields, it can play a key role in providing essential design considerations. Thus, sufficient follow-up case studies of e-portfolios in a specific educational environment must be conducted in order to develop a robust and reliable framework for design and implementation of e-portfolios that are appropriate for a particular educational context. The research context of the study is a medical education environment. In medical education, there have been lack of empirical studies for providing proper recommendations for designing and implementing e-portfolio systems for clinical clerkship.

Research Questions

The purpose of the present research is (1) to identified positive and negative experiences

of students and faculty in using the e-portfolio system in clinical clerkships, (2) to analyze key themes that are emerged from the identified positive and negative experiences, and (3) to provide suggestions for designing and implementing successful clerkship e-portfolio systems. A comprehensive framework for multipurpose educational e-portfolios was developed and proposed based on the review of the literature on educational e-portfolios as the foundation of this e-portfolio research.

A clerkship e-portfolio system was developed and implemented by the Inje College of Medicine to improve clerkship experiences of students and faculties. A series of individual interviews and online surveys were conducted during the last two months of a year-long clinical clerkship. The collected data were analyzed for key themes that significantly affected experiences of participants. Lastly, the final data analysis produced recommendations for successful design and implementation of clerkship e-portfolios. The following research questions were addressed and answered in this study:

- Research Question 1: What positive and negative experiences did students and faculty have in using the e-portfolio during the clerkship?
- Research Question 2: What key themes cause an individual to have positive or negative experiences during the clerkship?
- Research Question 3: What are the recommendations for designing and implementing a successful clerkship e-portfolio system?

CHAPTER 2

LITERATURE REVIEW

Overview to the Literature Review

This chapter reviews the literature on portfolios and e-portfolios in educational fields. This chapter begins with a historical overview of portfolios and e-portfolios. After the presentation of the historical foundation, the procedure and the results of the literature reviews are presented. The procedure of the literature review includes: criteria for selecting literature, data sources searched, and data processing and analysis. The results reported the issues and challenges of using e-portfolios, relevant strategies that overcome such problems, and guidelines for designing and implementing e-portfolios. Then, a table that organizes the results according to purposes of e-portfolio usage proposes a comprehensive framework for designing and implementing multipurpose e-portfolios. Finally, e-portfolios in medical education and reflective thinking in clinical clerkship are presented.

Historical Overview of Portfolios and E-portfolios

The Concept of Portfolios in Various Fields

The concept of a portfolio historically originates in art fields. Artists traditionally build their portfolios by selecting samples of their work in order to showcase their best work or their identity as artists (Barrett, 2001; Barrett, 2007; Castiglione, 1996). In finance, a portfolio

incorporates comprehensive fiscal data regarding a person's financial history and status (Barrett, 2001; Barrett, 2007). As for educational portfolios, its concept has been evolved over time. While an educational portfolio was initially considered a simple collection of a student's best work (Herbert, 1998; Polonoli, 2000). It has also embodied broader roles: a comprehensive collection of a student's learning progress and achievements, rich and authentic evidence to assess a student's learning or performances, and diverse information that meets the institutional need of accountability for academic programs (Polonoli, 2000).

More recently, portfolios have been used as an effective reflection tool for students' professional development in teacher education (Barrett, 2000; Wolf, 1999). Furthermore, particularly in medicine, portfolios have gradually played a critical role as continuing professional development tools (Challis, 1999). Though the definition of a portfolio has changed over the last couple of decades, this study defines a portfolio as a deliberate collection of artifacts that present a person's learning progress and achievements over time (Lorenzo & Ittleson, 2005; Paulson, Paulson, & Meyer, 1991), and qualifications for a job.

Definition and Benefits of Educational E-portfolios

Basically, an e-portfolio is a digital version of a paper-based portfolio (Butler, 2007). Abrami and Barrett (2005) defined an e-portfolio as "a digital container capable of storing visual and auditory content including text, images, video and sound," adding that "EPs may also be software tools not only because they organize content but also because they are designed to support a variety of pedagogical processes and assessment purposes." Because an e-portfolio is constructed in computer-based environments, it has benefits in comparison with their paper-based counter parts. The benefits of using e-portfolios include the following: unlimited space for

storing artifacts and resources, flexible and convenient re-processing of e-portfolio data according to institutions' needs (Ledoux & McHenry, 2006), overall portability and storability of data, development of technology skills to create digital artifacts, a more learner-centered environment, easy to organize artifacts to meet certain standards, and better accessibility to public or broader target audiences (Barrett, 2001).

Adoption of Educational E-portfolios

Since the 1990s, e-portfolios have increasingly been adopted due to four primary forces: pedagogical changes toward student-centered, active learning, web-based digital communication technologies, increased demand of accountability for students' learning, and mobility in education and employment (Clark & Eynon, 2009).

In the pedagogical shift toward student-centered learning, each student is considered a self-directed learner who creates his or her own learning content. Integrative learning has grown in interest as a means of learning across disciplines and programs and of linking the classroom to authentic experiences and various life goals. E-portfolios can respond to the growing movement of these pedagogical trends. The second driver is the advancement of web-based information technology, such as Web 2.0. The technological capacity to accumulate and publish digital contents makes e-portfolios accessible and adaptable (Clark & Eynon, 2009). The use of e-portfolios has also been accelerated by the growing need for accountability. The need for providing stakeholders with accessible and comparable measures of student learning can be fulfilled by e-portfolios. By linking students' learning outcomes and progress to institutional competencies, e-portfolios can be a good alternative to traditional assessments that merely emphasize standardized testing (Clark & Eynon, 2009; Reese & Levy, 2009). Finally, the

e-portfolio movement can respond to increasing mobility in employment and education (Clark & Eynon, 2009). These days, people commonly have multiple career shifts, and growing numbers of students take courses in multiple educational institutions. Students need a way to showcase their learning and qualifications, and to keep the materials and data with them when they move from one institution to another. E-portfolios can meet the need for transferability among institutions or organizations (Clark & Eynon, 2009).

Classification of E-portfolios

Many studies have presented several criteria to categorize portfolios. Lorenzo and Ittleson (2005) classified e-portfolios into three categories based on major subjects: student e-portfolios, teaching e-portfolios, institutional e-portfolios. Several studies classified portfolios according to the purpose of use. Zeichner and Wray (2001) highlighted three different types of portfolios based on the purpose of use: learning portfolios, credential portfolios, and showcase portfolios. Abrami and Barrett (2005) listed three different types of portfolios with slightly different purposes from Zeichner's and Wray's: process portfolios, showcase portfolios, and assessment portfolios. Smith and Tillema (2003) also defined four types of portfolios based on different purposes: dossier portfolios, training portfolios, reflective portfolios, and personal development portfolios. These studies all have categorized different types of portfolios by its purpose for use despite the differences in naming of said purposes between studies.

The following three common purposes for e-portfolio usage were identified from these studies: learning, assessment, and showcase. Figure 2.1 shows how the purposes are grouped into the three major categories.

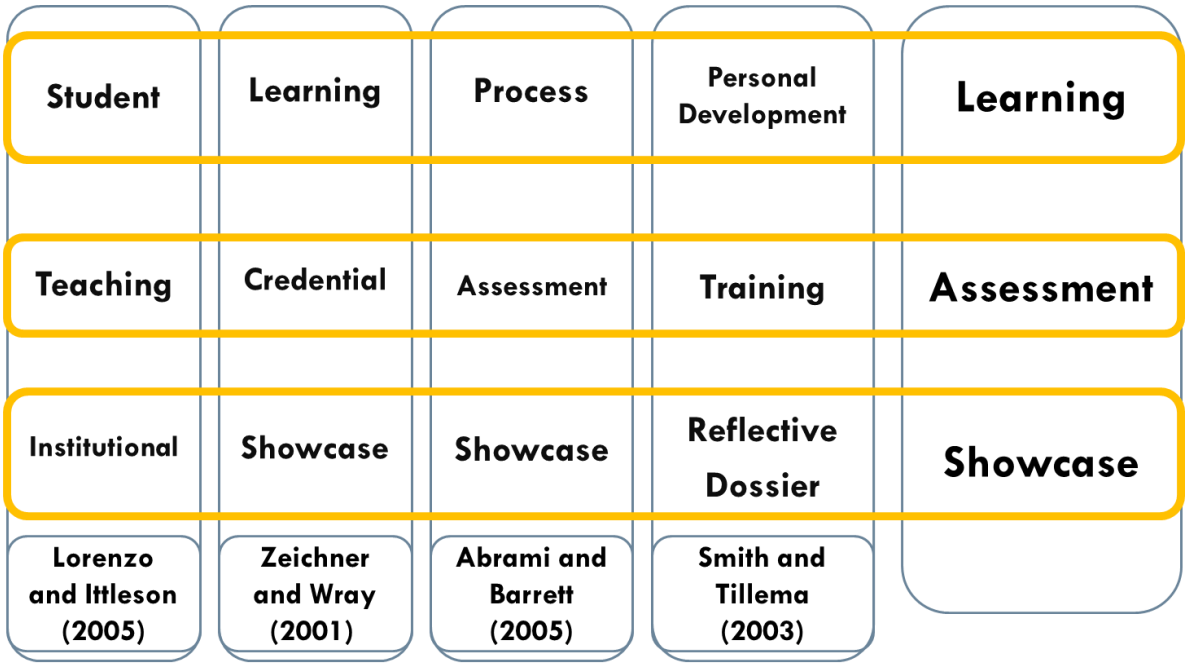


Figure 2.1

The three major purposes of e-portfolios

This classification of e-portfolios reflects various stakeholders' perspectives, including those of the creators themselves, professors, employers, institutions, organizations, and so forth. For example, in the case of students who are the most important creators of educational e-portfolios, a student's learning continuum throughout his or her lifetime—learning as a student, learning for a job or a promotion, and continuing education for professional development—can be incorporated by the three major purposes. From the standpoint of the instructor and the institution, e-portfolios can be used as an evaluation tool to assess students' learning. A showcase e-portfolio can also be used as valuable evidence for evaluation of a job applicant or a professional.

A Framework for Designing and Implementing Multipurpose E-portfolios

This section attempts to understand the recent status of different uses of e-portfolios in educational fields reflected in empirical studies related to e-portfolios. Then, limitations of the previous empirical studies are reviewed, and key components and relevant strategies to overcome primary challenges of using e-portfolios are discussed. Finally, this section summarized guidelines for designing and implementing e-portfolios embracing the three major purposes: learning, assessment, and showcase. This section begins with the procedure of the literature analysis.

The Procedure of the Literature Analysis

Selection criteria. The existing studies on e-portfolios were selected using the following criteria: (1) the research should only involve educational e-portfolios, (2) the study should be carried out in higher education environments, (3) the research should be published in English, and (4) the study should involve either a design framework for e-portfolio systems or a conceptual model that structures e-portfolio artifacts, or the study should include empirical data obtained from implementations. To develop a more generalized design framework by collecting and analyzing broader fields of study, the types of fields in which studies were conducted as well as the time of publication were overlooked.

Data sources. Education Research Complete, ERIC, PsycINFO, Academic Search Complete, ScienceDirect, Health Source, MEDLINE, and Science Citation Index (SCI) were searched using the search query "*portfolio*", and the search results ranged from years 1990 to 2013. Additional papers were retrieved from the reference sections of the searched articles. A total of 217 studies were searched, and based on the selection criteria, 148 studies, which involved non-educational portfolios or had no empirical data, were excluded. In total, 69 studies

were selected and reviewed.

The fields of the selected studies were medical education, teacher education, engineering education, and information technology education. Medical education and teacher education were identified as the major fields of educational portfolios or e-portfolios. In total, 57 out of 69 studies were found in medical education and teacher education.

Data coding and analysis. First, the 69 studies were divided into two groups: studies that involve either design frameworks or models of e-portfolio design and empirical studies. Five studies proposed a design framework or a model, and 64 studies were identified as empirical studies. The 64 empirical studies were organized by educational fields and the three major purposes. Then, the 64 studies are analyzed by summarizing issues, challenges, and lessons learned from their implementations and by collecting strategies used to improve or solve those issues and challenges. Based on the issues, challenges, and attributes for successful design and implementation of e-portfolios, 11 key components of e-portfolios and 19 relevant strategies to improve the key components were identified. Finally, ten guidelines for designing and implementing successful e-portfolios were proposed.

The Recent Status of Different Uses of E-portfolios in Various Educational Fields

Initially, the 64 empirical studies were classified by their fields and, purposes of use of the e-portfolios implemented. They were also differentiated by major themes of the studies. Regarding the purposes of use, 41 out of 64 studies implemented e-portfolios for student leaning. As for the main themes, 41 studies involved learning improvement, technology incorporation, students' attitudes or behaviors about use of e-portfolios, efficient ways of structuring or standardizing e-portfolios, and postgraduate education. Of 64 studies, 22 focused on the effectiveness of e-portfolios as an assessment tool for postgraduates. Only one study researched

e-portfolios' potential as a showcasing tool. The study studied e-portfolios' use in students' career planning. In terms of educational fields, 34 studies were conducted in medical education, and 23 in teacher education, and seven in the other educational fields such as engineering. Table 2.1 shows the result of the initial analysis. Table 2.2 presents the research goals and key findings of the key empirical studies according to the eight main themes.

Table 2.1

The analysis of the different use of e-portfolios in various educational fields

Field/Purpose	Main Themes of Studies	Medical Education	Teacher Education	General Education	
Learning		22	15	4	41
	Learning improvement	10	11	1	(64%)
	Technology incorporation	3	0	2	
	Attitudes/behaviors	1	2	0	
	Structure/standardization	3	0	1	
	Postgraduate education	5	2	0	
Assessment		12	8	2	22
	Effectiveness	8	8	2	(34.4%)
	Postgraduate evaluation	4	0	0	
Showcase		0	0	1	1
	Career planning	0	0	1	(1.6%)
		34(53%)	23(36%)	7(11%)	64

Table 2.2

Example empirical studies according to the main themes

Purpose	Main Themes	Fields	Example Articles	Research Goals	Key Findings
Learning					
	Learning improvement	Teacher	Harun, R., Safinas, R. N., & Jhee, Y. S. (2012). Enhancing Learning through Process E-Portfolios among ESL Graduate Students in an Education University. International Journal of Learning, 18(10).	(1) to investigate what kind of learning opportunities are given through the process of building the e-portfolio, (2) to identify challenges students and lecturers encountered.	(1) The e-portfolio provided many learning opportunities through the process of building an e-portfolio (2) Careful and thoughtful instructions are essential to guiding students to be fully engaged in online learning activities.
		Medical	Goodyear, H. M., Bindal, T., & Wall, D. (2013). How useful are structured electronic portfolio	To examine usefulness of the 11-field structured	(1) Four fields are the maximum number for

		templates to encourage reflective practice?. Medical Teacher, 35(1), 71-73. doi:10.3109/0142159X.2012.732246	template for specialty trainees' reflective practice	better reflection of key learning points. (2) There was a need for emphasis on quality rather than quantity of reflective logs
Technology incorporation	Medical	Bogossian, F. E., Kellett, S. E., & Mason, B. (2009). The use of tablet PCs to access an electronic portfolio in the clinical setting: a pilot study using undergraduate nursing students. Nurse education today, 29(2), 246-253.	To examine the usability of tablet PCs to access an e-portfolio in the clinical setting.	Effective use of the e-portfolio was limited by the following factors: lack of space, the busy nature of the working environment, and concerns about the security of the devices.
Attitudes /behaviors	General	Tzeng, J. Y., & Chen, S. H. (2012). College students' intentions to use e-portfolios: From the perspectives of career-commitment status and weblog-publication behaviours. British Journal of Educational Technology, 43(1), 163-176.	To examine college students' intentions to use and the students' attitudes towards using an e-portfolio system in relation to career commitment	Career commitment status significantly influenced students' intentions and attitudes related to using an e-portfolio. However, students' use of e-portfolios for career-

			status and weblog-publication behaviors	commitment was not significantly impacted by the use of weblogs.
Structure /standardization	Medical	Rao, S., Swartz, A., Obeid, L., Rao, S., Joyce, B., Whitehouse, S., ... & Rubinfeld, I. (2012). e-Portfolio competency metadata: Pilot study for a call to action. Journal of medical systems, 36(2), 457-462.	To develop a standardized e-portfolio that provides portability of e-portfolio data among medical institutions in order to obtain improved education and patient care	An e-portfolio system was developed based on the preliminary standard for residency competency metadata and implemented for a residency program. The metadata schema is expected to be a foundation for the development of standard e-portfolios for residency programs.
Postgraduate education	Medical	Fung, M. F. K., Walker, M., Fung, K. F. K., Temple, L., Lajoie, F., Bellemare, G., & Bryson, S. C. (2000). An Internet-based learning portfolio in resident education: the	To describe an internet-based learning portfolio and to examine its effects on residents' perception of their	The learning portfolio showed a significant effect on residents' perception of their self-directed learning abilities. The residents

			KOALA™ multicentre programme. Medical education, 34(6), 474-479.	self-directed learning abilities	believed the learning portfolio with online resources would lead to their future learning.
		Teacher	Pitts, W., & Ruggirello, R. (2012). Using the e-Portfolio to Document and Evaluate Growth in Reflective Practice: The Development `and Application of a Conceptual Framework. International Journal Of Eportfolio, 2(1), 49-74.	To propose a conceptual framework for supporting and assessing authentic reflections for science teacher education programs using e-portfolios	Successful e-portfolio entries that describes teachers' reflective practice were made when teachers explicitly showed how their professional competency increased over time through well-aligned sets of evidence.
Assessment					
	Effectiveness	Teacher	Lambe, J., McNair, V., & Smith, R. (2013). Special Educational Needs, e-Learning and the Reflective e-Portfolio: Implications for Developing and Assessing Competence in Pre-Service Education. Journal Of Education For	(1) to evaluate an e-portfolio system to assess a pre-service teacher education program (2) to examine individuals'	The e-portfolio was perceived to be an authentic approach for program assessment. And individuals felt that the e-portfolio was useful for showing their

	Teaching: International Research And Pedagogy, 39(2), 181-196.	perceptions of using the e-portfolio as a qualitative assessment tool	learning in diverse ways. A tutor-led workshop was also perceived helpful and necessary. Finally, some participants acknowledged the e-portfolio's potential for continuing professional development (CPD).
Medical	Sánchez Gómez, S., Ostos, E. C., Solano, J. M., & Salado, T. H. (2013). An electronic portfolio for quantitative assessment of surgical skills in undergraduate medical education. BMC Medical Education, 1365. doi:10.1186/1472-6920-13-65	To examine the perceived usefulness of newly designed e-portfolio to evaluate students' surgical knowledge and skills	Students perceived that the e-portfolio was useful for their learning when both quantitative feedback on their progress and formative evaluations were given. Also, students felt that the e-portfolio's quantitative indication of learning progress guided

					their learning process towards achievement of the surgical skills targets.
	Postgraduate evaluation	Medical	Staccini, P., & Rouger, P. (2008). Modeling and using a web-based and tutored portfolio to support certification of professional competence in transfusion medicine. AMIA ... Annual Symposium Proceedings / AMIA Symposium. AMIA Symposium, 697-701.	To introduce an e-portfolio-based national certification program for transfusion medicine professionals	The e-portfolio's structure was proved to be an effective list of evidence for certification of professionals. This e-portfolio-based certification system was approved by the national healthcare agency and has been used for the actual certification process in France.
Showcase					
	Career planning	General	Lumsden, J. A., Pinataro, C. M., Baltuch, A. L., & Reardon, R. C. (2009). Assessing career skills and competencies with an electronic portfolio. Career Planning & Adult	To describe the use of an e-portfolio for career assessment that evaluates staffmembers'	The key to the e-portfolio was a skills matrix, which consisted of nine transferable skills: communication,

	Development Journal, 25(4), 126-137.	ability and skills for their jobs.	creativity, critical thinking, leadership, life management, social responsibility, teamwork, technical/scientific, and research/project development. The most important lesson was the frequent introducing of the purpose, its value, guidance for building career e-portfolios, and actual use to all the community members.

The Limitations of the Previous Implementations of E-portfolios

The lack of consideration of e-portfolios' multipurpose nature in previous studies.

Most e-portfolio systems in educational institutions have been designed and used for various purposes (Butler, 2007) in a range of courses, programs, and institutions, yet no studies reviewed in the literature review have proposed comprehensive frameworks that sufficiently consider the three major purposes—learning, assessment, and showcase—for designing and implementing e-portfolios. For example, several studies proposed design frameworks or models of e-portfolios (e.g. Buzzetto-More & Alade, 2008; Rao et al., 2012; Wang, 2009). Specifically, two studies proposed design frameworks only for the learning purpose: an ontological structure of e-portfolios' artifacts to improve learner's reflections and a standardized framework of e-portfolio data for postgraduate education (Rao et al., 2012; Wang, 2009). The other study proposed a model to guide decision-making in adopting e-portfolio systems (Buzzetto-More & Alade, 2008). Likewise, most of the studies focused on either the adoption of e-portfolio systems in institutions or structuring e-portfolios for student learning.

In addition, a study proposed several technological methods, such as semantic web and cloud computing, for building effective and scalable educational e-portfolios (Kim, Ng, & Lim, 2010). The study aimed to improve several implementational challenges in scalability, sustainability, data transportability, and user's incorporation of recent information technologies. However, the study did not incorporate the three major purposes into their design and implementation of e-portfolios. Other empirical studies reviewed also mainly focused on providing guidelines for one purpose and lesson learned from their practices (e.g., O'Sullivan, 2012; Wall, Higgins, Miller, & Packard, 2006; Kabilan & Kahn, 2011).

Problems of incomprehensive design of e-portfolios. The previous section highlighted the limitations of the previous studies in the design and implementation of e-portfolios. The studies did not comprehensively consider multipurpose nature of e-portfolios. Such lack of comprehensive design of e-portfolio systems can cause various problems. For example, discontinuous use, decrease in learning effectiveness, and inappropriate content for purposes can arise when an e-portfolio system is designed and developed only for a single purpose or a target audience instead of being designed by carefully considering multiple purposes and various stakeholders (Lorenzo & Ittleson, 2005).

Students often stop using their e-portfolios immediately after they graduate from a program or even after they complete a course. The gap between student purposes and instructor or institutional purposes for using e-portfolios can hinder students and instructors from using e-portfolios (Zeichner & Wray, 2001). The gap can come about when either learning or assessment is overemphasized. Lack of perception of the value of e-portfolios, superficial reflection of students, and low levels of student engagement can also be caused by insufficient consideration of the learning purpose of e-portfolios (Buzzetto-More & Alade, 2008; Lorenzo & Ittleson, 2005).

After graduation, educational e-portfolios constructed for a course or program may not meet the needs of the current job markets (Butler, 2007; Greenburg, 2004) unless the e-portfolios were initially designed and constructed as showcase tools and considered potential employers as target audiences. Sometimes, depending on their goals and purposes, students have to create different sets of e-portfolios (Zeichner & Wray, 2001). These problems caused by lack of comprehensive design can be primary barriers to continuous and effective use of e-

portfolios.

Key Components and Relevant Strategies to Overcome Primary Challenges of Using E-portfolios

From the literature review of educational e-portfolios in various fields including medical education, teacher education, engineering education, and information technology education, key components and relevant strategies were identified. Each key component was derived from common issues, challenges, guiding questions, attributes for successful design and development of an e-portfolio system, and barriers to using e-portfolios. Each key component was initially classified according to the main purposes, and then, relevant strategies were identified under each key component. In the following section, each key component and relevant strategies are explained.

Quality of student reflection. Most studies have emphasized the importance of student reflection on contents of an e-portfolio to improve learning (e.g., Abrami & Barrett, 2005; Smith & Tillema, 2003). An e-portfolio can become a powerful and effective learning tool depending on the quality of the student reflection because reflection is a key aspect of the pedagogy of portfolios (Kimball, 2005).

Many empirical studies in various educational fields (e.g., Mcmullan, et al., 2003) have reported several causes of superficial reflections: student's inexperience with authoring reflections, an overabundance of guidelines that cause restriction and low engagement, and a general lack of: guidelines, examples from previous portfolios, instructor support, security, perception of the importance of e-portfolios, meaningful feedback, and so on. Based on these factors, relevant strategies such as providing the support of the educational supervisor, enhancing

student engagement, improving student perception of the importance of creating an e-portfolio, and applying a multisource feedback system, were identified as ways to improve the quality of student reflection.

Postgraduate (continuous) learning. One of the major driving forces of e-portfolio use, as explained in the previous section, is increasing mobility in employment and education (Clark & Eynon, 2009). When students graduate from school or transfer to other educational institutions, they would like to keep their e-portfolios, including their learning achievements, skills, and qualifications for relevant job positions, with them (e.g., Abrami & Barrett, 2005; Lorenzo & Ittleson, 2005). Professionals may also prefer to use their e-portfolios when they enter new institutions or organizations. In these cases, a lack of standards or transportability can cause discontinuous use of e-portfolios. This can be a huge barrier to using e-portfolios as a learning tool. Since e-portfolios have significant potential of learning for students as well as postgraduate learning for professionals (Barret, 2000; Lorenzo & Ittleson, 2005; Love & Cooper, 2004; Zeichner & Wray, 2001), covering the entire learning continuum of an individual is important for improving the effectiveness and use of an e-portfolio as a learning tool. From this point of view, establishing standards for certification and providing interoperability and transportability were identified as relevant strategies.

Technology use and user-friendly interface design. E-portfolios usually use various current web-based technologies, such as Web 2.0, and require multimedia authoring skills. Several studies (e.g., Heath, 2002; Hauge, 2006; Tosh, Light, Fleming, & Haywood, 2005) have reported student difficulties in learning and using the technological authoring skills. Guiding instructors to effectively incorporate the technologies in their teaching with e-portfolios was also challenging. Providing introductory technological instruction at the beginning of the course to

facilitate learning of the required skills was identified as a good way to provide students with hands-on experience in e-portfolios. The introductory sessions can also improve student understandings of how to use e-portfolios for their own learning and demonstrate the value e-portfolios have as learning and evaluation tools (Duque et al., 2006).

User interface design has posed another serious challenge in developing e-portfolio system. Interface should reflect multiple design factors including the various levels of students who use technologies and authoring tools, the purpose in using e-portfolios, the target audiences, and so forth. According to Snider and McCarthy (2012), "Intuitive, easy to use, and flexible" design of user interface is necessary to relieve the difficulties in using e-portfolios.

Access control for e-portfolio artifacts. Since e-portfolios are developed on web-based platforms and are viewable by many people, there have been concerns about privacy issues (Tosh, Light, Fleming, & Haywood, 2005). Because e-portfolios often contain private contents, it is important to provide students with the control of accessibility to the sensitive artifacts in their e-portfolios. An insufficient access control may discourage students from posting personal reflections or any other sensitive material in their e-portfolios. The lack of control can yield low quality reflections, and can even decrease the entire learning effectiveness of e-portfolios. Several studies (e.g., McNeill, Brown, & Shaw, 2010; Treuer & Jenson, 2003; Tosh, Light, Fleming, & Haywood, 2005) have reported these privacy issues.

Consideration of target audience. The design and content of an e-portfolio should be differentiated according to the potential target audiences (Smith & Tillema, 2003). For example, a showcase e-portfolio designed to show a student's academic progress and achievement will not be appropriate for use when applying for a job. Likewise, an e-portfolio presenting only the best pieces of work will not be useful for evaluators who wish to assess a student's reflective learning

(Butler, 2007). In the case of personal use, target audiences can be anyone who has access to e-portfolios; thus, a creator of an e-portfolio can freely post various artifacts thought to be meaningful for him or her in any form. If an e-portfolio is used for the purpose of learning in a course, artifacts should be constructed to meet the objectives and guidelines of the course.

Reliability and validity. Many studies (e.g., Davies, Khera, & Stroobant, 2005; Jasper & Fulton, 2005; Webb et al., 2003) have raised concerns about the reliability and validity of e-portfolio assessment since most of the contents of e-portfolios are very subjective, and they are often assessed by an instructor. Subjective and inconsistent judgments of raters and lack of validity of assessment tools have been pointed out as concerns in using e-portfolios as assessment tools (Butler, 2007). Having sufficient discussions of evaluation results and integration of multiple judgments (Driessen et al., 2005) were identified as relevant strategies to remedy these concerns.

Clear guidelines for assessment. The content of an e-portfolio consists of very purposeful artifacts and includes learning resources, personal reflections, knowledge, and information. The contents can cover a wide area depending on the purpose and goals. A lack of a clear layout and specific guidelines (Smith &Tillema, 2003) and a lack of good examples of past portfolios (Darling, 2001) can confuse students and cause anxiety about the range, nature, and value of the task (Darling, 2001; Wade & Yarbrough, 1996). Providing students with explicit and clear guidelines can help students focus on creating artifacts in their e-portfolios (Lorenzo & Ittleson, 2005; Tosh, Light, Fleming, & Haywood, 2005).

Timely and appropriate amount of feedback. One of the benefits of e-portfolios is that it can facilitate the exchange of ideas and feedback (Lorenzo & Ittleson, 2005). Students can receive feedback from instructors and peers quickly and regularly throughout the process of

constructing their e-portfolios (Ahn, 2004). In that way, e-portfolios can contribute to feedback cycles as an essential part of formative assessment (Cambridge, 2001). Instructors should be committed to the process of constructing e-portfolios and should spend appropriate time to give students regular and meaningful feedback on their work and reflections (Butler, 2007).

Several studies (e.g., Pearson & Heywood, 2004) have pointed out that the time-consuming nature of the e-portfolio construction and assessment processes is one of the predominant barriers to e-portfolio use. Providing too much feedback can be a burden for both students and instructors and even hinder positive functions of e-portfolios.

Access control for assessment. An e-portfolio is a collection of various contents with different purposes. Each artifact or group of artifacts should be under the control of students, depending on the purpose (Butler, 2007). Some artifacts should be open only to instructors for assessment, and its accessibility should be controlled by students in an easy and intuitive way. To give the control to students, instructors should provide students with clear assessment criteria (Carliner, 2005).

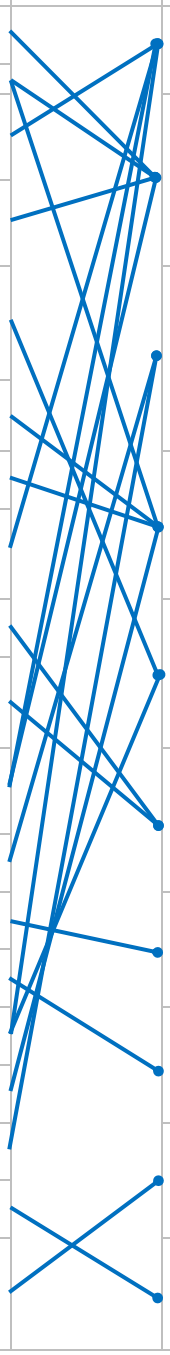
Multiple versions of e-portfolios. Most e-portfolio systems support only one version of an e-portfolio. Students thus may have to revise sections of their e-portfolios when they have new audiences, such as employers, or when they enter other institutions in different fields. For the same reason, a variety of versions of an e-portfolio has been suggested as practical and technical requirements need to be met (Abrami & Barrett, 2005; Challis, 2005; Lorenzo & Ittleson, 2005; Mason, Pegler, & Weller, 2004; Tosh, Light, Fleming, & Haywood, 2005). To improve the continuous use and effectiveness of e-portfolios, systems should provide easy ways to construct and manage multiple versions of an e-portfolio depending on the purpose.

Alignment with the needs of job markets. One of the main purposes of e-portfolios is showcasing an individual's qualifications and competencies in job interviews, for evaluation, or for promotion (Milman & Kilbane, 2005). It is important to guide students in designing their e-portfolios to meet the needs of current job markets although students can construct another version of an e-portfolio for professional development. In today's changing economy and job market, e-portfolios should contribute to providing opportunities to link students' learning achievements to the workplace (Greenburg, 2004).

By examining the key components and relevant strategies, ten design guidelines were identified. The comprehensive framework for designing and implementing e-portfolio systems are summarized in Table 2.3, including key components, relevant strategies, and design guidelines. Each design guideline is explained in the following section.

Table 2.3

Comprehensive framework for designing and implementing multipurpose e-portfolio systems

Purposes	Target End Users	Key Components	Relevant Strategies		Design Guidelines
Learning	**Leaners**	**Quality of Student Reflection**	Help or support of the educational supervisor		1. Provide clear guidance and introductory session
			Enhance student engagement		
			Improve student perception of importance of creating e-portfolio		2. Provide online support system to allow instructors to guide student reflection
			Give students the ownership of their learning and e-portfolios		
			Provide structured templates or guiding questions balanced with freedom for creativity		3. Provide a refined access control to allow students to control permission of each artifact
			Provide a multisource feedback system		
			Regular evaluation of e-portfolio artifacts		4. Provide strong peer review community and feedback systems
			Provide clear guidance with fading		
		Postgraduate (continuous) Learning	Establish standards for certification		5. Provide structured templates or guiding questions, and good examples
			Provide interoperability and transportability		
		Technology use and user-friendly interface design	Provide introductory instructional sessions		6. Provide interoperability and transportability for students' e-portfolios
		Access control for an e-portfolios' artifacts	Provide access control to students		
		Consideration of target audiences	Customize e-portfolios according to target audiences		7. Guide to construct e-portfolios according to target audiences
Assessment	**Instructors Institutions**	**Reliability and validity**	Multiple rater and discussion and negotiation		
		Clear guidelines for assessment	Provide specific guidance for students		8. Provide reliable and valid assessment tools or programs
		Timely and appropriate number of feedback	Provide frequent and meaningful feedback		
		Access control for assessment	Provide access control for students		9. Design e-portfolio structures to be aligned with needs of job markets
Showcase	**Learners Job applicants Professionals**	**Multiple versions of e-portfolios**	Provide multiple e-portfolios according to purposes		
		Alignment with needs of job markets	Guide students to build their e-portfolios aligned with needs of job markets		10. Provide multiple versions of e-portfolios according to purposes

Guidelines for Designing and Implementing E-portfolios

Guideline #1: provide clear guidance and an introductory session. To improve the quality of student reflections, it is necessary to provide clear guidelines for assessments and learning objectives. Also, introductory sessions (Driessen et al., 2005; Duque et al., 2006) can be a good way to improve technology use, reflective journaling, and student perceptions of e-portfolios. In the case of Western Governors University (WGU), the university uses a commercial e-portfolio system called taskstream. Initially, students can learn how to build their own e-portfolios with the taskstream through an online training program and a full-time staff. This is a practical example of the introductory session. The training system also can be used for providing clear assessment guidance.

Guideline #2: provide an online support system that allows instructors to guide student reflections. Students need lots of tutors or supervisory support during the entire process of e-portfolio construction (Smith & Tillema, 2003; Tiwari & Tang, 2003). In addition, an individual's potential for reflection may require the support of tutors or supervisors (Sandars, 2009). Tutor support can also play an important role in technology use and student perceptions of e-portfolio. Even timely feedback can be provided by an online support system. An example of a practical implementation of an online support system is the group of trained mentors at Clemson University which provides virtual assistance. The assistance program can provide students with just-in-time learning opportunities.

Guideline #3: provide a refined access control function to allow students to control accessibility to their artifacts. The open nature of e-portfolios often causes lower engagement in reflective journaling (Butler, 2007) because e-portfolios may involve sensitive personal content. In remedying privacy concerns, an access control function (Butler, 2007) is necessary.

Some implementations, such as eFolio Minnesota, Indiana@work, provide password-protected access functions (Lorenzo & Ittleson, 2005a). In the case of assessment, some artifacts may need to be opened only to instructors to assess students' learning progress and to give feedback. Some students may want to share some artifacts only with their friends. Access control allows students and instructors to control permissions to access specific artifacts depending on their needs.

Guideline #4: provide peer review communities and feedback systems. Providing meaningful and timely feedback is crucial to improving the quality of student reflections. Peer interaction and multisource feedback is obviously one of the main benefits of e-portfolios (Lorenzo & Ittleson, 2005). Most web 2.0 and social network tools, such as weblog, video blog, twitter, etc., provide strong peer interaction functions. E-portfolio systems can provide peer interaction and feedback functions by simply incorporating those tools. Netfolio system proposed by Barbera (2009) can be a practical example for building a sound feedback system.

Guideline #5: provide structured templates or guiding questions and good examples. As mentioned in design guideline #2, an individual's reflection may require additional support including structured templates or guiding questions. Several studies have shown the effectiveness of structured templates (Goodyear, Bindal, & Wall, 2013) and guiding questions (Perkins, Jay, & Tishman, 1993; Shouhong, 2009) in improving the quality of student reflections. Various good examples are also beneficial for student reflection. The QMU's e-portfolio system provides students with templates as a gateway to build their own e-portfolios (Peacock, Murray, Scott, & Kelly, 2011).

Guideline #6: provide interoperability and transportability of e-portfolio systems. Students may transfer to another institution once or more times during their educational career, or they may need to transfer their e-portfolios to another platform when they graduate from

school. In such cases, interoperability and transferability features of e-portfolios become more important. Standards play a key role in making e-portfolio systems meet the needs for portability and adaptability (Lorenzo & Ittleson, 2005a). Standardization, interoperability, and transportability of e-portfolio can also promote postgraduate learning. Individuals can maintain their e-portfolios after graduation by transferring their e-portfolios to new platforms that are adopted by their new organizations or institutions.

In the case of the Virginia Tech's SCHOLAR system, students can transfer their own e-portfolios to the public blog site "Weebly". When they graduate from school or move to another institution, they can keep their e-portfolios constructed while at Virginia Tech by transporting them to the weebly site. This is a good example of transportability of e-portfolios.

Guideline #7: guide students to construct e-portfolios according to potential target audiences. E-portfolios are widely and easily accessible by a large number of audiences due to their accessibility (Strudler & Wetzel, 2005). The purpose and contents of an e-portfolio can be changed depending on who the target audiences are. Users and audiences of an e-portfolio should be clearly identified before designing and constructing it (Heath, 2005), and an e-portfolio system should guide users to consider target audiences (Butler, 2007). This design guideline also can be supported by various tutoring systems.

Guideline #8: provide reliable and valid assessment tools or programs. One of the major concerns of studies of medical education is reliability and validity in evaluating e-portfolios (Butler, 2007). Since e-portfolios include personalized reflection on individuals' learning experiences, they are usually evaluated by instructors. Due to the feature of e-portfolio evaluation, many studies have presented concerns and emphasized the importance of reliability and validity of assessment criteria and tools as well as assessors themselves (e.g., Burnett

&Williams, 2009; Lorenzo & Ittleson 2005; Wald et al., 2012). As mentioned earlier, adopting the multi-rater system can be a practical example.

Guideline #9: design e-portfolio structures to be aligned with the needs of job markets. One of the major purposes of e-portfolios is to showcase an individual's qualifications and competencies as a job applicant. An e-portfolio constructed only to show learning progress and achievement of an individual will not give a good impression to employers (Butler, 2007). A showcase e-portfolio should be designed to meet current needs of job markets. Elon University (http://www.elon.edu/home/) used e-portfolios as the showcasing tools (Greenbug, 2004).

Guideline #10: provide multiple versions of e-portfolios according to each major purpose. As explained in the previous design guidelines, many components of e-portfolios including design and contents should be differentiated depending on the purpose of the e-portfolios. That is, a single version of an e-portfolio cannot meet the needs of all stakeholders. Therefore, e-portfolio systems should be designed to support multiple versions of e-portfolios that have different purposes and target audiences.

E-portfolios in Medical Education

The context of the dissertation study was a medical education environment, particularly a clinical clerkship environment. In relation to the research context, this section presents e-portfolios in medical education and reflective practice as the key theoretical framework for clinical clerkship.

Definition and Adoption of E-portfolios in Medical Education

Definition of portfolio and e-portfolio. Based on the literature review, this study defined a portfolio as a deliberate collection and selection of artifacts that presents a person's learning progress and achievements over time (Lorenzo & Ittleson, 2005; Paulson, Paulson, &

Meyer, 1991), and qualifications for a job. In medical education environments, a portfolio is an authentic assessment tool to evaluate students' learning and clinical performance (Driessen et al., 2005) as well as a purposeful collection of authentic evidence for students' learning achievements and skills mastery over time (Davies, Khera, & Stroobant, 2005). Similar to teacher education, portfolios can also be used as professional development tools to enhance teaching (Butler, 2007).

Adoption of e-portfolios in medical education. Portfolios have been widely used as learning and assessment tools in undergraduate or postgraduate medical education for years due to the movement toward competency-based medical education (Buckley et al., 2009; Driessen et al., 2005) and an increased emphasis on reflective practice (Buckley et al., 2009; General Medical Council, 2013). Although many studies (e.g. Driessen, et al., 2005; Gordon, 2003) have demonstrated various strengths of portfolios as evaluation tools, paper portfolios clearly have limitations such as increasing workload for both students and faculty, ineffective feedback loop (Carraccio & Englander, 2004), privacy issues, limited maintenance of student artifacts, and evaluation data. Due to these limitations, e-portfolios have been broadly adopted in many medical environments.

Reflective Thinking in Clinical Clerkship

Definition of Reflective Thinking

In education fields, John Dewey as cited by Mann, Gorden, and MacLeod (2009), initially defined reflection as "active, persistent and careful consideration of any belief or supposed form of knowledge in the light of the grounds that support it and the further conclusion to which it tends." With support for Dewey's ideas of reflective thinking, Donald Schön (1987)

brought scholars' attention to the role of practitioners' reflective thinking in problem solving. He explored the nature of problems that practitioners encounter and the role of reflective thinking in their problem solving. Schön regarded reflective thinking in a practitioner's problem solving as continuous interactions between the practitioner's prior experiences and the situation faced. He referred to it as "reflection-in-action." In the mid-1980s, experiential learning emerged and was heavily researched. In experiential learning, a learner's reflection on concrete experience was considered the key to construct or reconstruct his or her knowledge (e.g. Boud, Keogh, & Walker, 1985; Kolb, 1984).

Reflective Practice

The concept of reflective practice as an iterative cycle of the three types of reflection—reflection-for-action (Killion & Todnem, 1991), reflection-in-action, and reflection-on-action (Schön, 1987)—was introduced based on how professionals deal with problems in real-world settings. The first stage of the reflective practice cycle, reflection-for-action (Killion & Todnem, 1991), refers to the planning stage for future actions. The next stage, reflection-in-action (Schön, 1987), happens during the actions as practitioners continuously adjust their responses to the actions. In this stage, prior experiences are responsible for a significant difference between novices and experts. Lastly, reflection-on-action (Schön, 1987) occurrs after the actions, when practitioners analyze the results of their actions and reflect on them during their next actions. These stages are continuously repeated (Danielson, 2008) throughout performance.

The Three Stages of Reflection Cycle in Clinical Clerkship

Several studies in medicine have researched the relationship between student reflection

and learning or professional development in clinical clerkship (e.g. Baernstein & Fryer-Edwards, 2003). This section presents the three stages of reflection cycle in clinical clerkship.

Reflection-for-action. Upon Schön's (1987) theory of reflective practice, Killion and Todnem (1991) presented reflection-for-action as a third type of reflection. They argued that a third type of reflection, which refers to reflections for future actions, is necessary because reflections occur over past, present, and future and the two previous types of reflection proposed by Schön (1987) mainly focused on past and present events. In their study, reflection-for-action is described as "desired outcomes" resulting from the two previous types of reflection. Reflection-for-action can be considered a reflective process for planning or preparing future actions based on the results of reflection-in-action and reflection-on-action.

In a clinical clerkship, reflections required to plan for clerkship studies and improvements in future clerkship practices can be referred to as reflection-for-action. Most clerkship portfolio forms encourage students to be engaged in reflection-for-action by requiring various kinds of reflective writings: study planning, structured reflective journals, and reflective statements for faculty assessment results. Throughout a clerkship course, students are continuously asked to reflect on their past clerkship experiences and assessment results and to establish improvement plans for their future clerkship practices. To facilitate effective preparation for a clerkship practice, daily study plan forms ask students to establish learning goals that the student expects to achieve and to list specific learning activities for the goals. Questions in reflective journals encourage students to think reflectively about their future practices. Improvement plans are also included in most evaluation forms to further guide students' future practice.

Reflection-in-action. Reflection-in-action is the reflection that occurs when practitioners face novel or challenging problems for which they cannot find appropriate solutions with their existing knowledge or expertise, or when they encounter unexpected consequences during their practices (Mamede & Schmidt, 2004; Schön, 1987). In a problematic situation, practitioners' past experiences, referred to as knowing-in-action, play a key role in finding the most appropriate solution or adjusting the current course of actions.

During a clinical clerkship course, students mostly diagnose real patients who are involved in typical clinical cases and are asked to master only the basic clinical skills. Thus, the students may not be given enough opportunities to engage in reflection-in-action unless their faculty members provide immediate feedback or ask reflective questions during clerkship practices. A study that conducted a systematic literature review in health profession educations reported that no studies of students reviewed in their study attempted to explore reflection-in-action due to students' lack of authentic experiences (Mann, Gordon, & MacLeod, 2009).

Reflection-on-action. Reflection-on-action is the other type of reflection described by Schön (1987). It refers to a practitioner's deliberate reflection on the processes and consequences of their previous practices. This type of reflection allows practitioners to obtain deeper understanding of their previous practices and encourages them to learn from the experience. To promote student reflections on clerkship experiences during a clerkship course, most clerkship forms, including weekly and final reflective journals, aily study plans, assessment forms, etc., require students' reflections on clerkship practices, faculty feedback, and assessment results.

The primary benefits of reflection are closely related to improvement in students' learning and their subsequent professional performances. Engaging in the reflection process

allows students to acquire new knowledge or correct errors in previous thinking patterns. Moreover, with iterative learning processes and cumulative experiences over time, students can cope better with various real-world problems. Thus, a clerkship e-portfolio should be designed in a way that promotes each type of reflection and the cycle of reflective practice.

CHAPTER 3

METHODS

The dissertation study set three goals: (1) identification of positive and negative experiences of students and faculty in using the e-portfolio system in clinical clerkship, (2) analysis of key themes that are commonly observed in the identified positive and negative experiences, and (3) providing recommendations for successful design and implementation of clerkship e-portfolio systems. The research was designed to seek for answers for the following research questions:

- Research Question 1: What positive and negative experiences did students and faculty have in using the e-portfolio during the clerkship?
- Research Question 2: What key themes cause an individual to have positive or negative experiences during the clerkship?
- Research Question 3: What are the recommendations for designing and implementing a successful clerkship e-portfolio system?

Research Design: Exploratory Sequential Mixed Method Design

The goals of the current study were to explore positive and negative experiences of students and faculty in using the clerkship e-portfolio system and to provide recommendations

for designing and implementing a successful clerkship e-portfolio system. In order to accomplish the research goals, it was essential to obtain in-depth understanding of experiences of e-portfolio users as well as overall experiences of the entire participants.

In order to conduct this study, an exploratory sequential mixed method design (Creswell, 2014) was adopted. The exploratory sequential approach starts with collecting and analyzing qualitative data and then uses the analysis results to develop better instruments for quantitative data collection. Accordingly, data collection and analysis consisted of three steps: (1) collecting qualitative data through individual interviews and then conducted initial coding with the transcribed interview data as the first cycle of data analysis, (2) developing online surveys for students and faculty based on the result of initial coding and collecting quantitative data by the online surveys, and (3) analyzing both qualitative and quantitative data together. Figure 3.1 shows the three steps of exploratory sequential mixed method design.

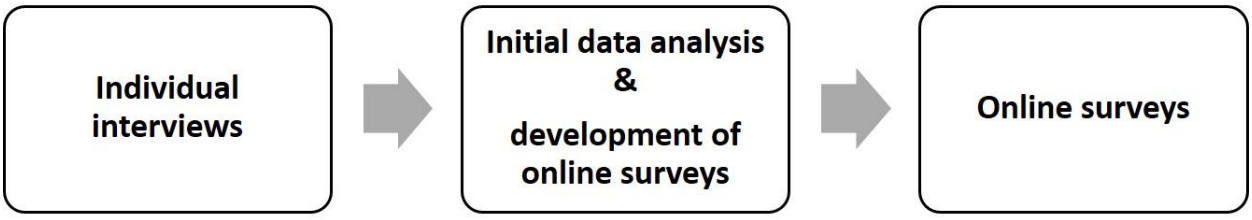


Figure 3.1

Data collection based on exploratory sequential mixed method design

Research Context and Implementation of the Current Clerkship E-portfolio System

Selection of the Inje University College of Medicine as the Research Site

The current study was implemented at the Inje University College of Medicine, one of the leading institutions in medical education in Korea. For many years, the Inje University College of Medicine (IUCM) has developed and used paper-based clerkship portfolios. This work has noted the disadvantages of paper-based portfolios such as increased workload for both students and faculty, ineffective feedback loop (Carraccio & Englander, 2004), privacy issues, limited maintenance of student artifacts, and evaluation data. Recently, to overcome these issues, IUCM developed and launched an e-portfolio system. IUCM transferred existing paper-based portfolio forms to e-portfolio forms, for their clinical clerkship program—the first step, in Korea, to a medical education. Having implemented an initial version of e-portfolio system in their clerkship program, IUCM has over 100 students and 200 clerkship faculty members; these individuals represent the potential participants of this research. Considering this, IUCM appeared to have the appropriate conditions as the research site for this study. This study was conducted during the first official implementation of the e-portfolio system in IUCM's clinical clerkship program.

The Clinical Clerkship of Inje University College of Medicine

IUCM has about 700 professors and 600 students in five university hospitals. The third-year medical school students are enrolled in a clinical clerkship course. The clinical clerkship lasts for a total of 36 weeks. On average, five to six students are grouped together. Each group rotates between six major disciplines—internal medicine, surgery, pediatrics, obstetrics and gynecology, emergency medicine, and psychiatry—as planned during the clinical clerkship

course. Within the 36 weeks, all groups complete the clerkship practices for the six major disciplines.

Three breaks are given for students during the clinical clerkship course. Each break is one-week long. During each break, all third-year students come together to the main university hospital where the medical school buildings are located. Students study together or have personal preparation time during the week. The first break comes after the first six weeks. The second break takes place 12 weeks after the first break ends. The last break is 12 weeks after the second break ends. Figure 3.2 shows how the 36 weeks of the clinical clerkship course is structured.

Clerkship practice for each discipline consists of several following activities: study planning, diagnosis of outpatients and long-term inpatients, practicing clinical skills, observations of operations, problem-based learning (PBL) sessions, and presentations of assigned clinical cases. Each student makes several study plans for a discipline based on the clerkship curriculum before or during the clerkship practice. According to the schedule arranged, each student is enrolled in several regular clerkship practices: diagnosing outpatients or long-term inpatients, cultivating basic clinical skills, participating in operations as an observer, engaging in PBL group sessions, making a presentation about an assigned clinical case. These activities are repeated throughout the entire clinical clerkship course.

First Round of the Clinical Clerkship Course													
Month	Mar			April					May				June
Week	1	2	3	4	5	6	**1st Break**	7	8	9	10	11	12
Rotation1	Internal Medicine (Part1)							Internal Medicine (Part2)					
	Surgery							Surgery					
	Obstetrics and Gynecology							Obstetrics and Gynecology					
	Pediatrics							Pediatrics					
	Psychiatry				Emergency medicine			psychiatry				Emergency medicine	
Second Round of the Clinical Clerkship Course													
Month	June			July					August				September
Week	1	2	3	4	5	6	**2nd Break**	7	8	9	10	11	12
Rotation2	Internal Medicine (Part1)						**Research Data Collection**	Internal Medicine (Part2)					
	Surgery							Surgery					
	Obstetrics and Gynecology							Obstetrics and Gynecology					
	Pediatrics							Pediatrics					
	Psychiatry				Emergency medicine			Psychiatry				Emergency medicine	
Third Round of the Clinical Clerkship Course													
Month	September			October					November				December
Week	1	2	3	4	5	6	**3rd Break**	7	8	9	10	11	12
Rotation3	Internal Medicine (Part1)						**Research Data Collection**	Internal Medicine (Part2)					
	Surgery							Surgery					
	Obstetrics and Gynecology							Obstetrics and Gynecology					
	Pediatrics							Pediatrics					
	Psychiatry				Emergency medicine			Psychiatry				Emergency medicine	

Figure 3.2

The 36-week schedule for the clinical clerkship

The Implementation Context of the Clerkship E-portfolio System

A preliminary clerkship e-portfolio system was developed by the North Star Developer's Village Co., Ltd., an educational software development company. A beta test was conducted in November 2014. The intention behind IUCM's implementing the clerkship e-portfolio was to transfer the previous paper clerkship portfolios to the electronic version of the portfolio system. Thus, the most recent version of the paper clerkship portfolios—used for the 2014 clinical clerkship course—served as the foundation for developing the clerkship e-portfolio.

During the November 2014 beta test, participants consisted of 23 third-year medical school students and faculty members in the pediatrics and obstetrics and gynecology disciplines.

Based on feedback from the beta test, several revisions were made before IUCM launched the e-portfolio system for the entire third-year clerkship program of 2015. The current study was conducted during the first official implementation of the e-portfolio system in 2015.

The User Interface of the Clerkship E-portfolio

A clerkship e-portfolio system, which provides both web and mobile interfaces, was developed and implemented at IUCM by transferring the previous paper-based clerkship portfolio forms to electronic files. The e-portfolio system consists of four major components: study planning, recording clerkship practices, assessment, and reflections on feedback and clerkship experience. Table 3.1 shows the design features and interfaces of the e-portfolio system according to the four major components. This section describes interface design of the clerkship e-portfolio system according to its four major components.

Study planning. Each student develops his or her study plan for the discipline they will next enroll according to the clerkship curriculum. Self-evaluation, learning objectives, and specific plans for learning activities are established according to pre-defined learning achievements required for the discipline. During the clerkship practices for the discipline, students make daily and weekly study plans (Figure 3.3). All those plans are reviewed and counseled by a designated clerkship faculty. For promoting these study planning processes and facilitating faculty's counseling works, two major design features—the web-based forms' flexibility and a convenient feedback loop—were considered in the design process. Because all forms in the clerkship e-portfolio are developed in the form of Web pages, students can input almost an unlimited amount of texts. Also, students can quickly and easily edit their study plans in any PC environments with internet access, if needed. In terms of faculty feedback, multiple

input methods are supported by the e-portfolio system such as text input and voice recording. Faculty can provide feedback in the form of text through the web interface or by simply recording their voice feedback via mobile devices. Furthermore, in order to intuitively inform 1) students of received feedback and 2) faculty of clerkship forms submitted by their students, an intuitive index page is provided for both students and faculty. With the index page, students can easily check whether they have received faculty feedback for clerkship forms that they submitted. Faculty can also easily check whether there are clerkship forms ready for assessment and feedback. Blue-colored label with the pencil icon serves as the indicator that informs students of received feedback. The label without the pencil icon indicates that students submitted a certain clerkship form to receive feedback.

Table 3.1

Design Features and Interface of the Current Clerkship E-portfolio According to the Four Clerkship Activities

Clerkship Activities	**Design Features Applied**	**Designed Interface**
Study planning	• Flexible forms • Convenient feedback mechanism	✓ Supporting practically unlimited amount of texts ✓ Multiple input methods for faculty feedback ✓ Intuitive index pages for both students and faculty
Recording clerkship practices	• Flexible forms • User's mobility • Intuitive progress checking	✓ Supporting practically unlimited amount of texts ✓ The web and mobile interfaces ✓ Intuitive progress-checking by the index pages
Assessment & Reflections on feedback and clerkship experience	• Convenient feedback mechanism • Intuitive progress checking	✓ Multiple input methods for feedback ✓ The web and mobile interfaces ✓ Intuitive progress-checking by the index pages

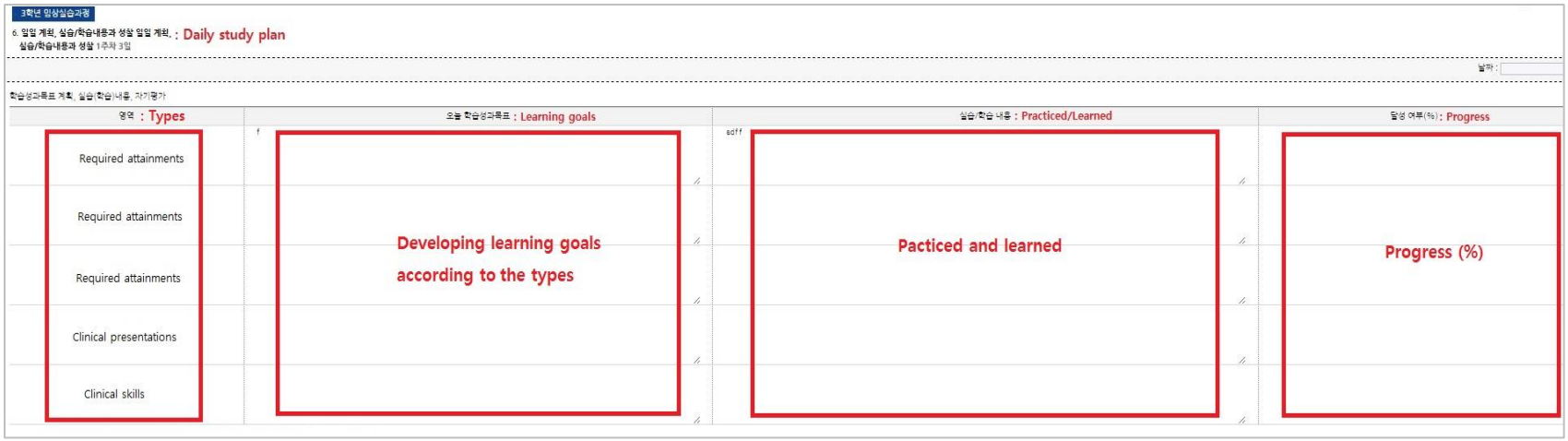


Figure 3.3

A screen capture of the form of daily study plan (study planning)

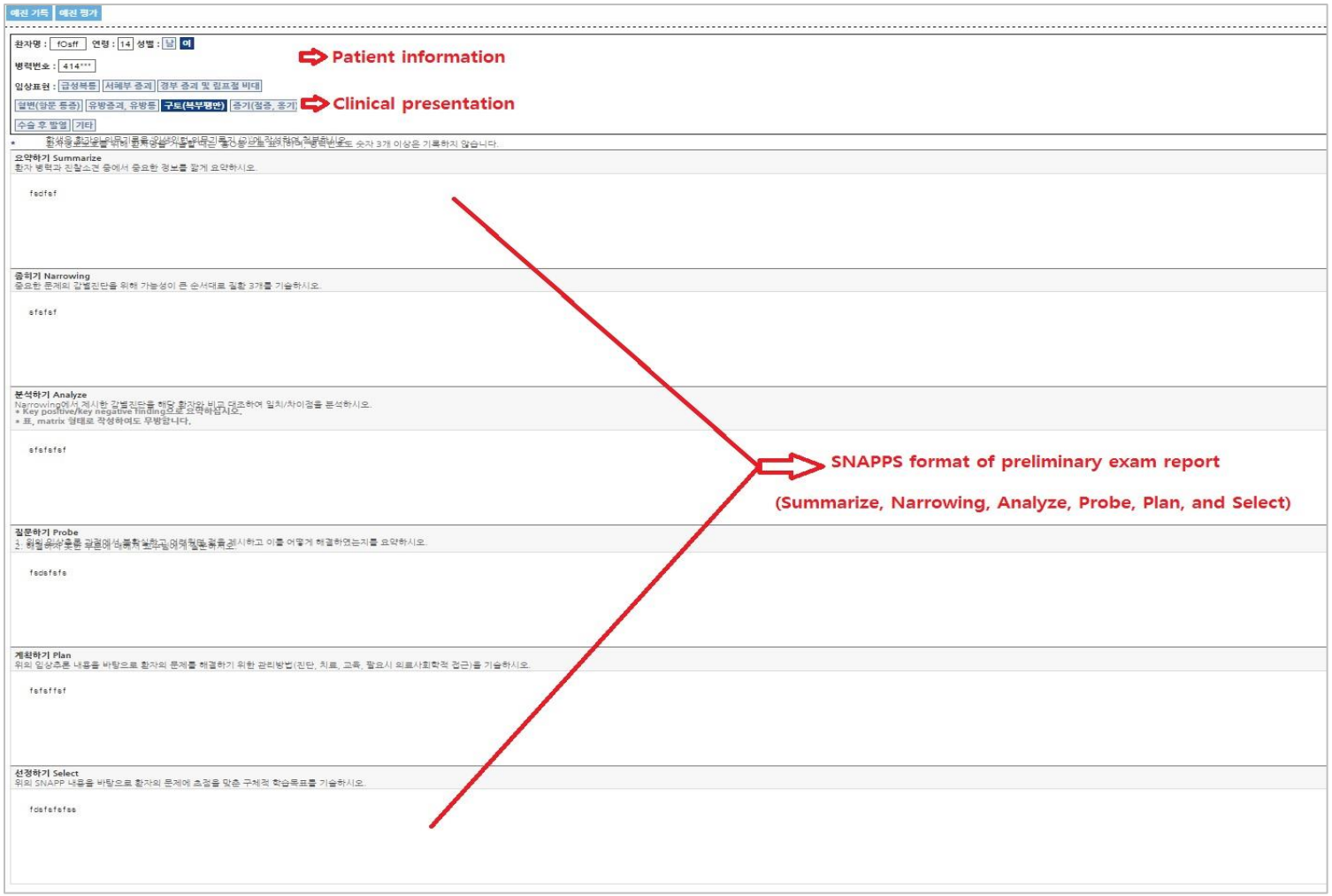


Figure 3.4

A screen capture of the preliminary exam practice report (recording clerkship practices)

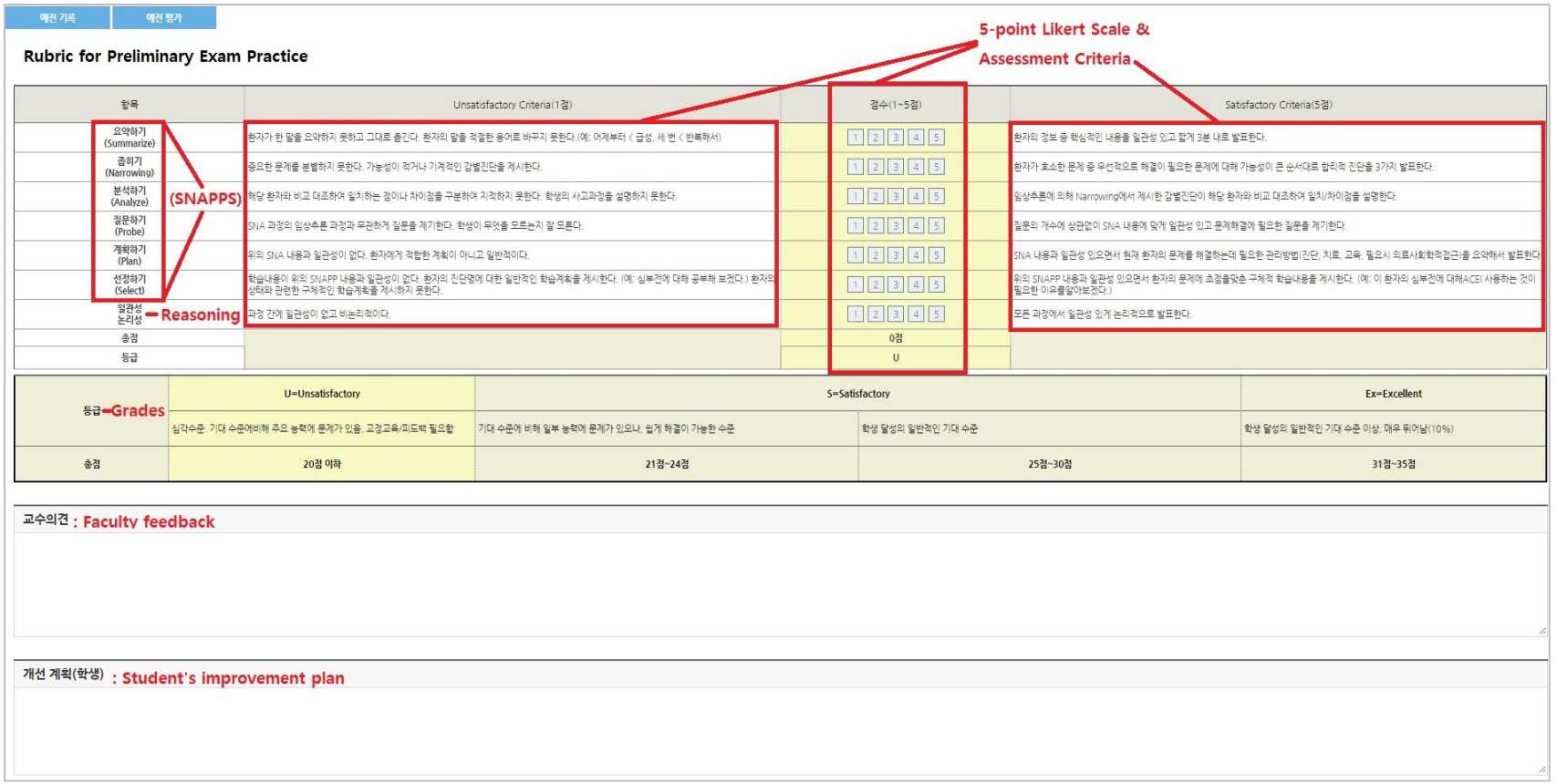


Figure 3.5

A screen capture of the rubric for the preliminary exam report (assessment and feedback)

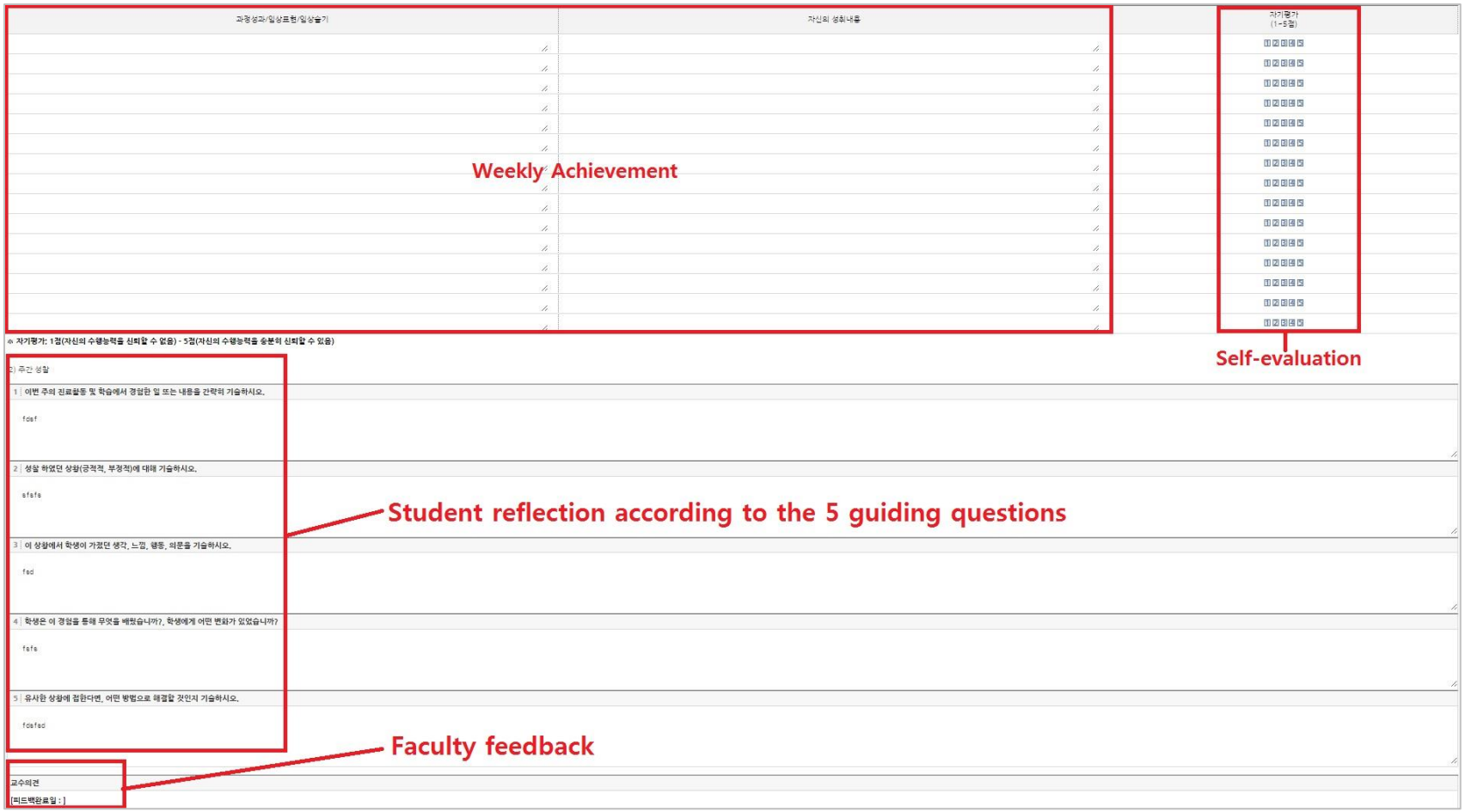


Figure 3.6

A screen capture of the weekly reflective journal (reflection)

Recording clerkship practices. In order to record students' clerkship practices, students are asked to record almost all of their clerkship practices including preliminary examination practices for outpatients, progress notes for long term inpatients, reports for problem-based learning group sessions, reflective reports for patient safety, a list for basic clinical skills that students practiced or observed, etc. The form's flexibility, user's mobility, and intuitive progress checking were considered as key features in the design process. Web-based flexible forms and supporting multimedia resources allow students to record their clerkship practices freely and faithfully with less space constraints. Also, students can record their clinical practices anywhere and at any time using both web and mobile interfaces. Lastly, an index page is provided for students to enable intuitive progress-checking and efficient submission of clerkship forms. Figure 3.4 shows the overall structure of the preliminary exam report.

Assessment and reflections. Clerkship faculty members evaluate students' clerkship practices based on diverse rubrics (See Figure 3.5) and provide feedback based on records that students submitted. Students are asked to reflect on their clerkship practices and faculty feedback to enhance their clerkship performances (See Figure 3.6). This cycle of student clerkship practices, faculty feedback, and student reflection is iterated as the key aspect to the clerkship e-portfolio during a clinical clerkship course. To facilitate faculty feedback, multiple input methods for providing feedback and intuitive progress-checking with push alarms were implemented in the clerkship e-portfolio system. Faculty feedback can be immediately given to students through the voice feedback function, and detailed feedback can be provided via web interface. Faculty can also easily identify students in need of feedback with an intuitive progress-checking page and push alarm messages in the mobile interface. A similar progress-checking page, as presented in the previous section, is also provided for students. Students are informed when they receive

feedback through the page and can reflect on the received feedback to enhance their clerkship performances.

Three Stages of Reflection Cycle in Clinical Clerkship and the Clerkship E-portfolio

As described in chapter 2, the clinical clerkship course involves the reflective practice cycle. The clerkship e-portfolio was also designed to facilitate students' reflective practice during the clinical clerkship. This section presents reflection-for-action and reflection-on-action with the use of the clerkship e-portfolio. Reflection-in-action with the use of the current version of the clerkship e-portfolio is not covered in this section because the clerkship e-portfolio does not play a crucial role during clerkship activities for students' reflection.

Reflection-for-action. The clerkship e-portfolio system implemented for this study was designed to support students' reflective writings that facilitate their reflection-for-action. The clerkship e-portfolio consists of numerous web and mobile pages, so students can compose the reflective writings with less space constraints and easily locate previous records for their reflections. The e-portfolio system additionally provides multiple feedback input methods and an intuitive index page for both students and faculty. The features serve to help students check their progress and receive or request faculty feedback and assessment of clerkship forms.

Reflection-on-action. Reflection-on-action plays a crucial role in clinical learning with a clerkship e-portfolio. Thus, the clerkship e-portfolio is designed to support students' recording of their clerkship practices and encourage student reflections. To do so, an e-portfolio system first offers both web and mobile pages. Such features allow students to draft reflective journals anywhere and at any time with less text space constraints. Additionally, the students are able to locate relevant records or resources with a small number of clicks.

Moreover, the e-portfolio system aims to promote assessment processes, including faculty feedback, that can be completed online. Students can also submit clerkship forms and receive faculty feedback and assessment results via online. Furthermore, tablet devices and a voice recording function allow immediate feedback and assessment. Progress-checking (or index) pages indicate received feedback for students and feedback requests for clerkship faculty members.

Participants

The population of this study consisted of 363 participants—108 third-year medical school students and 255 clerkship professors who had used the clerkship e-portfolio system during the clinical clerkship. As the focus group for individual interviews, this work drew from the departments of internal medicine and of obstetrics and gynecology. Nine students and nine professors volunteered for individual interviews. Five of the students were male and four female. Five of the professors were male and four female. Figure 3.7 shows the years of service for the interviewed professors.

This work also conducted follow-up online surveys, which were completed by 97 students and 62 professors. According to the student survey responses, among the student participants, 72 students were male (76%) and 23 students were female (24%). At the time of the individual interviews and the student online survey, all student participants had either completed all of the six clinical rotations or were enrolled in the last rotation. That means that all student participants had sufficiently experienced clerkship activities of the six major departments. In the case of clerkship faculty, 62 professors from five hospitals and six major departments participated in the research.

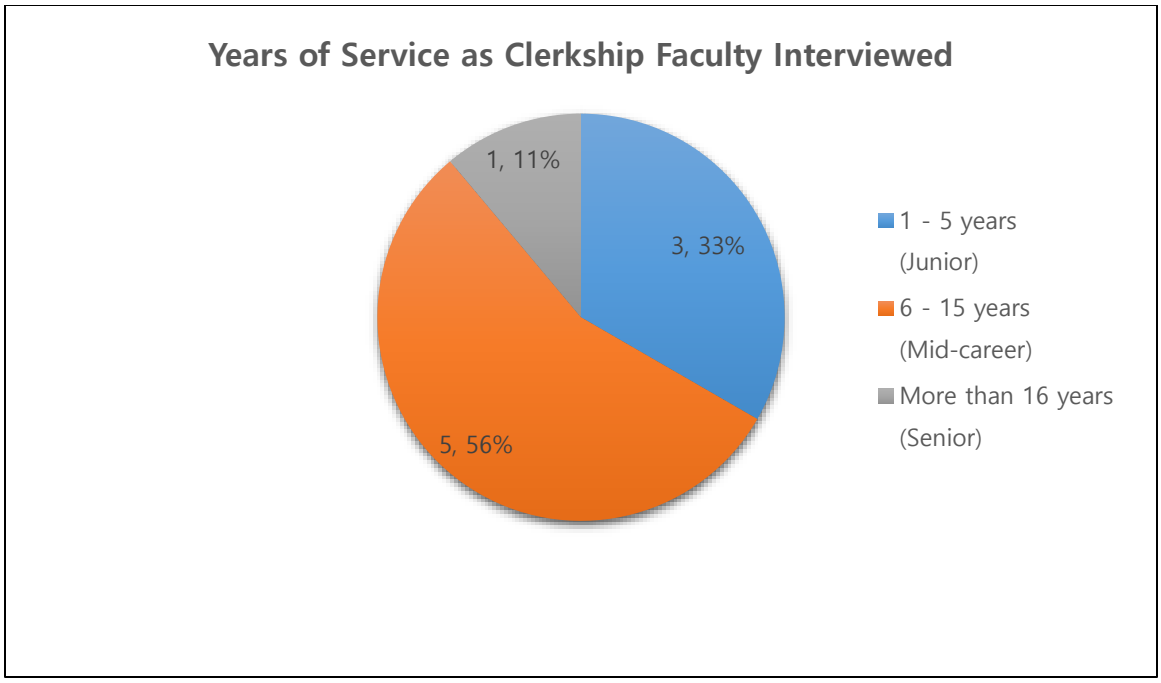


Figure 3.7

Years of working experience as clerkship faculty interviewed

The recruitment was conducted under the guidance of the Associate Dean for Academic Affairs at IUCM. In the first step of the recruitment process, researchers provided informed consent forms to clerkship faculty from all major disciplines. The clerkship faculty then explained to their students about the study during a regular conference meeting, and asked their students if they wanted to participate in the research. Students were able to ask questions about the study to the researcher through email or skype. Students who consented to participating in the study signed a consent form and submitted the consent form to their faculty. The signed consent forms were delivered to the researcher via postal mail. Regarding faculty recruitment, the researcher provided an informed consent form to the Associate Dean for Academic Affairs. The Associate Dean introduced the study to clerkship faculty during the orientation meeting about

clerkship e-portfolios. The clerkship faculty were also able to ask questions about the study to the researcher through email or skype. Faculty who consented to participating in the study signed a consent form and submitted the consent form to the Associate Dean. The signed consent forms were delivered to the researcher via postal mail. The consent forms for students and faculty are presented in Appendix D and Appendix E. All participants were asked to take one online survey.

Data Collection and Analysis

Data Collecting Instruments

In this study, a semi-structured interview was conducted to examine the focus groups' in-depth experiences of using the clerkship e-portfolio system. An abstract interview protocol was developed for both the student and the faculty interviews. In addition, online surveys were used to collect information about thoughts and experiences of using the clerkship e-portfolio system during a year of clinical clerkship from all participants.

Interview protocol. The abstract interview protocol consists of three parts: introduction, key interview questions containing relevant sub-themes, and closing statement. In accordance with the three research questions of this study, four main themes—overall experiences with e-portfolios during clerkship, experiences with the e-portfolio in reflective cycles during clerkship, challenges and limitations, and suggestions—were identified. Next, four key interview questions and relevant themes as probes were correspondingly decided. Participant interviews were mainly structured by the key interview questions and the relevant themes. Table 3.2 shows how the interview questions were developed according to the research questions and the corresponding themes. The developed interview protocol was reviewed by a medical expert for validity. The interview protocol is presented in Appendix C.

Online survey. The goal of the student and faculty online surveys was to collect opinions from all of the participants regarding the use of the e-portfolio system for the clinical clerkship. In this case, individual interviews yield in-depth user experiences, but the number of interviewees is quite limited. Thus, the online survey responses were expected to be used as the most supportive data form.

The online survey questions were developed after the student and faculty interviews were completed. First, the interview data were briefly analyzed for noticeable experiences. The initial analysis revealed a number of meaningful information such as participants' strong preference for using the e-portfolio in PC environments over mobile environments, lack of use in tablets and the voice recording feedback feature, and so forth. The online survey questions were selected to inquire about the four main themes that are presented in Table 3.2 and the revealed noticeable experiences. Then, the survey questions were organized into six categories: demographic information, overall experiences of using the e-portfolio, exchanging feedback through the e-portfolio system, the use of the e-portfolio in the reflection cycle, objectivity of student assessment, and suggestions and satisfaction. The survey questions were reviewed by a medical expert for validity. Finally, the online survey form was created for distribution using Qualtrics. The student and the faculty versions of surveys are shown in Appendix A and Appendix B.

Table 3.2

The developmental structure of the interview questions

Research Questions	Themes	Samples of Interview Questions
RQ1: What positive and negative experiences did students and faculty have in using the e-portfolio during the clerkship?	* Overall experiences with e-portfolios during clerkship	◆ What is your overall impression of using the clerkship e-portfolio?
RQ2: What key themes cause an individual to have positive or negative experiences during the clerkship?	* Experiences with the e-portfolio in reflective cycles during clerkship	◆ How was your experience in using the clerkship e-portfolio for exchanging feedback?
RQ3: What are the recommendations for designing and implementing a successful clerkship e-portfolio system?	*Challenges and limitations	◆ What makes using the clerkship e-portfolio challenging?
	*Suggestions	◆ What are your suggestions for improvement of the current e-portfolio system?

Data Collection

The data collection consisted of individual interviews and online surveys for students and clerkship faculty. The individual interviews were conducted with nine students and nine clerkship faculty. Ninety-seven 3rd year students and 62 clerkship faculty members participated in the online survey. The data collection was conducted near the end of the year in November

and December of 2015 to ensure thorough reflection of the participants' experiences of using the clerkship e-portfolio for a year of clinical clerkship.

Qualitative data. As for qualitative data, the interview data were collected under the guidance of IUCM and with the supports of clerkship faculty and students. In total, nine students and nine clerkship faculty from departments internal medicine and obstetrics and gynecology were individually interviewed between November and December of 2015. First, individual interviewees were contacted via emails for interview scheduling. The email asked them for the following three pieces of information: available date and time for the interview, the preferred mode of contact for the interview, and contact information for the preferred mode of contact such as skype id or phone number. Then, the individual interviews with students and faculty was conducted for an hour or less depending on the interview protocol at the appointed date and time. The interviews were digitally recorded and transcribed for the analysis with participants' consent.

Quantitative data. Regarding quantitative data, online surveys were implemented in December of 2015 for students and clerkship faculty members. The online survey was open to students and clerkship faculty for about two weeks to ensure sufficient response rate. For students, the log-in page of their clerkship e-portfolio system provided a link to the survey. All students participated in the online survey through the link that became disabled after his or her completion of the survey. For faculty, the link to the online survey was distributed via email. Clerkship professors accessed the survey using the link. For faculty, an additional reminder email was sent to encourage their participation.

Data Analysis

Interview data analysis. Saldaña (2016) summarized diverse coding methods for analyzing qualitative data. Based on the review of the various coding methods presented by Saldana (2015), initial coding and focused coding were selected as the first cycle and the second cycle coding methods, respectively. Saldaña (2016) described initial coding as "Frist Cycle, open-ended approach to coding the data", and focused coding as a process of searching for "the most frequent or significant Initial Codes" to find out the most appropriate categories in the data. The goal of the analysis of the interview data were to classify individual experiences in relation to the research questions, so initial coding and focused coding was the most appropriate set of qualitative data coding methods.

The interview data were initially transcribed for the analysis. Then, the initial coding of the transcriptions was conducted to identify students' and faculty's experiences in using the clerkship e-portfolio. By the first cycle of focused coding, the identified experiences were sorted according to positive and negative nature, subjects, and corresponding reasons for the identified experiences as stated by the interviewees. To validate the result from initial coding and the first cycle of focused coding, a member check was conducted by a medical expert. The results from the member check were found to be mostly in accordance with that of the coding results. The second cycle of focused coding, based off of the result from the first cycle, was conducted to discover key themes that are responsible for the identified experiences. Then, appropriate recommendations for designing and implementing successful clerkship e-portfolios were made based on the identified key themes and the relevant experiences. Figure 3.8 shows the data analysis process. The data coding process of the interview data is shown in Figure 3.9 and an

example of the data coding is shown in Appendix D.

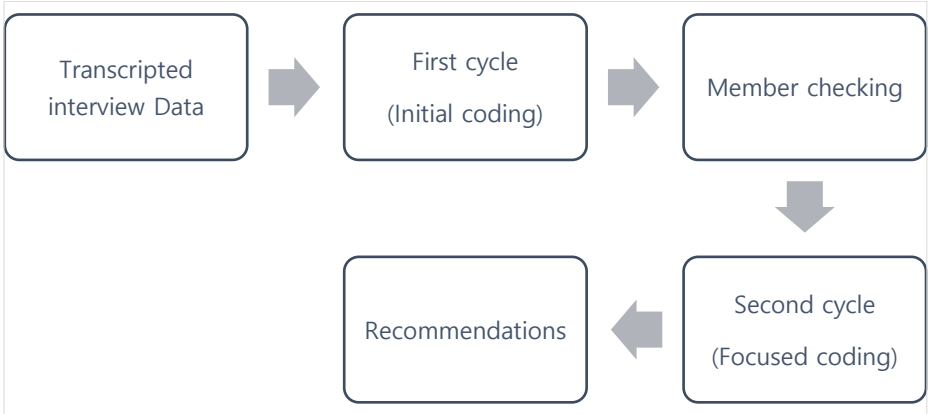


Figure 3.8

The data analysis process

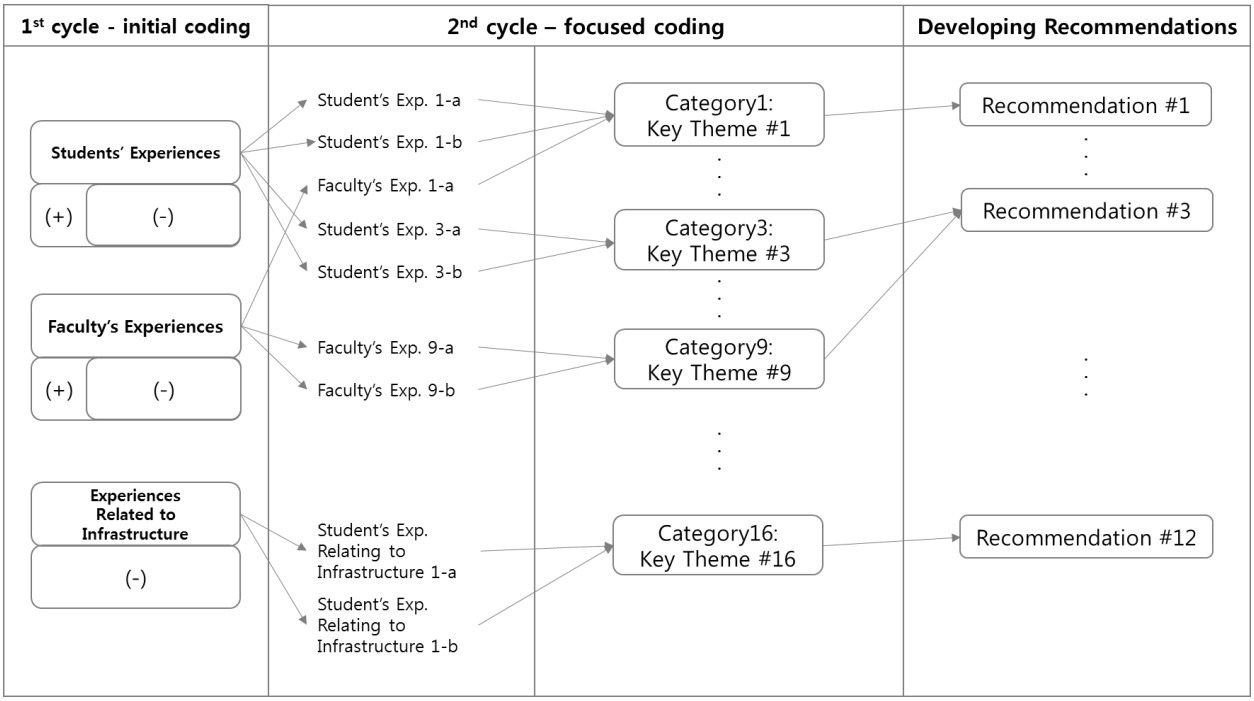


Figure 3.9

Data coding process of the interview data

Online survey data. The survey response data was pre-processed by descriptive statistics and initially sorted by themes. The themes used for classification include: pros and cons of using the clerkship e-portfolio, satisfaction, usability, challenges and limitations, and suggestions for improvement of the current e-portfolio system. To support the analysis results of the interview data, the survey responses were analyzed, reorganized, and linked to the noticeable experiences based on relevance.

Researcher's Perspective

This research was conducted in a Korean medical school environment. Although I had chances to observe actual clinical environments when I visited the medical school and have studied e-portfolios and medical education for years, I do not have much knowledge of medical fields. Such a lack of knowledge might reduce potential bias in analysis and interpretation of interview data. However, it could also limit my understanding of the interview data and participants' experiences. Thus, while I conducted individual interviews with participants, I intentionally started with questions that would help me understand participants' learning or working environments. During the interviews, I double-checked that I understood my interviewee correctly by repeating back to him or her what I had heard and asking for confirmation.

Another potential source of bias is the fact that part of this research was sponsored by a Korean software development company that developed the clerkship e-portfolio system. And the data collection of the current study was supported by IUCM. Since they are stakeholders of this research and the e-portfolio project, I made extra efforts to keep an objective and neutral stance to the end of this research. In fact, I maintained zero contact with any of them after I completed

data collection.

CHAPTER 4

RESULTS

This chapter presents empirical results found in this study. The results are presented in the order of the three research questions. The first section of this chapter briefly summarizes the students' and the clerkship faculty's positive and negative experiences using the clerkship e-portfolio. The next section presents the key themes in relation to the positive and negative experiences identified. The results in this section are organized into three categories: students, clerkship faculty, and infrastructure. The final section provides recommendations for designing and implementing a successful clerkship e-portfolio system in conjunction with the key themes presented in the second section. The transcripts of the interviews with the nine students and nine clerkship faculty are used as the primary data source, and the online survey response is used as the secondary data. Quotes from the interview transcripts and the online survey responses that support the results are also provided. Appendix G and Appendix H provide summaries of the responses of the student and faculty online surveys.

Research Question One:

What positive and negative experiences did students and faculty have in using the e-portfolio during the clerkship?

The results of the data analysis being presented in this section provide answers to

Research Question 1. This section is divided into two sub-sections according to the subject: students and clerkship faculty. According to the data analysis, three positive and nine negative aspects were identified from the perspective of the students. Three positive and six negative aspects were identified from the perspective of the clerkship faculty. Those aspects of the two groups are discussed in detail in this section.

Positive Experiences Perceived by Students

Perceived ease in writing and editing. Most students in this study were under the age of 25 and good at working with PCs and mobile devices. The clerkship e-portfolio turned out to be beneficial for the younger generation in terms of writing and editing their clerkship reports because the e-portfolio system fully supports both PC and tablet environments. Many students considered the ease of typing and editing to be a primary advantage of the clerkship e-portfolio. For example, when I asked about the perceived advantages of the clerkship e-portfolio, one student stated that:

> Well, unlike our professors, we are very familiar with typing with computers although it's also comfortable for us to write by hand. So, it was good for me to write and edit my clerkship reports with computers or other electronic devices. (Interview with Student A)

Other students also shared similar opinions regarding the clerkship e-portfolio's convenience in writing and editing:

> There's a lot of PCs that we can use in every corner of the hospitals. So, we can use the clerkship e-portfolio through one of the PCs. (Interview with Student B)

> I used to write drafts of my clerkship reports with a computer. Then, I wrote down the

> final draft on paper before I submit it. This is because it is difficult to write as quickly as patients speak, and it is quite inconvenient to erase and modify what I've written previously on paper forms. But, now, I can write clerkship reports and submit it online immediately. I don't need correction fluids or erasers any more. (Interview with Student H)

> It's more convenient and faster to type with a keyboard. I can always review whatever I've written before. (Interview with Student G)

The responses from the student survey also showed that 85% of the students considered ease of writing and editing as one of the primary advantages of the clerkship e-portfolio. However, two students pointed out that a number of students are unfamiliar with PC or mobile environments. The variation among students should be reflected in designing and implementing user-training programs.

Efficient accumulation of student data and increased accessibility. According to the literature on educational e-portfolios, secured and efficient data storage and easy access to data are considered as benefits of electronic portfolios (Ahn, 2004; Canada, 2002; Van Tartwijk, Driessen, Van Der Vleuten, & Stokking, 2007; Wolf, 1991). From the perspective of students, they are free from carrying around paper files, keeping a large quantity of paper, and losing their paper portfolios. Also, they can access their portfolio data whenever they need it even after they have submitted it for evaluation. The results of data analysis revealed that the clerkship e-portfolios are perceived as effective in accumulating and providing easy access to the students' clerkship data. When I asked about the purposes of using the clerkship e-portfolio, one student explained how the online-based clerkship e-portfolio system was useful to him for educational

purposes:

> Students can review what they've studied through the clerkship e-portfolio whenever they need it. Also, I think that accumulating students' clerkship records is the significant beneficial feature of the clerkship e-portfolio in terms of the educational purpose. (Interview with Student C)

Other students also provided the similar opinions in response to the question about the pros and cons of using the clerkship e-portfolio:

> First, it is a clear benefit to me that our clerkship records are accrued on a daily basis. We can access the previous records and avoid the risk of losing our clerkship records because the clerkship e-portfolio is a web-based system. I can access my clerkship records anywhere and at any time, even after I submit it for evaluation. (Interview with Student F)

Less peer pressure among students due to the use of individual accounts. In student interviews, three students pointed out that quite a number of students have competed against each other by writing excessively long clerkship reports in order to obtain higher grades. According to them, this practice caused conflict among students and occurred because students could see the length of clerkship reports each student wrote when the reports collected for submission. The results of the data analysis showed that the clerkship e-portfolio can contribute to reducing that problem. For example, one student explained how the clerkship e-portfolio can reduce the problem in detail:

> There had been such a problem last year. The leaders of student groups were able to look

> at group members' clerkship reports when they collected the reports. But, this year, it is really hard to know how much other students wrote in their clerkship reports because each student logs into his or her personal account and directly submits clerkship reports online. However, we sometimes see other students' monitor screen while they are writing their reports in public spaces such as the PK room. It is not that difficult to see that some students still write a huge amount of reports. Well, I think that students' anxiety comes from the fact that we don't know how much the amount of writing affects the final grade. That's the point… (Interview with Student E)

Another student also provided a similar opinion in response to an open-ended question about suggestions:

> My suggestion is that each item of clerkship reports should be limited to a certain number of words. For example, it may be good that a reflective journal is limited to 200 or 500 words. That may prevent students from writing four pages of reflective journal in order to obtain higher grades. (Interview with Student F)

Negative Experiences Perceived by Students

Lack of perception on the purposes of using the clerkship e-portfolio. Based on the literature review in Chapter 2, this study defined a portfolio as a deliberate collection of artifacts that present a person's learning progress and achievements over time (Lorenzo & Ittleson, 2005; Paulson, Paulson, & Meyer, 1991) as well as their qualifications for a job; this study also defined an e-portfolio as a digital version of a paper-based portfolio (Butler, 2007). It is commonly emphasized in the literature that an e-portfolio can have various purposes, and the content and structure of the e-portfolio should be aligned well with the intended purposes

(Van Tartwijk, Driessen, Van Der Vleuten, & Stokking, 2007).

However, the results of the data analysis indicated that a large number of students used the clerkship e-portfolio with no clear purposes. For example, one student strongly argued that students should simply do what the school asked them to do:

> As a student, we have to do what our school asked us to do. Quite frankly, regardless of the clerkship e-portfolio system, I really don't feel a huge need for the paper-based clerkship portfolio itself. I believe most students feel the same way. (Interview with Student E)

Another student pointed out the low level of usage of the clerkship e-portfolio:

> I believe it is not appropriate for us to discuss about the purposes of using the clerkship e-portfolio itself at this point because the clerkship e-portfolio has not been used enough for any purposes yet, if you ask me. Even our professors also did not seem to faithfully use the clerkship e-portfolio for assessment. (Interview with Student I)

The responses from the student survey showed that 89.2% of students felt they did not know why they had worked with the clerkship e-portfolio, and 77 students out of 93 (82.8%) regarded working with the clerkship e-portfolio as imposed paperwork.

In contrast to the students' thoughts introduced above, two students explained how they had used the clerkship e-portfolio as a way to look back on what they have learned:

> Well, I think that constructing the clerkship e-portfolio is to accumulate my clerkship records on a daily basis. Doing it online allows me to review the previous records. ……
> The reflective journal is a kind of clerkship diary to me. I can review what I have learned on a daily basis through reflective journals. (Interview with Student G)

> Fundamentally, the clerkship e-portfolio has my daily learning goals and lessons that I have learned on a day-to-day basis. For the purpose of learning, it means a lot to me. (Interview with Student C)

Writing the clerkship portfolio out of a sense of obligation. In the interviews, most students commonly stated that they often write up their clerkship portfolios out of a sense of obligation or merely for assessment rather than learning. The results of the data analysis identified four primary causes of this negative aspect: excessive number of items to write and heavy workload, insufficient number of noticeable events for daily and weekly reflective journals, misunderstanding of the purpose and value of reflective journals, and lack of faculty feedback or confirmation for clerkship reports submitted.

Excessive number of clerkship forms to write and heavy workload. The large number of clerkship forms that students are required to write was the most predominant reason1 why students wrote their clerkship reports out of a sense of obligation mentioned in the student interviews. Students commonly argued that they do not have sufficient time to faithfully write up all of the items in the clerkship e-portfolio because they are swamped with a heavy workload every day. Such a heavy workload made them cram in the portfolio work during the weekends. For example, when I asked about the cons of the clerkship e-portfolio, two students expressed their difficulties in writing up their clerkship e-portfolios:

> As I said earlier, we have too many forms and items to write every day. Thus, it is really hard to complete all the daily clerkship e-portfolio work on the same day. I think that there will be no work left undone if it is just 10-minute work. However, if we need to spend more than one hour for the e-portfolio work, then we cannot afford to do it every

day and will try to cram it during the weekend or just before the work was due. (Interview with Student B)

If you ask me, there may be a difference between individuals, we have quite a large number of forms and items to write every day. It sometimes strikes me that this work is too much to write every day. We often have to put the portfolio work off when we rotate at particular departments that require a much heavier workload than the others. The portfolio work is quite a commitment to us at the time. (Interview with Student H)

Insufficient number of noticeable events for reflective journals. The clerkship e-portfolio includes three types of reflective journals: daily, weekly, and final reflective journals. The first two reflective journals must be written every day and weekly, respectively. Students are also asked to write the final reflective journal in the last week of each rotation: internal medicine, surgery, pediatrics, obstetrics and gynecology, emergency medicine, and psychiatry. Based on the results of the data analysis, it at least appeared that most students do not think that they encounter sufficient noticeable events for their daily reflective journals. The following comments were found in the student interviews regarding the insufficiency of noticeable events:

There is always a blank space for reflection. But, sometimes it is not easy to bring what I felt in the day to mind. Of course, I learn something every day, but I doubt how many of them are appropriate for reflection. (Interview with Student A)

It seems that many students think that writing a reflective journal every day gives them a hard time. It is quite hard to write daily reflective journals faithfully because we have to write a reflective journal on a daily basis regardless of whether we have something to reflect on or not. On the other hand, it is less difficult for us to write a reflective journal

> once a week because we probably have at least one critical incident every week. (Interview with Student C)
>
> I believe that our school wants us to reflect deeply on a critical incident. However, it is not common to encounter such an event in our clinical practice. Well, it would be more helpful for us to write one reflective journal weekly. (Interview with Student F)

Misunderstanding of the purpose and value of reflective journals. Although the reflective journals were designed to promote students' in-depth reflections on their learning experiences through journaling on their clerkship and mentorship experiences, the results of the data analysis showed that students had considered reflective journals as personal clerkship diaries. Thus, students tended to feel uncomfortable about their personal reflections being assessed by their professors, making it quite hard for students to reveal their true feelings and unsuccessful experiences in their reflective journals. According to the student survey results, 52.2% of students agreed that they frequently put limitations on the contents of their reflective journals because the journals are assessed by their professors. Only 13 percent disagreed with the statement. This indicates that there had been predominant misunderstanding of the purpose and value of the reflective journals among students.

Lack of faculty feedback and confirmation for clerkship reports submitted. Clerkship professors can check the list of clerkship reports that was submitted to them through the web interface of the clerkship e-portfolio system. Once clerkship professors finish their review of a clerkship report, they can type feedback and insert their digital signature as confirmation of their review. However, the results of the data analysis revealed that the feedback loop did not work as intended. Students commonly pointed out that they could rarely get feedback through the

clerkship e-portfolio system, and some clerkship reports were not confirmed even at the end of the clerkship program. For example, one student's statement directly showed how rarely they get feedback from their professors:

> You know each clerkship report itself has a text field for faculty feedback. However, only two or three professors have given feedback for a year of the clerkship course. It seems that the feedback loop through the clerkship e-portfolio does not work properly. (Interview with Student C)

Another student explained how the lack of faculty feedback and confirmation had negative effects on his attitude to writing clerkship reports:

> Let me see the previous clerkship reports that I submitted. Now, I am looking at a daily reflective journal that I submitted in March. I found that it is not confirmed yet. This makes me think that our professors do not check our clerkship reports intensively. I felt a growing sense of slothfulness in writing clerkship reports. (Interview with Student B)

Consistent with what the students mentioned in the interviews, the student survey responses also showed that 56.5 percent of students agreed that they got no feedback or confirmation for most reflective journals they submitted. Only 12 percent disagreed with that.

Concerns about the reliability of assessment results. There have been concerns about reliability and validity of e-portfolio assessment due to the subjectivity of e-portfolio contents and raters' judgements (e.g., Davies, Khera, & Stroobant, 2005; Jasper & Fulton, 2005; Webb et al., 2003). Also, the need for clear guidelines for assessment was emphasized to prevent students from confusion and anxiety about the range, nature and value of the task (Darling, 2001; Wade &

Yarbrough, 1996). Although the clerkship e-portfolio involved rubrics that were designed to assess clinical performance and clerkship e-portfolios of the students, most students argued in the interviews that the assessment for the students' clinical practices has been mostly subjective and often incomprehensible. Students provided various thoughts regarding reliability of the clerkship assessment. For example, many students insisted that it might be quite difficult for professors to remain objective in the clerkship assessment:

> Actually, I think that it is quite hard for professors to remain objective in the clerkship assessment because they are not education experts but clinical experts. Thus, it is natural for them to assess our clinical practices by their own clinical knowledge and experiences rather than the rubrics. Practically speaking, I think that there is nothing we can do for this issue unless the professors are trained by a proper training program. (Interview with Student C)

Students also raised doubts about whether their clinical practices were assessed properly and fairly:

> We frequently get the assessment results almost at the end of a clinical rotation. We sometimes cannot understand the assessment results or professors' feedback because it is quite hard for us to have clear a memory of what we had performed or how well we had performed during the rotation. I doubt whether professors have a clear memory of what we had practiced when they do the assessment. (Interview with Student H)

> We often find that some professors often marked at three-points for the most assessment items of a rubric. We doubt whether the assessment was done properly whenever we got such an assessment result. (Interview with Student F)

Regarding the need for clear guidelines for assessment, students commonly pointed out that the lack of clear standards for assessment made them confused and anxious. For example, a student expressed how he felt about his assessment results:

> Actually, we do not know what percentage this clerkship e-portfolio counts toward the final grades and what items of the clerkship e-portfolio are assessed. Thus, there is no way for us to know how an assessment result was calculated and whether an assessment result was calculated with no errors. (Interview with Student A)

Another student explained the problems that were caused by the lack of guideline for the written length of each item or clerkship report:

> There is no guideline for the amount of writing in a clerkship e-portfolio. We even do not know whether the amount of writing is reflected in the final grade or not. It makes us quite anxious. Consequentially, we competitively spend much time to write clerkship reports as much as possible. Some colleagues transcribe what they have studied into their clerkship reports to increase the length of it. (Interview with Student D)

The students' arguments mentioned above also correspond with the student survey responses. 69 out of 92 students agreed that assessment standards vary from professor to professor. Only two students disagreed. Also, 61 out of 92 students agreed that assessment results were sometimes not reliable because they did not know what the assessment standard was and how assessment results were calculated. Only three students disagreed.

Failure to facilitate immediate faculty feedback and establish an online feedback loop. Promoting timely and sufficient feedback was identified as one of the key design

components for a successful e-portfolio system in the review of literature. Each form of the clerkship e-portfolio involved a text field for faculty feedback or a confirmation field in order to promote the feedback loop. The clerkship e-portfolio system also provided text and voice recording input methods for faculty feedback. Based on the individual interviews with students and the student survey, the clerkship e-portfolio system was not useful to promote immediate faculty feedback, and most of the faculty feedback was provided verbally and not recorded in the clerkship e-portfolio system. This means that the feedback loop was established outside of the clerkship e-portfolio system.

According to the student survey responses, 70 out of 92 students disagreed that the clerkship e-portfolio system was useful to receive immediate feedback from professors. Only two students agreed with that. Also, 50 out of 92 students responded that they have rarely received feedback through the clerkship e-portfolio. 11 students responded otherwise. In addition to the student survey responses, the interviews with students revealed more detail about how rarely they have received faculty feedback through the clerkship e-portfolio. For example, three students described how much faculty feedback they received through the clerkship e-portfolio:

> So far, there have been only two or three professors who provided feedback through the clerkship e-portfolio. It does not seem that the feedback mechanism of the clerkship e-portfolio is working properly. (Interview with Student E)

> As far as I remember, there was nothing meaningful even when we checked the feedback given. Many of them were just one or two sentences. There was often nothing but professors' signature. (Interview with Student B)

> If we could receive a line of feedback, it would lead us to reflection on our practices. We

could not make up for our fault unless we received simple positive or negative feedback. We never know whether professors reviewed what we submitted or not. Professors' signatures were the only thing we could see. Thus, nothing has changed about that. (Interview with Student F)

Students also provided various possible reasons why very little faculty feedback was provided through the clerkship e-portfolio:

Professors typically accompany us when they are on daily rounds or take care of patients. In most cases, professors tell us what we need to know, and we take a note if needed. Thus, faculty feedback is seldom provided through the clerkship e-portfolio (Verbal feedback). (Interview with Student C)

Actually, it seemed that some professors were not trained enough to use the e-portfolio. Many of them did not know how to use the e-portfolio system. And most of them did not know how to assess students with the e-portfolio. Wouldn't it be hard for them to provide feedback through the e-portfolio system? (Faculty training) (Interview with Student A)

Most students write out lots of designated clerkship reports and submit the reports to professors. I think that it is nearly impossible to examine all of them one by one. It might be feasible to examine our reports and provide feedback bi-weekly. (Heavy workload) (Interview with Student F)

Regarding the voice recording feedback, two students explained why no one used the voice recording function:

> We would rather not use the voice recording function because using the function is a choice, and not a responsibility. The recording process is also not that easy. Also, I think that it is enough for us to take a note of what professors commented briefly because professors typically say things shortly and concisely. (Interview with Student C)

> It seemed that most professors felt uncomfortable about recording their voice in front of students. We could not ask professors' permission to record verbal feedback because we knew how they felt about recording their voice. (Interview with Student B)

Duplication of paperwork on both paper forms and its electronic counterpart. The clerkship e-portfolio provided both mobile and web interfaces in order to support students to make their e-portfolios anywhere and anytime. Each student initially purchased a tablet PC, and a Bluetooth keyboard was also given to each student of the two focus groups in order to facilitate typing with tablet PCs. Students could also use the web interface with many PCs that are placed throughout the hospitals. Interviews with students revealed that students have written most clerkship reports through the clerkship e-portfolio after they finished daily schedules or during weekends. However, many students also noted their duplicated efforts writing clerkship reports in some cases, such as for the preliminary exam report. According to student interviews, they initially wrote their preliminary exam reports on paper while they examined assigned inpatients and immediately brought the reports to their professors for review and feedback. Then, they had to type the same reports into their e-portfolios because the final grade was given through the clerkship e-portfolio system.

The data analysis results identified three primary reasons for the duplicated work. First of all, it was not easy for the students to type a preliminary exam report with tablet PCs and the

Bluetooth keyboard in less than 10 to 15 minutes while they examine their patients. For example, two students explained what difficulties they experienced in typing preliminary exam reports with their tablets and Bluetooth keyboards:

> I often felt that it was more convenient for me to write reports on the paper first because the Bluetooth keyboard itself was not convenient to use, and there had been lots of typing errors. I had to repeat erasing and typing multiple times while I was typing a report. In the meantime, my patients had to wait for me to ask another question. Thus, I felt that it would be better to write preliminary exam reports on paper first, and then type the reports into the clerkship e-portfolio later even though my workload was doubled. (Interview with Student H)

> Sometimes, I lost everything that I had typed because errors occurred when typing a preliminary exam report. I explained why I could not bring anything to professors. After a while, I had to rely on my memory to rewrite the report briefly. (Interview with Student B)

The data analysis results also revealed that the duplicated work was caused because some of the six major departments have required students to use specialized forms instead of standardized forms embedded in the clerkship e-portfolio. Several professors explained the need for the specialized forms in the faculty interviews. This will be discussed in detail in a later section.

Finally, Students commonly stated in their interviews that no one uses their own tablet PC during clinical practices. Most students commonly stated about why they did not use their tablet PCs during the other five rotations of the clinical clerkship. For instance, a student

described for what purposes they have used their tablet PCs:

> Well, if you ask me, I sometimes used my device for writing preliminary exam reports and surfing the web. But, after the trial period when professors encouraged us to use tablet PCs intensively for most clinical practices, I have never used my device at all. I may say that almost all students who were assigned to other departments have seldom used their tablet PCs during the entire clerkship. (Interview with Student D)

Another student pointed out that there were few professors who requested or encouraged students to use tablet PCs for their e-portfolio work:

> Professor 'A' had actively encouraged us to use tablet PCs for our e-portfolio work as much as possible during the internal medicine rotation. I remember that we had tried to use our tablet PCs in as many cases as possible due to her encouragement. However, after the rotation, we have stopped using tablet PCs because there was no professor who asked or encouraged us to use tablet PCs, and instead, we have been writing clerkship reports through the web interface. (Interview with Student F)

Portability of tablet PCs and the risk of loss was also mentioned by many students during interviews:

> My tablet PC is quite heavy to carry and not small enough to fit into a pocket of the doctor's gown so I have had to hold the tablet in one hand. Then, I can use only one hand for clinical practices unless I found a proper place to put it down during clinical practices. Even though I found a proper space to put my tablet down, I should risk the danger of loss. Like other students, I spent much money purchasing this tablet so I do

not want to risk the danger of loss. As a result, I usually leave the tablet at home. (Interview with Student G)

Difficulties in use caused by various errors at the early stages of the system operation. Although the clerkship e-portfolio system has been evaluated several times in the development process, a sufficient number of beta tests were not performed before its launch. Such a lack of beta tests caused many errors at the beginning of the system operation, and the errors gave students and professors a negative impression of the e-portfolio system. For example, a student described the errors they experienced and how they felt when they faced the errors:

> Sometimes, I lost a full draft of what I had typed for a clerkship report because the server suddenly shut down. Then, I had to rewrite the report all over again. Unfortunately, it was very hard for me to do it again and cost me a lot more time. It seems that it was the most difficult part of using the clerkship e-portfolio at the beginning. However, I could not find such critical errors since May or June. I think that that is because I have used the e-portfolio only through PCs. (Interview with Student C)

Another student explained how students reported errors to the developers and how well the errors were corrected:

> There had been errors for the first two or three months such as loss of a whole draft of a clerkship report. Students contacted a representative of the development company or sent messages through a chat room in which all students of our rotation group participated. So, there was nothing particularly uncomfortable working with the e-portfolio because most errors being reported were fixed soon. (Interview with Student G)

Insufficiency of IT infrastructure and financial support. Providing a proper IT infrastructure for users is one of the most important implementation factors to operate an e-portfolio system successfully because an e-portfolio system is an internet-based system. The initial evaluation performed during the end of 2015 with the initial version of the e-portfolio program revealed that wireless internet access in some areas of the hospitals could be limited or unavailable because the wireless signal may interfere with sensitive medical equipment. In order to solve possible issues of wireless internet access, a separate mobile application for students called 'off-line mode' was designed to store report data in the local storage of a tablet PC when the wireless network was not available. This application then synchronized the local data to the clerkship e-portfolio server when the wireless network was available.

The data analysis results showed that the wireless network was not stable enough, so many students used either high-speed mobile internet to tether their tablet PCs or the separate mobile application. A student shared his experience of using the clerkship e-portfolio in the current wireless network environment:

> The clerkship e-portfolio worked better in the hospitals' wireless network environment than I thought. However, the wireless network was not stable enough to use without any concerns. In most areas, wireless network was available, but we often had some problems with the internet connection. In case of preliminary exam practices, we examine real patients, so it is not appropriate to ask for their understanding regarding the internet connection. That is the time when we need internet connection most. At times like that I disconnected the wireless internet connection and used mobile internet by tethering my tablet PC. (Interview with Student F)

In addition to the issues of IT infrastructure, the financial burden of purchasing an individual tablet PC was pointed out by most students. Students complained that despite its high cost, they have rarely used their tablet PCs for the clerkship practices. As an example, a student expressed strong dissatisfaction with purchasing a grossly underutilized tablet PC:

> I bought a tablet PC because the company initially announced that we would be able to use the e-portfolio system only through Android-based tablet PCs. However, we have mostly used the e-portfolio through the web interface. Afterwards we also found that we could use the e-portfolio through iPads if we use web browsers. I think that some students may have a deep antipathy if our school either allows students to choose whether they use tablet PCs or decides not to use tablet PCs next year. (Interview with Student I)

Unsuitable clerkship forms for the clinical learning environment. The clerkship e-portfolio includes various kinds of clerkship forms that were designed to help students systematically record how each student performed designated clinical practices and what they have learned from the practices. However, most students who were interviewed commonly agreed that some clerkship forms are not suitable for certain clerkship environments or have never been used during the clinical clerkship. For instance, supporting evidence found in the interview transcriptions included the following:

> I believe that the clerkship e-portfolio includes unnecessary clerkship forms. We would be able to control how much time to spend at the e-portfolio work and at the other necessary work. I think that it is often difficult for us to handle our time effectively because we are usually asked to write too many clerkship reports within a limited time.

(Interview with Student H)

I think that it might be better to exclude some underutilized clerkship forms. However, I am not sure if it is possible to exclude those forms because they are probably included in the assessment criteria. (Interview with Student C)

We typically have nothing to write for some clerkship forms. For example, we scarcely write the reflective journal for patient safety because we typically have nothing to reflect on patient safety. Overall, it seems that many clerkship forms are not activated yet. (Interview with Student B)

Students also commonly asserted that there are too many clerkship forms for them to write every day. Several students suggested a similar idea regarding the need for adjusting the amount of paperwork:

It would be more efficient if students are encouraged to concentrate on certain clerkship forms that are selected by professors of each department as necessary. For example, it is inevitable that there are often many overlapping contents between daily and weekly reflective journals. I would write better reflective journals if I wrote reflective journals once or twice a week. (Interview with Student A)

Positive Experiences Perceived by Clerkship Faculty

Junior faculty's positive perception on adoption and use of the clerkship e-portfolio. It is important to encourage professors themselves to appreciate the educational value of a transformative change, including the use of e-portfolios, in order for them to support and spend sufficient time making the change (Van Tartwijk, Driessen, Van Der Vleuten, &

Stokking, 2007). IUCM had several introductory sessions and discussions with clerkship professors to explain what the clerkship e-portfolio system is, why the new system is necessary for the clinical educational environment, and how the system work.

The analysis results of the interviews with the clerkship professors showed that the institution's efforts succeeded in attracting junior professors' support, but failed to draw seniors professors' attention. As the supporting evidence for this finding, a junior professor provided her thoughts regarding the use of the clerkship e-portfolio:

> If you ask me, there is no doubt that the use of the clerkship e-portfolio instead of paper portfolios is natural to swim with the current of the tide. In fact, the use of the clerkship e-portfolio has many advantages over the previous paper portfolio. (Interview with Faculty D)

Another junior staff member expressed in her interview that senior staff rarely used the clerkship e-portfolio:

> Most senior professors and some professors who could hardly invest time for students have rarely used the clerkship e-portfolio. It seems that the professors themselves are responsible for the problem rather than the e-portfolio program itself. I recognized that most senior professors who had often provided feedback by using the paper portfolio tend to provide no feedback using the clerkship e-portfolio. (Interview with Faculty E)

Free from worrying about storability and storage space. Ease of archiving and managing user data is one of the most significant benefits of using an e-portfolio because an e-portfolio is fundamentally a Web-based system. The analysis results of the interview

transcriptions also showed that many professors recognized the ease of data accumulation and maintenance. For example, two professors explained the advantages of using the clerkship e-portfolio:

> Students sometimes lost some of the paper portfolios before. But, now, we don't need to worry about that. E-portfolios have been quite useful in that way. The clerkship e-portfolio, in fact, has more advantages than the previous paper portfolio. As stated above, there is no worry about loss. In addition to that, immediate feedback can be given to students through the clerkship e-portfolio, and students' grades are automatically calculated and processed at once by the e-portfolio system when we input assessment results. It is a convenient part of the clerkship e-portfolio. (Interview with Faculty D)

> Let's imagine that we put all the paper portfolios together. In my experience, a big box of papers is stacked up in storage per student per year in general. I have been working here for five years so five boxes of papers might have been stacked up from the students whom I have advised. If there are 20 professors in a hospital, 100 boxes of papers would be piled up in storage at least. It is nearly impossible to find and review a certain paper from the boxes. In this respect, I agreed on the adoption and use of the clerkship e-portfolio. (Interview with Faculty G)

Negative Experiences Perceived by Clerkship Faculty

Lack of interest in the clerkship e-portfolio. According to the data analysis results of the interviews with the clerkship faculty, the most notable finding was clerkship professors' indifference to the use of the clerkship e-portfolio or even the e-portfolio system itself. First of all, all students who had been asked to use the clerkship e-portfolio intensively for a certain

rotation pointed out in the interviews that only a few professors of the two designated departments had encouraged students to use the clerkship e-portfolio. Even the students commonly stated that they had never been asked to use the clerkship e-portfolio when they were involved in the other rotations. The students also asserted that many professors did not know how to use the clerkship e-portfolio, so they had to help their professors use the e-portfolio first. In addition to the students' statements, many professors expressed in their interviews that they had not used the clerkship e-portfolio enough to share their experiences using the clerkship e-portfolio. For example, a professor described how he felt about the clerkship e-portfolio and how he had done his e-portfolio work:

> As you know, against our expectations at the beginning, most clerkship professors have not been interested in the clerkship e-portfolio ever, if you ask me. I also could not afford to spend time to carefully review students' e-portfolios and provide feedback due to heavy workloads. Mostly, I did all of the e-portfolio work at the last minute. (Interview with Faculty F)

Inconvenience caused by serious errors at the beginning. According to the data analysis results, most clerkship professors were challenged by various crucial program errors mainly for the first three months. Their difficulties in using the e-portfolio gave them a negative impression of the clerkship e-portfolio, and many of them have even stopped using the e-portfolio since then. Supporting evidence was found in the interview transcriptions. For example, two clerkship professors explained what critical errors had occurred and how they felt when the errors occurred:

> Actually, I initially entered some students' grades, but the e-portfolio system still asked me to enter the grades when I accessed the system a few days later. I was so embarrassed when I was asked to enter their grades again. I did not have a clear memory of how the students performed their clerkship practices because many students had been assigned to me since the students rotated to another department. (Interview with Faculty D)

> The deadline for the final grade was two days ago. A critical error occurred on that day. Three students' grades were not stored in the e-portfolio system. We had no choice but to go to the person in charge of student records and tell her the grades were missing directly. I am sure that I entered the grades appropriately. There had been other similar errors. For example, I could see that relevant scores were entered well in the preliminary exam report. But, I found that the scores were not reflected in the final grade. (Interview with Faculty B)

Another professor was concerned about the negative impressions of the clerkship e-portfolio that arose among clerkship professors because of critical errors in the early stages:

> The clerkship e-portfolio system had been unstable for a while. The instability of the system forced us to spend more time to work with the e-portfolio. It seems that professors who experienced that kind of inconvenience at the beginning lost their will to use the clerkship e-portfolio. (Interview with Faculty A)

Regarding the process of error correction, two professors worried that the development company was sometimes unreachable through calls or emails. They were also concerned that there might be several professors who did not know how to report the errors that they encountered to the development company. However, most professors and students expressed that

the problems that they reported were fixed relatively quickly.

Dissatisfaction with the user interface of the clerkship e-portfolio. The user interface of the clerkship e-portfolio had been evaluated by some of the clerkship professors and redesigned several times according to the professors' suggestions. However, against all expectations, the data analysis results revealed that several professors were dissatisfied with the user interface of the e-portfolio. They mostly presented three major complaints about the user interface: excessive amounts of information that displayed on the screen, the need for noticeable indicators to show the status of information, and overly complex steps to access student data. For instance, two professors provided their thoughts about the two major complaints:

> We usually have to make time for e-portfolio work despite our busy schedule. It seems that too much information is displayed on one screen. So, it is not easy to know what I have to do and what I have already done. It would be great if I could see the simplified information that I need to look at on a day. (Interview with Faculty B)

> Strictly speaking, professors are responsible to review all student data that were submitted to them and provide feedback on them. So, I do not agree with the other professors' opinions. I think that the index page of the e-portfolio was rather designed well. I often felt the necessity of various indicators such as 'Read,' 'New,' 'Updated,' and so forth. (Interview with Faculty G)

> We should go through many complex steps to access student data that we need to see. It is a somewhat inconvenient and difficult job for us to go around to find a PC available, log into my account to access student data, and start assessment work in the middle of our busy schedule. Also, sometimes, I felt that too much information was shown on one

screen. I even had to struggle with a long scroll bar at the same time. (Interview with Faculty A)

Senior professors' difficulties in adapting and using the clerkship e-portfolio. Appropriate quantity and quality of user training is essential for a successful implementation of a new system. The development company had several user training sessions for both students and professors. The user training is divided into one-to-one and group sessions. The group session typically involved a main presentation to provide the overview of the clerkship e-portfolio system, system demonstration, and time for Q & A. The one-to-one sessions were carried out by some of developers and a professor who is in charge of the e-portfolio research.

The data analysis results of the interviews with faculty revealed that unlike junior professors and residents, most senior professors who are not familiar with computer and mobile technology experienced difficulties in adjusting to the clerkship e-portfolio system, and the user training sessions could not meet their needs to work with the e-portfolio system. In the interview with a junior professor, she explained that almost all senior professors rarely used the clerkship e-portfolio, and senior professors had difficulties in learning how to use the clerkship e-portfolio during group training sessions:

> Most senior professors and some professors who could hardly invest time for students have rarely used the clerkship e-portfolio. It seems that the professors themselves are responsible for the problem rather than the e-portfolio program itself. I recognized that most senior professors who had often provided feedback by using the paper portfolio tended to provide no feedback by using the clerkship e-portfolio. In terms of the group training sessions, it seemed that most senior professors had a very hard time to learn how

to use the clerkship e-portfolio system. (Interview with Faculty E)

The faculty survey responses also showed that the user training sessions were not entirely successful in many ways. First of all, the rate of professors who did not attend any of the training sessions regardless of the type was 27 percent. That means that 14 out of 51 professors responded that they did not attend any sessions. Moreover, 75 percent (38 out of 51) of professors felt the need for a more systematic user training program. This can be interpreted as the need for a better training program. Finally, in terms of effectiveness of the training sessions, 41 percent of professors responded that the training session that they attended was not useful when they used the clerkship e-portfolio.

Use of separate paper forms along with the clerkship e-portfolio forms. One of the design goals of the clerkship e-portfolio system was to help each user use the e-portfolio wherever internet access is available. In order to achieve the design goal, the clerkship e-portfolio provided both Web and mobile interfaces, and even an offline application mode that covered the areas where internet access was not available.

The data analysis results of the faculty interview transcripts, however, revealed that both paper forms and the e-portfolio actually have been used together, especially for the preliminary exam practice, and the standardized forms involved in the clerkship e-portfolio are one of the primary reasons for that. For example, one clerkship professor explained that they used paper forms for certain clerkship practices and it was nearly impossible to digitize all the paper forms because of the need for the separate forms that are required by each department or individual professors:

> Each department has a separate form for the preliminary exam practice. Those separate forms and the standardized form that is provided by the school through the clerkship e-portfolio are quite distinct from each other. In case of the preliminary exam practice of a department, students initially bring their designated paper forms that were filled out while they examined assigned patients to their professors. Then, the professors give the forms back to the students after the exams ended. The students reorganize the content of the forms according to the SNAPPS structure to fit the content to the standardized forms of the clerkship e-portfolio. Finally, the professors assess the students' reports through the clerkship e-portfolio. (Interview with Faculty D)

> I think that it is nearly impossible to transform the entire paper forms into Web pages because each department, each division, and even each professor uses a separate form. For example, in case of a professor who is a stomach cancer specialist, the professor probably uses separate forms and questionnaires that are specialized for stomach cancer patients. If we want to add the entire set of the separate forms to the clerkship e-portfolio, we should develop hundreds of online forms. Practically, that would be very difficult. (Interview with Faculty G)

In addition to the use of the separate paper forms, another professor also described various reasons why paper forms had been used for the preliminary exam practice instead of the e-portfolio. The reasons include students' difficulty in typing a preliminary exam report within a short time, the lack of using the tablet devices, unstable wireless internet access, and program errors. Their interview transcription included the following:

> It had become quite difficult for students themselves to finish their preliminary exam reports while they were examining their patients since we started to use the clerkship e-portfolio. After all, students had to initially write down their reports on the papers, and then entered them into the e-portfolio system later for assessment. We are still using separate paper forms and the clerkship e-portfolio together in case of the preliminary exam report because students often did not bring their tablets, internet access often became unstable, or errors sometimes occurred. (Interview with Faculty H)

Practical difficulties in student assessment. From the perspectives of the clerkship professors, student assessment is the most fundamental purpose of using the clerkship e-portfolio. Assessing students' clerkship practices and reports through the clerkship e-portfolio is typically performed by one or more of three forms: digital signature for confirmation, grading by the rubrics, and providing text or voice feedback. All of the three forms can be done by a few mouse clicks or keystrokes. However, according to the interviews with the clerkship professors, it appears that they experienced various difficulties in student assessment so that student assessment had not been performed properly in many cases. Based on the analysis results of the interview data, it was found that most of the difficulties arose from professors being overburdened by heavy workloads such as patient care, research, and so forth. The analysis results also identified four primary problems that caused the difficulties: insufficient time for student assessment, excessive amounts of assessment items, inappropriate timing of student assessment, and lack of reliability and objectivity.

First of all, all the clerkship professors interviewed commonly asserted that most difficulties in student assessment were caused because they could hardly have enough time for

student assessment due to their heavy workloads. One professor provided a practical explanation of why they could not spend enough time on student assessment:

> I think that only those who are hired for education can have enough time for students. However, in reality, professors at a medical school are typically responsible for education, patient care, and research. Especially, we are often forced to pay more attention to the patient care in order to make more profit for hospitals. Accordingly, we mostly spend much time for patient care or surgery rather than education. (Interview with Faculty G)

Most professors also voiced similar dissatisfaction with the amount of assessment items. For instance, two professors stated the need for adjusting the amount of assessment items:

> Overall, there are too many items to assess every day, and most of the items are overlapped or duplicated. I believe that that is the primary reason why both students and professors gradually neglected the e-portfolio work. (Interview with Faculty E)

> It is a huge burden for students to do such a large amount of paperwork. Likewise, it is also a large burden for professors to assess all of the student work. I had heard from one former student of mine that some students were often up all night working on the papers. (Interview with Faculty H)

Moreover, several professors also presented the problem of the late timing of student assessment. They consistently expressed that they mostly postponed their assessment work until the last minute due to their busy schedules:

> After a few weeks, my memories of individual students and their practices were hazy, so I had difficulty in assessing students' work properly. When we were using paper portfolios, I used to finish assessment work immediately when I had time. Instead, it seems that working with the e-portfolio has become more inconvenient for me. (Interview with Faculty B)

> When I had time to work with the e-portfolio, I often found that some of my students did not submit their reports yet. In that case, the reports of those students were typically graded in the last week of the rotation. It was quite difficult to cram lots of assessment work before the due date. So, I merely entered scores to the e-portfolio system or simply clicked for confirmation. (Interview with Faculty A)

Finally, some professors pointed out ambiguous assessment criteria and the lack of clear guidelines for the assessment criteria. The clerkship e-portfolio involved various rubrics which were carefully developed to facilitate professors' systematic assessment, and professors have assessed students' performances and e-portfolio work according to the rubrics in most cases. However, professors argued in their interviews that the student assessment has not been objectively performed in many cases. The analysis results of the faculty interviews identified two primary problems that caused subjective assessment: various interpretations of the assessment criteria and the lack of clear consensus among professors about the five-point grading scale.

Regarding ambiguity of the assessment criteria, a professor expressed that professors seem not to understand the assessment criteria quite clearly, so that each professor has his or her own interpretation of the assessment criteria and performs student assessment based on the individual interpretation:

> It seems that professors themselves do not have clear understanding of individual assessment criteria. So, professors' assessment processes often looked like quite disorganized. Some professors give high scores, but there are also professors who give relatively low scores because of the lack of clear assessment criteria. Our school, of course, provided guidelines of the use of the rubrics for student assessment, but each criterion was not clearly defined, and there was no consensus among professors. So, even if we assess the same student, there probably exists a huge variation among individual professors. In my opinion, there is a strong need for a systematic training for objective student assessment. (Interview with Faculty G)

Another professor shared his thoughts about the five-point scale. He pointed out that each rubric does not provide clear standards to differentiate each of the five-point scale but the descriptions of individual assessment criteria:

> I felt the need for consensus among professors about the five-point scale like many other professors. For example, previously, we typically gave three points for good performance, two points for average performance, and one point for bad performance in the case of the preliminary exam practice. However, for now, each rubric uses a five-point scale. So, it was somewhat confusing to differentiate students' performances into five levels. Of course, I have a personal standard for it, but there is no consensus among the entire professoriate yet. I sometimes saw other professors' assessment results. I could easily recognize a huge variation among the professors. So, often, I was even concerned if the scores that I gave to my students would negatively affect their grades. (Interview with Faculty D)

In relation to the late timing of student assessment, faculty survey responses confirmed the analysis of the faculty interviews. 30 out of 51 professors agreed that they experienced difficulties doing student assessment properly when they completed their assessments at the last minute. Only seven professors disagreed.

Difficulties providing feedback through the clerkship e-portfolio. Professors have used the clerkship e-portfolio for student assessment, although several practical problems made it difficult for professors to complete their assessment work properly. However, the analysis results of the faculty interview revealed that professors had seldom provided feedback through the clerkship e-portfolio for various reasons. The analysis identified four significant reasons why professors had rarely used the clerkship e-portfolio for providing feedback: insufficient time for providing feedback, professors' definite preference for verbal feedback, inconvenience in comparison to the previous paper portfolios, and failure of the voice feedback function.

As previously mentioned, most professors had insufficient time for student assessment. The analysis also found that the heavy workload of professors made it more difficult for them to provide feedback because careful review of students' work is required prior to providing meaningful feedback. For example, a professor firmly indicated improvement of the current harsh working conditions as the first-priority task for promoting faculty feedback. Another professor described the practical limitations on providing feedback. The followings are extracts from their interview transcriptions:

> The current working conditions need to be changed first before we expect for professors to provide feedback. This is because feedback requires careful review for a certain period of time. So, I think that it is not appropriate to force professors to provide

> feedback under the current working conditions. (Interview with Faculty F)
>
> We cannot give immediate feedback to students on the spot when we have schedules of surgeries or outpatients. What we can do under the time constraints is nothing but reading and confirming. (Interview with Faculty H)

In addition to the lack of time, the analysis also revealed that most feedback has been given verbally or on paper forms on the spot so that both professors and students did not feel the need to record the verbal feedback to the clerkship e-portfolio. According to the faculty interviews, professors tended to provide feedback through the e-portfolio only if they found something to correct in students' reports:

> Once students wrote their preliminary reports and brought them to me, then I reviewed their reports and provided feedback. In that case, students were required to reorganize the reports according to the designated forms and upload them to the e-portfolio system, although we all knew that were duplicated work. However, there were no records in the e-portfolio system because feedback was already given verbally. (Interview with Faculty D)

Also, several professors argued that they hesitated to use the e-portfolio because working with the e-portfolio requires more time and is more inconvenient for providing feedback in comparison with the previous paper portfolios. For example, a professor explained why they had to spend more time for the e-portfolio work. Also, another professor described what made it more difficult for him to provide immediate feedback:

> In my opinion, for example, I typically see the EMR screen with students and provide feedback verbally. It can be done within a couple of minutes. However, if I do the same task with the clerkship e-portfolio, it will take five to 10 minutes at least. Those who are not good at typing, like me, it will take much more time to finish. (Interview with Faculty G)

> In fact, when we were using paper portfolios, students wrote their reports on the paper and brought them to me. I mostly reviewed the reports on the spot and provided feedback immediately. But now, it is difficult for students to write a complete report with the e-portfolio on the spot. Providing feedback is more difficult now. (Interview with Faculty I)

Research Question Two:

What key themes cause an individual to have positive or negative experiences during the clerkship?

In the previous section, in relation to the use of the clerkship e-portfolio, various positive and negative experiences of students and faculty were reported based on the data analysis results of interview transcriptions and survey responses. The findings presented in this section provide answers to Research Question 2. The analysis results of the previously revealed positive and negative experiences of students and faculty members identified 16 key themes that significantly influenced one or more of the e-portfolio experiences. Each key theme is described with the students' and professors' thoughts about relevant experiences that were presented in the previous section.

Major Categories for the Key Themes

In relation to categorization of the key themes, this study referred to the model of factors that influence the successful introduction of educational portfolios which were proposed by Van Tartwijk, Driessen, Van Der Vleuten, and Stokking (2007). The model involves the three conditional factors: people (teachers and students), educational leadership, and infrastructure. Regarding the people factor, teachers' and students' commitment to working with a new educational method is emphasized for the successful introduction of the method. This is because introducing a new educational attempt, including use of portfolios, is likely to entail uncertainty and a certain level of resistance to the educational change. In addition, commitment by educational leaders to support and motivate teachers is also highlighted as another key conditional factor. Discussing and negotiating educational changes with teachers is presented as a characteristic of successful educational leaders. Finally, there are inevitable demands for technical infrastructure to adopt and use e-portfolios.

The factor of institutional leadership was excluded from the categories because the data collected for this study mostly focused on the experiences of students and faculty members as end users of the clerkship e-portfolio. The collected data involved little about the institutional leadership. As a result, the key themes were classified by four categories: students, professors, common for both students and professors, and internet and hardware infrastructure. The key themes are presented according to the four categories.

Key Themes that are Common for Both Students and Professors

Theme #1: Convenience in use of the clerkship e-portfolio due to the advantages of the web-based system. The clerkship e-portfolio is fundamentally a web-based system, although

the e-portfolio system provided both the web and the mobile interfaces. All user data is digitally stored in the e-portfolio servers and accessible by permitted users wherever internet is available. The data analysis results found that most positive experiences of students and faculty were commonly related to advantages of the web-based system.

From the students' point of view, all of the four positive experiences previously presented are linked to benefits of the web-based e-portfolio system. First of all, most students commonly expressed that it is convenient for them to do paperwork on PCs because they are used to using the computer and the internet. In addition, easy access to the previous e-portfolio data and unconstrained accessibility from any internet-capable PCs were also considered as benefits of using the e-portfolio system. Moreover, several students argued that the advantage of easy access to previous data allowed them to look back on what they had practiced. Finally, as a minority opinion, a student asserted that there has been less peer pressure among students because students used individual accounts to do and submit their paperwork so that they naturally had less chances to see each other's paperwork.

Likewise, many clerkship professors also mentioned benefits of the clerkship e-portfolio as a web-based system. They argued that it was quite good for them not to worry about loss of paper portfolios and a large required space for the archived paper portfolios.

Theme #2: Excessive amount of items to be completed by students and evaluated by professors. Working with the clerkship e-portfolio requires students to do paperwork to record most of their clinical practices and reflections on the practices. The clerkship e-portfolio work also requires professors to assess students' clinical performances and paperwork submitted. The data analysis results discovered that the large quantity of required e-portfolio work led to several

negative experiences of students and professors.

From the students' point of view, the analysis revealed that the excessive amount of paperwork was a major contributor to students' obligatory paperwork. Students mostly thought that they have too much required paperwork to be done properly in limited time because they carry a heavy workload for clerkship activities and individual studies besides the clerkship e-portfolio. Students also acknowledged that they mostly completed their paperwork at night or during weekends. In addition, in regards to the daily reflective journals, many students argued that they encountered an insufficient number of noticeable events for the five daily reflective journals so that some reflective journals could not be written properly.

According to the analysis results, and similar to the students' point of view, faculty also had difficulties in carrying out assessment work properly and providing meaningful feedback due to the excessive number of required assessment items. Regarding the amount of assessment items, a professor strongly asserted that students and professors had gradually neglected required work for the clerkship e-portfolio because professors had too much assessment work overall, and most of the work was duplicated or repeated. Faculty also argued that it was very difficult for professors to invest additional time for meaningful feedback because they even had difficulties in completing assessment work with limited time.

Key Themes Related to the Students' Experiences

Theme #3: Students' lack of understanding of the value of the clerkship e-portfolio. As mentioned earlier, the institution provided several introductory and user training sessions to explain the clerkship e-portfolio and help students to use the e-portfolio system. Overall, it appeared that most students were not challenged by use of the clerkship e-portfolio system

because of their familiarity with using PCs and mobile devices. No students mentioned technological difficulties or the need for additional user training sessions in their interviews about using the e-portfolio system.

However, the analysis recognized that there was a lack of understanding of the value of the e-portfolio among most students. The student survey responses previously showed that most students fundamentally doubted why they were asked to write clerkship reports and considered the e-portfolio work as paperwork that was imposed on them. Also, a student argued that most students did not feel a huge need for the portfolio work itself.

Theme #4: Students' redundant paperwork due to the mixed use of paper and e-portfolio forms. Originally, the clerkship e-portfolio was expected to be used in most clerkship environments by using either web or mobile interfaces. The analysis results showed that most required paperwork was accomplished through the clerkship e-portfolio when students had time.

However, the analysis also found that in the case of the preliminary exam practice, students had been burdened by redundant paperwork for both separate paper forms and standardized e-portfolio forms. According to the students' accounts, on the spot, they initially wrote preliminary exam reports on separate paper forms given by individual departments, and then, they reorganized the initial reports to fit the standardized clerkship e-portfolio form and submitted the rewritten reports to the clerkship e-portfolio system.

Regarding the use of the separate paper forms, the analysis results provided three primary contributors: students' difficulties in writing preliminary exam reports by using tablets and wireless keyboards, individual departments' specialized needs for the clerkship form, and

lack of use of tablets in clinical environments. First of all, most students commonly insisted that tablets and wireless keyboards seemed inconvenient and unstable tools for writing the report within a short time due to the risk of typing or program errors. Also, according to a professor's account, individual departments or even each professor has been using distinct forms depending on their specialties, and there might be hundreds of separate paper forms, making it practically impossible to develop and embed all of the forms into the clerkship e-portfolio. Finally, students have seldom used tablets for their clerkship practices. In other words, there has been no way to write preliminary exam reports but paper forms.

Theme #5: Students' limited reflection due to the lack of understanding of the purpose and value of the reflective journals. The reflective journals are one of the essential forms of the clerkship e-portfolio in promoting students' learning. However, in addition to the problem of the large number of required reflective journals, the analysis results also discovered that students' reflections were often limited because of students' misunderstanding of the purpose of the reflective journals. They simply considered the reflective journals as their personal diaries. Thus, students were uncomfortable to write their thoughts. They should understand this is a professional reflection on their learning experiences and clinical performances. In order to prevent such a misunderstanding, the institution should provide students with clear explanation of the purpose and educational value of individual clerkship forms.

Theme #6: Students' lack of motivation for producing quality clerkship reports due to lack of faculty feedback. Faculty feedback is one of the most significant and meaningful rewards for students' faithful completion of paperwork. However, the analysis results previously revealed that students had not received faculty feedback very often, and faculty had not even

confirmed students' work submitted in some cases. The lack of feedback and confirmation was also corroborated by the direct review of the actual e-portfolio data. Furthermore, the students perceived the lack of feedback and confirmation as a sign of faculty's disinterest in their e-portfolio work, so that students often neglected their e-portfolio work or wrote their clerkship reports out of a sense of obligation.

Theme #7: Practical challenges of using tablets in clinical environments. The tablet-based mobile interface of the clerkship e-portfolio was an innovative approach and was expected to promote faculty's immediate feedback and be a key component of the feedback mechanism of the clerkship e-portfolio. However, according to the analysis results, students seldom used tablets for their clerkship practices because they had been challenged by various practical difficulties in using tablets. The practical difficulties identified by the analysis included following: inconvenient to write clerkship reports on the spot, limited usage in clinical environment, lack of faculty encouraging students to use tablets, no need for the voice recording feedback, and lack of portability.

First of all, as mentioned earlier, it was inconvenient for students to write clerkship reports on the spot by using tablets due to the risk of typing and program errors. The difference in ease-of-use between general full size PC keyboards and the wireless keyboard given to students was a major contributor to students' inconvenience. In addition, students commonly perceived that the usage of tablets in clinical environment was very limited. According to the data analysis results, most students considered that the only clinical usage of tablets was writing preliminary exam reports, and they had mostly used PCs to work with the clerkship e-portfolio instead of tablets. Even the two groups of students who were encouraged to use tablets

intensively for the clerkship practices acknowledged that they had never used their tablets for their clerkship activities since they completed the clerkship rotation. Further analysis found that the lack of tablet use in the two groups of students was mainly caused by the lack of faculty willing to encourage students to use tablets. Despite the possibility of using tablets, they also mentioned that no faculty in other departments had encouraged them to use tablets for the clerkship activities. Many of the students acknowledged that the use of tablets and wireless keyboards to write preliminary exam reports was not convenient for a while but became the least adaptable after all.

The failure of the voice recording feedback also limited the usage of tablets. The first reason for the failure identified by the analysis was that professors' in-person verbal feedback was typically quite short and easy to understand for students. The other reason was that most professors were reluctant to record their voices in front of their students. The final difficulty was tablets' lack of portability in clinical environments. Ironically, students perceived tablets as unhandy devices to carry about due to their size and weight. They felt uncomfortable because they could neither hold tablets by hand nor put tablets in the pocket of their gowns during clerkship activities.

Theme #8: Students' lack of exploration of their final grades. According to the analysis results, most students thought that it was somewhat inevitable that faculty's assessment was often subjective. Some students even argued that professors are not educators but experienced clinical experts, so it might be natural for them to assess students based on their own clinical knowledge.

However, most students commonly pointed out that assessment criteria have never been specifically opened to students so that they were often anxious and confused. Students strongly asserted that they never knew how much the clerkship e-portfolio work weighed in their final grades and how the final grade was calculated, although they knew some of their scores and the final grades. Students also expressed that they could not know even whether they got proper assessment results or not.

Key Themes Related to the Faculty's Experiences

Theme #9: Junior faculty's increased awareness of the value of the clerkship e-portfolio. The institution provided several introductory and user training sessions for clerkship professors as they had done for students. According to the analysis results, the introductory sessions have been shown to be effective in increasing junior professors' awareness of the value of the clerkship e-portfolio. Many of the junior staff members interviewed expressed that they had felt the need for adopting and using an e-portfolio system for the clinical clerkship.

Theme #10: Senior faculty's lack of e-portfolio use due to technological difficulties. As described in the previous section, the institution provided several introductory and user training sessions for clerkship professors. Particularly, two types of user training including one-on-one and group sessions were provided to support professors' use of the clerkship e-portfolio.

However, the analysis results showed that most senior professors had difficulties adapting and using the clerkship e-portfolio system because of lack of sufficient user training and individualized user training programs. As supporting evidence, many junior professors commonly agreed that most senior professors had difficulties using the e-portfolio system, and

such difficulty in using the clerkship e-portfolio partially led to seniors' disinterest in the clerkship e-portfolio itself. Students also described that professors often asked them about how to use the clerkship e-portfolio system for student assessment and providing feedback. The faculty survey responses showed that 14 out of 51 (27%) professors never attended user trainings, 38 out of 51 (75%) professors felt the need for more systematic user training programs, and 21 out of 51 (41%) professors thought that the user training session(s) that they attended was not useful for their implementation of the e-portfolio system.

Theme #11: Faculty's predominant disinterest in using the clerkship e-portfolio due to time constraints. The analysis could significantly recognize that most clerkship faculty were indifferent to the use of the clerkship e-portfolio or even the e-portfolio system itself because of their lack of time. According to professors' accounts, clerkship faculty fundamentally has responsibilities of patient care, clinical research, and student education. Due to such heavy duties of professors, they were mostly pressured by lack of time. As a result, the lack of time caused the predominant lack of interest among faculty in using the clerkship e-portfolio. The analysis results also found that faculty's disinterest in the clerkship e-portfolio caused the lack of encouragement for students to use the clerkship e-portfolio.

Theme #12: Faculty's practical challenges in student assessment and providing feedback. In addition to the faculty's disinterest in the clerkship e-portfolio, the analysis found that lack of time also led professors to practical difficulties in accomplishing assessment work and providing feedback properly. According to professors' accounts, most of them barely entered assessment results into the e-portfolio system during the last week of the clerkship rotation due to lack of time. They typically did not have time to carefully review students' paperwork

submitted and provide meaningful feedback accordingly. Also, they described that assessment work was often accomplished without clear memories of students' clinical performances due to a week or more time gap between the students' clerkship practices and the assessment. As mentioned earlier, the analysis noticed a professor's opinion about the need for a change in the current busy working conditions of professors as a matter of the highest priority. Finally, many professors pointed to the limited interface design of the e-portfolio system. They argued that they were often confused in distinguishing what they had done and what they still needed to complete due to lack of sufficient indicators, and such problems made them spend more time on their e-portfolio work.

Theme #13: Faculty's strong preference for oral and written feedback over the clerkship e-portfolio feedback. The feedback mechanism including web-based text feedback and immediate feedback by using the voice recording function was one of the key design components of the clerkship e-portfolio. Various input methods of the e-portfolio system were expected to promote faculty feedback. However, against all expectations, the analysis results previously reported that students mostly got feedback verbally in-person or written on separate paper forms instead of through the clerkship e-portfolio. There appeared to be a strong preference for oral and written feedback over feedback through the clerkship e-portfolio, and such a strong preference was a huge hindrance to exchanging meaningful feedback through the clerkship e-portfolio system.

The analysis results identified four primary reasons for the strong preference of clerkship faculty: the use of separate paper forms, oral feedback's promptness and convenience, and lack of using the voice recording feedback and tablets. First of all, the use of separate paper forms

caused faculty's oral or written feedback. According to professors' accounts, they naturally provided oral or written feedback when they used paper forms, and then, there would be no need to enter the same feedback into the clerkship e-portfolio system because it was redundant work for them.

In addition, according to the analysis results, professors preferred oral or written feedback due to its promptness and convenience. According to professors' accounts, in most cases, faculty feedback was given to students when they meet together for clerkship activities. If professors provide oral or written feedback, all they need to do is talk for a minute or two or write a brief message on the paper. However, it would take more time to provide similar feedback through the e-portfolio system because several steps are required prior to providing the feedback, and some professors are not good at typing so that it would take much longer to complete the same task. For this reason, professors considered oral and written feedback to be faster and more convenient than online feedback.

Finally, the analysis results revealed that the voice recording feedback and the tablet-based mobile interface had rarely been used for preliminary exam practices. This means that professors had no choice but to use separate paper forms unless there was a feasible way to use PCs for the practice exams.

Theme #14: Faculty's lack of consensus on interpretation of assessment criteria and its implementation. Professors assess students' clinical performances and their paperwork based on rubrics. Each rubric involves descriptions for assessment items. So, professors are required to understand the assessment items prior to student assessment. The analysis results, however, found that there had been lack of consensus among clerkship professors on interpretation of

assessment criteria and implementation of the five-point scale.

According to professors' accounts, individual professors often interpreted descriptions for assessment items in rubrics quite differently, so the differences resulted in variation of assessment results. There was also a lack of consensus on implementation of the five-point scale in rubrics among faculty members. No clear guidelines for each point scale were given or introduced by the institution so that professors mostly gave scores according to their own criteria.

Key Themes Related to Internet and Hardware Infrastructure

Theme #15: Students' challenges in using the clerkship e-portfolio with tablets due to insufficient wireless internet network. The clerkship e-portfolio is basically a web-based system, so it usually requires internet access to use. The mobile interface especially requires stable wireless internet access due to the use of tablets. The analysis showed that the wireless internet access of each hospital was often unstable or even not available in many areas, so students had to find locations with a strong wireless internet signal, use mobile internet by tethering their smartphones, or use the off-line mode application. In any case, students could often only use the clerkship e-portfolio at the cost of huge inconvenience. Such an inconvenience was a contributor to the lack of using tablets, which ironically meant that wireless internet access was no longer a problem for students.

Theme #16: Students' financial burdens due to individual purchasing of tablets. In addition to the internet infrastructure, the analysis also found that students faced a financial burden because they were asked to individually purchase tablets for the clerkship e-portfolio without financial support. Also, some students personally subscribed to an expensive unlimited

data mobile plan for sustainable and stable use of the clerkship e-portfolio. Such infrastructural problems also created practical challenges for students regarding the use of the clerkship e-portfolio.

Research Question Three:

What are the recommendations for designing and implementing a successful clerkship e-portfolio system?

The previous two sections presented students' and faculty's experiences of using the clerkship e-portfolio system and 16 key themes relating to the experiences as the answers to Research Questions one and two. This section presents answers for Research Question 3 based on the analysis of the previous findings.

Recommendation #1: Provide maximum benefits from web-based system for convenient data use and management

The findings showed that most positive experiences of students and faculty regarding the use of the clerkship e-portfolio arose from advantages of web-based systems. Most students were familiar with using PCs so that it was convenient and familiar for them to do their paperwork with PCs. Moreover, students also thought that a great advantage of the clerkship e-portfolio system was that they could access their entire e-portfolio from any internet-capable PC at any time. Finally, a small number of students asserted that such free accessibility to individual e-portfolio data facilitated quality reflections because they could conveniently look back on their previous e-portfolio data.

From the faculty's point of view, enhanced data archiving and management of the clerkship e-portfolio system was considered as the most significant benefit. Faculty mostly asserted that they do not need to worry about loss of paper portfolios and take care of required spaces to archive paper portfolios any more. As shown above, students' and faculty's positive experiences mostly were caused by advantages of web-based systems. Therefore, it is desirable for e-portfolio designers to consider how their e-portfolio designs benefit from web-based systems in order to provide ease of use and improved data management for users.

Recommendation #2: Regularly review the appropriateness of the quantity of the e-portfolio work and make necessary adjustments to ensure meaningful fulfillment of the e-portfolio work

The excessive number of required portfolio work was considered a major hindrance to students' and faculty's proper use of the e-portfolio. As reported in the previous sections, students often wrote their clerkship reports out of a sense of obligation because they had too much required paperwork on top of their heavy daily workloads. Furthermore, in the case of reflective journals, students could hardly find five or more noticeable events required for daily reflective journals. The lack of insufficient notable events to reflect upon impeded students' quality reflections and reflective journals.

Clerkship professors were required to perform assessment of most paperwork which students submitted along with their clinical performance. Most clerkship professors had difficulties properly accomplishing the required assessment work and providing meaningful feedback with limited time. Thus, in order to promote students' and professors' proper fulfillment of e-portfolio work, there needs to be a regular review or discussion among students, faculty, and

the institution about the appropriateness of required clerkship e-portfolio work.

Recommendation #3: Invest sufficient time and effort in promoting users' understanding of the value of e-portfolio systems

Adopting and implementing a new educational method such as the clerkship e-portfolio system mostly accompanies significant changes in an educational environment. The changes require students and faculty to spend additional time and effort adapting and growing accustomed to the new environment. In order to encourage students and faculty to commit to the new approach, the first priority task is to help them to appreciate the educational value of the new method (Van Tartwijk, Driessen, Van Der Vleuten, & Stokking, 2007).

The medical school provided several orientation sessions for both students and clerkship professors in order to explain what the clerkship e-portfolio system is, how the system is operated, why the e-portfolio system is necessary for the clinical clerkship, and so forth.

However, the analysis results showed that those introductory sessions were not that successful, although several students and young junior professors showed their awareness of the value of the clerkship e-portfolio system. Most students doubted why they had been asked for so much paperwork on top of their daily schedules for their clerkship activities. Students also mostly considered the required e-portfolio work as imposed upon them. From the perspectives of clerkship faculty, most of them were indifferent to the use of the clerkship e-portfolio and the e-portfolio system itself. Although professors interviewed provided many reasons why they were disinterested in the clerkship e-portfolio or had difficulties in using the clerkship e-portfolio system, it appeared that they did not feel the huge need for the use of the clerkship e-portfolio. In this respect, it is essential for institutions to have sufficient introductory sessions and discussions

with students and faculty members to help them appreciate and subscribe to the value of the e-portfolio system before the system launched if possible.

Recommendation #4: Prepare e-portfolio systems to be used in all potential cases and to reduce redundant work due to lack of using e-portfolio systems

The clerkship e-portfolio provided the mobile interface to expand the areas of using the e-portfolio system. Although the result was not that successful, it appeared that the mobile environment was initially a feasible option that prepared the clerkship e-portfolio system to be used in all cases of the clinical environment possible. As shown in the previous findings, the tablet and wireless keyboard had not been used for preliminary exam practices due its practical challenges such as program errors at the beginning, inconvenience in typing clerkship reports within a short time, lack of usage in the clerkship environment, lack of portability, and lack of using the voice recording feedback. However, those are practical problems that can be fixed and improved. The analysis also previously reported that the lack of using tablets and use of paper forms in preliminary exam practices were a major hindrance to exchanging feedback through the clerkship e-portfolio because almost all feedback was oral or written feedback. The important point to be considered by e-portfolio designers is how to prepare e-portfolio systems to be used in all clerkship environments in order to maximize the use of the e-portfolio system.

Moreover, another noticeable challenge was students' burden of duplicating work on paper forms and the e-portfolio forms. The analysis revealed that students initially made a draft on a paper form during the preliminary exam practices, and then, they were asked to reorganize and re-write the clerkship reports to fit the clerkship e-portfolio's standardized form. Finding and eliminating or minimizing such redundant work should be carefully considered in all stages of

designing, implementing, and operating e-portfolio systems.

Recommendation #5: Provide clear and sufficient explanation of the purpose and educational value of individual e-portfolio forms in order to prevent students' misunderstanding

The result of the current study showed that students' reflection often limited because of their misunderstanding of the purpose of the reflective journals. They simply considered the reflective journals as their personal clerkship diaries. Thus, students were uncomfortable to write their thoughts. According to the student survey responses, 52.2 percent of students said that content of their reflective journals had been frequently limited because all the reflective journals were reviewed and assessed by their professors. Similar thoughts also arose in the interviews with students. This result means that there had been lack of understanding of the purpose and value of reflective journals. In order to prevent such a misunderstanding among students and promote students' quality reflections, it is necessary for institutions to provide clear and sufficient explanation of individual clerkship forms.

Recommendation #6: Objectively reward students' efforts with paperwork in the form of faculty feedback or confirmation

As presented in the section of Recommendation #2, students and faculty struggled with too much required clerkship work. As a reward for their effort, students expected that their paperwork was reviewed and assessed fairly and properly by faculty. However, the analysis results showed the lack of faculty feedback and even confirmation for students' paperwork in the clerkship e-portfolio. According to students' accounts, the lack of faculty feedback and confirmation was read by students as a disinterest in their e-portfolio work so that students lost

motivation and often neglected their e-portfolio work. Adding to students' understanding of the value of e-portfolio systems, students' motivation in their e-portfolio work is one of the key components of successful implementation of an e-portfolio system. Therefore, it is important for institutions to take proper action to ensure that students' efforts in their e-portfolio work are fairly rewarded to help students remain motivated.

Recommendation #7: Facilitate students' clear and coherent understanding of assessment standard

The review of the literature in chapter 2 demonstrated that content of the e-portfolio is typically subjective because the content involves individual students' thoughts and experiences, so there have been concerns about the reliability of student assessment (e.g., Davies, Khera, & Stroobant, 2005; Jasper & Fulton, 2005; Webb et al., 2003). The analysis results found that students were often confused and anxious because they knew little about the assessment criteria and the calculation process of their final grades. According to students' accounts, they wondered whether their e-portfolio work was reflected in their final grades or how much the individual items were reflected in their final grades. Such doubts often made them confused and anxious when they did paperwork. The peer pressure presented before was also mainly caused by the lack of information about the assessment criteria. Accordingly, institutions should ensure that clear and specific information about what the assessment criteria are and how the final grade is calculated should be introduced to students at the beginning of the process.

Recommendation #8: Design and provide customized user training program tailored to individual faculty's technological abilities

One of the predominant negative experiences of using the clerkship e-portfolio among

professors was senior professors' lack of using the e-portfolio system. The institutions provided several training sessions in group and one-on-one formats. However, the analysis results reported that most senior professors had difficulties working with the clerkship e-portfolio and they provided less feedback to students after the clerkship e-portfolio system was implemented. Regarding the senior professors' difficulties, the analysis results paid attention to the user training programs. The faculty survey responses revealed that the user training sessions for faculty were not thorough enough for senior faculty to be comfortable using the clerkship e-portfolio. According to the faculty survey response data, 27 percent of faculty did not attend any of the user training sessions, 75 percent of faculty felt the need for more systematic user training opportunities, and 41 percent of faculty considered the user training sessions not to be useful for them. These responses mean that the user training program could not meet professors' individual needs. Therefore, institutions should invest much time and effort in developing differentiated user training programs that are carefully tailored to meet the needs of individual faculty.

Recommendation #9: Require institutions to encourage faculty to make sufficient commitments to student education and assessment

In addition to the senior faculty's technological difficulties in using the clerkship e-portfolio, another predominant negative experience of clerkship faculty was their overall disinterest in the e-portfolio system itself and their difficulties in student assessment due to lack of time. According to faculty's accounts, they are severely pressured by heavy duties of patient care, clinical research, and student education every day. Thus, fundamentally, most of them had little interest in the clerkship e-portfolio system itself. Also, they practically could not spend

enough time on student education and assessment work. Mostly, assessment work was postponed until the last week of a clerkship rotation and accomplished within a short period of time without clear memories of students' performances. Naturally, it is quite hard to expect proper student assessment under such conditions.

Although some clerkship professors fundamentally revealed their lack of willingness to use the clerkship e-portfolio, most professors strongly asserted that improving and changing their busy working conditions is the first priority task. So, it is essential for institutions to support and promote faculty's sufficient commitments to their e-portfolio work.

Recommendation #10: Encourage use e-Portfolios for feedback exchange despite faculty's strong preference for oral and written feedback

The analysis results reported that oral and written feedback were given to students in most cases, and faculty strongly preferred oral and written feedback because their convenience and promptness fit professors' busy working conditions. According to faculty's accounts, oral and written feedback is much faster and more convenient than e-portfolio feedback because several additional steps were required to use the clerkship e-portfolio system and some professors type quite slowly. Also, paper portfolios were directly submitted to faculty and did not require any additional processes prior to their review so that the faculty often provided immediate feedback if they were available.

It is inevitable for the clerkship e-portfolio to require professors to find available PCs, complete additional steps to verify them, and approach their students' data. Although these are major contributors to the faculty's preference for oral and written feedback, they are inevitable difficulties to use of e-portfolio systems and not redundant work. Thus, institutions are required

to continuously promote and persuade clerkship faculty to use e-portfolios for feedback, particularly before launching e-portfolios and in the beginning of using e-portfolios.

Recommendation #11: Provide clear guidelines and offer trainings for assessment criteria to minimize variation in assessment results

Student assessment was conducted by using the rubrics that were embedded in the clerkship e-portfolio. Each rubric provided descriptions of relevant assessment items, so professors referred to the descriptions and performed assessment accordingly. However, the analysis revealed earlier that there was significant variation among professors' assessment results because the assessment items were interpreted by individual professors quite differently, and there were differences in implementation of the five-point scale among professors. According to professors' descriptions, there was no consensus among professors of interpretation of the assessment items and the implementation of the five-point scale for each assessment item in rubrics. There were also no clear guidelines or faculty training for student assessment from the institution. A professor was even concerned that some of their students might be harmed because their grades were relatively low. In order to maintain reliability of student assessment results, institutions should develop and provide clear and specific guidelines for assessment criteria and sufficient faculty trainings.

Recommendation #12: Build or expand IT and H/W infrastructure for reliable use of e-portfolio systems

The clerkship e-portfolio system basically requires stable and seamless wireless or wired internet service to use it. Also, students need tablets to use the mobile environment. Hospitals provided wireless internet service for mobile devices and most PCs were internet-capable. A

number of tablet PCs were also prepared for rent. However, the analysis reported that the wireless internet service was unstable, and there were areas where wireless internet was not available at all. So, some students personally subscribed to unlimited mobile data plans for stable use of the clerkship e-portfolio. Another group of students tried to use the off-line mode application, but the application sometimes did not work properly. Most of the students gave up on using tablets. Also, regarding the requirement for tablets, all students faced the financial burden of purchasing tablets without any financial support from the institution. Although the distinct characteristics of hospitals need to be considered, IT and H/W infrastructures are essential for implementing and operating e-portfolio systems. Institutions should check and prepare required IT and H/W infrastructures for successful implementation of e-portfolio systems.

CHAPTER 5

DISCUSSION AND CONCLUSION

The purpose of this study has been (1) to understand students' and clerkship professors' positive and negative experiences of using the clerkship e-portfolio system, and (2) to propose recommendations for designing and implementing successful clerkship e-portfolio systems.

Initially, the clerkship e-portfolio was developed based on the paper-based clerkship forms. Students and clerkship faculty used the clerkship e-portfolio system during a year of the clinical clerkship course. Empirical data were collected regarding students' and faculty's experiences using the clerkship e-portfolio by conducting focus group interviews and online surveys. The data analysis results provided the answers for the three Research Questions.

It is important to note that this study was conducted during the first implementation of the clerkship e-portfolio system. This timing led to unexpected challenges caused by a lack of systematic technical support and user training programs, limited interface design, system errors at the beginning, and an unstable wireless internet. Such challenges mainly resulted in the overall negative experiences of students and faculty using the clerkship e-portfolio. These results, nonetheless, have provided valuable implications for successful implementations of clerkship e-portfolio systems. This chapter provides a brief summary of the research findings and related discussion. Limitations of the study and suggestions for future research are also discussed.

Summary of Findings

The Positive Experience of Students and Clerkship Faculty

Convenience in use of the clerkship e-portfolio due to the advantages of the web-based system. In this study, students and clerkship faculty members indicated that the e-portfolio provided two major benefits: ease of use and convenience in managing and accessing e-portfolio data. These benefits are aligned with the results of other studies of educational e-portfolios (e.g. Ahn, 2004; An & Wilder, 2010; Canada, 2002; Heath, 2005; Wade et al., 2005).

In the current study, ease of use and enhanced data management were two keywords that represent most positive experiences of the students and the faculty members. The ease of access to the previous clerkship records especially showed potential to facilitate students' reflections when students were willing to utilize them. In addition, there was less peer pressure among students due to the use of individual accounts. From the faculty's point of view, they paid more attention to the enhanced data management. They were mainly satisfied with the fact that they did not have to worry about loss of portfolio data and growing space needs for archiving paper portfolios.

Students' Negative Experiences as Major Hindrances to Quality E-portfolio Work

Excessive amount of items to be required for students. Several studies in medical education fields have revealed students' concerns about the heavy workload associated with e-portfolios. Hrisos, Illing, and Burford (2008) highlighted trainees' perceived burden of excessive e-portfolio work. According to the authors, despite recognizing the benefits of portfolio learning trainees doubted whether the e-portfolio was an appropriate and practical approach in the context

of a busy clinical environment. Ross, Maclachlan, and Cleland (2009) also reported students' concerns about their heavy workload. Consistent with the findings of previous studies, most students in the current study pointed out that the major hindrance to producing quality clerkship paperwork was the excessive amount of required e-portfolio work. Most students asserted that they struggled with heavy daily workloads on top of their e-portfolio work so that they often wrote clerkship reports out of a sense of obligation.

Students' lack of motivation for producing quality clerkship reports due to lack of faculty feedback. The importance of a proper reward for students' e-portfolio work has been emphasized in several studies of educational e-portfolios. Van Tartwijk, Driessen, Van Der Vleuten, and Stokking (2007), for example, stated that grading students' paperwork and faculty's interest in students' efforts into their e-portfolio work promoted the adoption of an educational e-portfolio. Race (2005) also indicated that faculty's feedback on students' e-portfolio work was an important factor in promoting successful learning. Moreover, An and Wilder (2010) suggested that institutions should recognize and reward students' time and efforts. Despite the importance of fair rewards to motivate students to invest time and effort into their e-portfolio work, in the current study, it was observed that few faculty members offered feedback or confirmed students' work. The lack of faculty feedback and confirmation was perceived by students as disinterest in their e-portfolio work, so that students often neglected their paperwork. Clerkship faculty's willingness to invest their time and effort into student education along with the appropriate institutional support to secure faculty time for education is a necessary condition in order to increase students' motivation to be actively engaged in completing quality clerkship reports and improve students' reflective learning and clinical competencies.

Students' lack of understanding the clerkship e-portfolio's educational value.

Several studies have reported that students and faculty members fail to perceive the educational value and potential benefits of e-portfolios. Ross, Maclachlan, and Cleland (2009) reported that while students valued e-portfolios for certain purposes (e.g., job applications), they showed little understanding of the reflective learning and e-portfolios' potential merits. The researchers stressed the need for institutions to strive to ensure students consider e-portfolios as something more than an alternative assessment method. Vance et al. (2013) also evaluated medical trainees' perceptions of the educational value of the implemented e-portfolio. They stated that only a few medical trainees perceived their e-portfolio work as positive and a "worthwhile investment of time." Most perceived the e-portfolio as not so useful for achieving learning goals or developing self-directed and reflective learning abilities. Likewise, Hrisos, Illing, and Burford (2008) reported trainee doctors' and supervisors' perception that the e-portfolio lacked educational value. As explained earlier, IUCM provided several introductory sessions that demonstrated how to use the clerkship e-portfolio system and explained details about it. In this study, however, it was found that most students perceived their e-portfolio work as merely paperwork for the clinical clerkship or assignments imposed on them. Consistent with the literature, the result of the present study implies that IUCM's introduction sessions for the clerkship e-portfolio might be neither effective nor sufficient to help students and faculty members understand the educational value of the clerkship portfolio.

Students' limited reflections due to lack of understanding of the purpose and value of the reflective journals. Adding to the importance of students' understanding of the educational value of e-portfolios for better student engagement and educational effectiveness, it is also necessary for institutions to inform their students of the institution's intentions behind

designing and developing individual clerkship forms. The results of this study found that students' reflections were often limited because of their predominant misunderstanding of the purpose and the value of the reflective journals. According to the results, students considered reflective journals as personal clerkship diaries, which made them feel it difficul to be honest when writing reflective journals. However, the institution's intention for the reflective journals was to yield better insight into students' clerkship practices and reflective thoughts. This phenomenon demonstrates a gap between the institution's intention to assign reflective journal activity to students and students' actual practices of reporting their reflective journals. In order to help students produce quality reflections, it is necessary for institutions to explain, with sufficient opportunities, the purposes and values of individual clerkship forms, such as the reflective journals.

Students' lack of exploration of their final grades. What is essential to promote students' quality e-portfolio work is clear and specific guidelines of assessment criteria. Race (2005) underscored the necessity of transparency of student assessment regarding the list of outcomes assessed and criteria used for assessment. Other studies (e.g. Canada, 2002; Carliner, 2005; Smith and Tillema, 2003) also stressed the need for well-defined guidelines for portfolio-based assessment. Canada (2002) indicated the importance of informing students of the weight portfolios have in their final grades. Darling (2001) and Wade and Yarbrough (1996) warned of students' confusion and anxiety that might be caused by a lack of clear guidelines. The analysis results also aligned with those found in the literature. According to the results of the current study, students were confused and anxious because they had little information about specific assessment criteria and individual departments' calculation processes for the final grades. That means that the institution might not be successful at providing students with clear and specific

guidelines for student assessment.

Students' challenges in using the clerkship e-portfolio with tablets due to insufficient wireless internet network. Van Tartwijk, Driessen, Van Der Vleuten, and Stokking (2007) considered the proper infrastructure available for e-portfolio systems as one of the major factors that influence the successful introduction of e-portfolios. According to the analysis results, students' use of the clerkship e-portfolio system was also limited by insufficient Information Technology and hardware infrastructures. It was found, for instance, that the wireless internet service was unstable or unavailable in many areas of the hospitals. Also, all students had to buy their own tablets to use the clerkship e-portfolio system with no financial support from the institution. The lack of sufficient internet infrastructure and the students' additional financial burden were practical challenges to the students' use of the clerkship e-portfolio. The institution's continuous investment of resources and budgets is required to expand the wireless internet and hardware infrastructure.

Clerkship Faculty's Negative Experiences as Major Hindrances to Student Assessment

Faculty's predominant disinterest in using the clerkship e-portfolio due to time constraints. Regarding the faculty's time constraints for their e-portfolio work, An and Wilder (2010) emphasized the need for administrative support to help faculty promote students engaging in their e-portfolio work. They suggested that the administration offer release time to their faculty members so they can invest sufficient time for e-portfolio work involving student assessment and education. Consistent with the literature, the results of the current study revealed a predominant indifference among faculty (owing to time constraints) regarding the use of the clerkship e-portfolio and even the e-portfolio system itself. According to clerkship faculty's

description, individual clerkship professors had heavy duties of patient care, individual research, and student education. Due to their daily heavy workloads, clerkship faculty felt pressure by lack of time. Many professors strongly asserted that improving their busy working conditions would be the first priority task to obtain clerkship faculty's proper attention to the clerkship e-portfolio.

Faculty's practical challenges in student assessment and providing feedback. Faculty's lack of time also mainly caused their difficulties in properly accomplishing student assessment and providing sufficient and meaningful feedback. They were fundamentally unable to invest sufficient time to carefully review students' e-portfolio work, so that it was a practical challenge for faculty to properly conduct their assessment work. Also, most assessment work was often postponed until the last week of the clerkship rotation and completed within a short period of time. In the case of the last minute work, faculty had typically conducted student assessment without clear memories of students' relevant clinical performances due to a week or more time gap between the clerkship performances and the faculty's assessment.

Senior faculty's lack of e-portfolio use due to technological difficulties. An and Wilder (2010) as well as Redish, Webb, and Jiang (2006) stressed the importance of systematic and ongoing technical support for faculty and students. An and Wilder (2010) recommended preparation of proper technical resources and a place for face-to-face technical support for students and faculty. Similarly, Redish, Webb, and Jiang (2006) also considered ongoing technical support as a key factor for successful implementation of e-portfolios. Despite the institution's effort to provide group and individual user-training sessions for clerkship faculty, senior faculty encountered technological difficulties using the e-portfolio system. This gave rise to their general neglect of engaging with it. The senior faculty's technological difficulties may be

due in part to the limited faculty-training sessions. These mostly relied on presentations and demonstrations of the e-portfolio system and did not give faculty sufficient time and instruction to practice. Although individual trainings were conducted for some professors, the number of professors who were trained individually was very limited. Many professors even did not attend any trainings. In order to spread the use of the clerkship e-portfolio, particularly among senior faculty, more systematic and individualized user trainings are essential.

Faculty's lack of consensus on interpretation of assessment criteria and its implementation. Several studies proposed practical ways to increase reliability of portfolio-based assessment. For example, Driessen, van Tartwijk et al. (2007) reported several feasible methods to improve reliability: use of multiple trained assessors and sufficient discussions among raters before or after the assessment. Jasper and Fulton (2005) also suggested external assessor and descriptive assessment criteria. The student assessment within the clerkship e-portfolio was conducted based on the embedded rubrics. Each rubric provided brief descriptions of individual assessment items. The clerkship professors were required to consistently assess students' clinical performances and their paperwork according to the assessment items of the rubrics. However, there were significant variations among assessment results due to lack of consensus among clerkship faculty on the interpretation of the assessment criteria and implementation criteria of the five-point scale. These problems of student assessment were mainly caused by the lack of clear and specific guidelines for the assessment criteria and sufficient faculty trainings to achieve the consensus among them.

Faculty's strong preference for oral and written feedback over the clerkship e-portfolio feedback. According to Rogers' diffusion of innovation theory (2003), the rate of

adoption of an educational innovation is influenced in large part by one critical factor—the potential users must perceive how the innovation is superior to the traditional method. Jaffe (1998) considered routine practices and cultural traditions as major barriers to educational innovations. In relation to relative advantages and barriers to educational innovations, the analysis results reported that there was a strong preference for oral and written feedback among clerkship professors over e-portfolio feedback. Besides their familiarity with those types of feedback as routine practices, clerkship faculty perceived that the e-portfolio feedback required more time and additional complex steps in comparison with oral and written feedback. That means clerkship faculty perceived few relative advantages to using the e-portfolio for faculty feedback. The clerkship e-portfolio system will probably maintain limitations in the aspects because verifying users and requiring a few more steps to access specific student data are essential and structurally inevitable processes of the clerkship e-portfolio system. Thus, it is necessary for the institution to invest the best effort possible to encourage and persuade clerkship faculty's use of the clerkship e-portfolio for exchanging feedback rather than oral or written feedback. However, effectiveness of the institution's effort is probably limited as long as paper clerkship forms are used with the e-portfolio forms.

Recommendations for design and implementation

Recommendation #1: Provide maximum benefits from web-based system for convenient data use and management. Most positive experiences of using the clerkship e-portfolio arose from advantages of the web-based e-portfolio system including ease of use and advanced data management. Besides the two noticed benefits, the web-based e-portfolio system can have more potential to enhance users' experiences. For example, automatic loading of

relevant previous data for certain clerkship forms can be effective to reduce users' time and effort in completing paperwork. Also, automated calculation of students' assessment results and various formats of analytical reports based on various data representations can support more enhanced user experiences.

Recommendation #2: Regularly review the appropriateness of the quantity of the e-portfolio work and make necessary adjustments to ensure meaningful fulfillment of the e-portfolio work. Students' paperwork and faculty's assessment work were commonly limited due the excessive amount of required e-portfolio work. Although each form or item has value, if the other major practical concerns require more time to solve, it would be a practical alternative to discuss proper ways to temporarily reduce the number of required items without affecting the value of the clerkship reports. However, improving faculty's and students' working conditions and the e-portfolio system itself is a fundamental and proper option despite it probably requiring much more time.

Recommendation #3: Invest sufficient time and effort in promoting users' understanding of the value of e-portfolio systems. Students were less challenged by use of the clerkship e-portfolio system but demonstrated a lack of understanding of the value of the clerkship e-portfolio. It appeared that students' quality clerkship work was hindered by their lack of understanding of the clerkship e-portfolio's value. Therefore, user training programs for students must also be required to pay more attention to increasing their awareness of the clerkship e-portfolio's value. From the faculty's point of view, some junior professors showed that they felt the necessity of adopting and using the clerkship e-portfolio, and most other professors also fundamentally acknowledged the need for and the value of the clerkship

e-portfolio. However, several practical difficulties such as lack of time had led them to indifference toward the clerkship e-portfolio. Thus, the institution's continuous encouragement and persuasion is necessary along with the improvement of faculty's current working conditions in order to increase their interest and use of the clerkship e-portfolio.

Recommendation #4: Prepare e-portfolio systems to be used in all potential cases and to reduce redundant work due to lack of using e-portfolio systems. The clerkship e-portfolio was not used for preliminary exam practices, which are one of the key clerkship practices, due to the mixed use of paper forms and the e-portfolio forms and lack of using tablets. There can be alternatives to solve this problem such as supporting more clerkship forms on the e-portfolio system or taking advantages of the dynamic nature of web pages to meet the needs of as many clinical environments as possible. The mobile environment also has potential to expand the area of use of the clerkship e-portfolio, although several practical challenges need to be solved first. In addition, prudent and in-depth discussion is also needed to find practical solutions to prevent students from redundant paperwork due to the mixed use of paper forms and e-portfolio forms.

Recommendation #5: Provide clear and sufficient explanation of the purpose and educational value of individual e-portfolio forms in order to prevent students' misunderstanding. Students' reflections were limited because they considered reflective journals as personal notes for reflection. Students' lack of understanding of the purpose and value of reflective journals caused such limitation in their reflections. In order to promote quality reflections, institutions should provide clear and sufficient explanation of individual forms.

Recommendation #6: Objectively reward students' efforts with paperwork in the form of faculty feedback or confirmation. It is a serious problem that there was a lack of faculty feedback or confirmation for most of the students' e-portfolio work. Oral or written feedback that was actually given to students is meaningful, but when considering that students continuously invested time and effort into their e-portfolio work, proper rewards such as sufficient feedback and confirmation are necessary to maintain students' motivation to complete quality e-portfolio work.

Recommendation #7: Facilitate students' clear and coherent understanding of assessment standard. Students were confused and anxious due to lack of clear and specific information of assessment criteria. It is very important for students to have clear and specific guidelines of assessment for their quality paperwork and reliability of assessment results. Clear guidelines of assessment can prevent students from unnecessary efforts to write longer clerkship reports and even help them identify what they lacked in their clinical performances or clerkship reports. Individual departments and professors mostly have their own assessment criteria or rules that were specialized for their clinical environments. Institutions should be required to collect all of the relevant assessment information and provide students with it.

Recommendation #8: Design and provide customized user training program tailored to individual faculty's technological abilities. Most senior professors were used to using paper-based clerkship portfolios rather than PCs or tablets. Although there had been efforts to provide one-on-one user trainings, these were not successful in facilitating many faculty members' use of the clerkship e-portfolio system. Faculty have different abilities in technology use, so user training programs for faculty also need to be individualized to fit their different

abilities. Also, institutions should ensure that proper user trainings are given to all clerkship professors.

Recommendation #9: Require institutions to encourage faculty to make sufficient commitments to student education and assessment. Many professors were disinterested in using the clerkship e-portfolio or the e-portfolio system itself, and proper assessment was also not accomplished due to faculty's lack of time. It appears that it is not so easy to fundamentally improve faculty's hard working conditions. However, faculty's willingness to use the clerkship e-portfolio and provide meaningful feedback is essential for successful implementation of the clerkship e-portfolio. Also, faculty's proper fulfillment of assessment work is the key for their e-portfolio work. Accordingly, institutions must invest the best effort possible to support faculty and improve their busy working conditions.

Recommendation #10: Encourage use e-Portfolios for feedback exchange despite faculty's strong preference for oral and written feedback. Many professors had used paper-based clerkship portfolios for a long time. Also, oral and written feedback is fundamentally fast and convenient, especially for those who are very busy with a heavy workload. However, it is evident that oral and written feedback is a major hindrance to the use of the clerkship e-portfolio despite those types of feedback being more appropriate and effective feedback in certain clerkship environments. Therefore, institutions should continuously encourage and persuade faculty to provide sufficient e-portfolio feedback with oral and written feedback.

Recommendation #11: Provide clear guidelines and offer trainings for assessment criteria to minimize variation in assessment results. There were significant variations of assessment results among professors because they interpreted descriptions of assessment criteria

differently and used personal standards for implementing the five-point scale. Fundamentally, such a problem was caused because the institution had not provided clear and specific guidelines for student assessment. Due to the lack of guidelines, there was no consensus among faculty members on student assessment criteria and the implementation of the five-point scale. In order for reliability of assessment results, institutions should provide clear guidelines and proper faculty training for student assessment.

Recommendation #12: Build or expand IT and H/W infrastructure for reliable use of e-portfolio systems. In order to use the clerkship e-portfolio system, stable internet service and required hardware are essential. However, internet service was not stable or available in many areas in the hospitals. Also, students were asked to individually purchase their own tablets to use with the clerkship e-portfolio. Tablets were not even used for students' clerkship practices despite their high cost. It appeared that such a lack of internet and hardware infrastructure gave students negative impressions of the use of the clerkship e-portfolio so that there was a clear decrease in using the clerkship e-portfolio in the beginning. Thus, institutions should continuously invest sufficient resources and budgets for the infrastructure.

Overall, when it came to using the clerkship e-portfolio system, the students and clerkship faculty mostly reported negative experiences. Students' paperwork using the clerkship e-portfolio was limited for four major reasons—excessive paperwork, ignorance of the purpose and the educational value of the clerkship e-portfolio, time and effort to build and maintain the clerkship e-portfolio going unrewarded, and a lack of clear and specific guidelines of assessment criteria. Their limited use of the clerkship e-portfolio system was also due to lack of sufficient wireless network and hardware infrastructure.

Faculty struggled to conduct student assessment using the clerkship e-portfolio for the following reasons: time constraints, technological difficulties, lack of perception of relative advantages of using the e-portfolio, lack of consensus of interpreting assessment criteria and implementing five-point scale in rubrics, and lack of sufficient faculty training for student assessment. Consequently, the faculty proposed 12 recommendations for designing and implementing successful clerkship e-portfolio systems. Table 5.1 presents an overall summary of the research findings.

Table 5.1

The summary table of the research findings

Subjects	#	Key Themes Related to the EP Experiences	Subject	Positive and Negative Experiences of Using EP	#	Recommendations for Design and Implementation
Students & Professors	1	**Convenience in use of the clerkship e-portfolio due to the advantages of the web-based system**	Students	● Convenience of and Familiarity with Writing and Editing Through PCs ● Effective in Accumulating Student Data and Accessible from Any Internet-capable PCs ● Less Peer Pressure Among Students Due to the Use of Individual Accounts ● Facilitated Students' Reflection by Providing Easy Access to Previous Student Data for Review	#1	**Provide maximum benefits from web-based system for convenient data use and management**
			Faculty	● Free from Worrying about Loss and Spaces for Archving Paper Portfolios		
	2	**Excessive amount of items to be completed by students and evaluated by professors**	Students	● Writing the Clerkship Portfolio out of a Sense of Obligation Due to… ▶ Excessive Number of Clerkship Forms to Write and Heavy Workloads ▶ Insufficient Number of Noticeable Events for the Daily and Weekly Reflective Journals	#2	**Regularly review the appropriateness of the quantity of the e-portfolio work and make necessary adjustments to ensure meaningful fulfillment of the e-portfolio work**
			Faculty	● Difficulty in Assessing Excessive Number of Students' EP Works With Limited Time ● Difficulty in Providing Proper Feedbacks for Excessive Number of Students' EP Works With Limited Time		
Students	3	**Students' lack of understanding of the value of the clerkship e-portfolio**	Students	● Lack of Perception on the Purposes of Using the Clerkship E-portfolio ▶ Most Students Doubted Why They were Asked to write Clerkship Reports ▶ Students mostly Consider EP Works as Assignments that were Imposed on Them	#3 (1)	**Invest sufficient time and effort in promoting users' understanding of the value of e-portfolio systems**
	4	**Students' redundant paperwork due to the mixed use of paper and e-portfolio forms**	Students	● Initial Writing on the Paper and Another Duplicated Work for a Standardized EP Form ● Individual departments has been used seprate paper forms because… ▶ The EP forms did not fit in individual departemts' clinical environments (SOAP vs SNAPPS) ▶ Students mostly did not bring their tablets to their clerkship practices	#4 (1)	**Prepare e-portfolio systems to be used in all potential cases and to reduce redundant work due to lack of using e-portfolio systems**
			Faculty	● A professor pointed out that there are hundreds of separate forms so it would be practically impossible to develop all the forms and embeded them in EP		
	5	**Students' limited reflection due to lack of privacy**	Students	● Writing the Clerkship Portfolio out of a Sense of Obligation Because… ▶ Reflective Journals were Reviewed and Assessed Despite the Journals Might Include Personal and Sensitive Content.	#5	**Aim to separate portfolio items that have privacy issues from faculty's assessment to ensure students' quality reflection**
	6	**Students' lack of motivation for producing quality clerkship reports due to lack of faculty feedback**	Students	● Writing the Clerkship Portfolio out of a Sense of Obligation Because… ▶ Lack of Feedback and Confirmation was Perceived as Disinterest in Students' Works and Might Lead Students to Neglect their EP Works.	#6	**Objectively reward students' efforts with paperwork in the form of faculty feedback or confirmation**

Students	**7**	**Practical challenges of using tablets in clinical environments**	Students	● Students Experienced Difficulties in Writing Preliminary Examination Reports by their Tablets and BT Keyboards within 10 to 15 Minutes Because of Typing Errors and Program Errors. ● Students Used Their Tablets Only for Preliminary Examination Practices ● No One Felt the Need for the Voice Recording to Exchange Verbal Feedbacks Because Professors' Verbal Feedbacks were Typically Quite Short and Easy to Understand for Students. Most professors was reluctant to record their voice in front of their students ● Tablets were unhandy to carry about for clerkship practices in terms of its size and weight ● No professor encouraged their students to use tablets for the clinical clerkship since the two weeks of intensive use ended	**#4 (2)**	**Prepare e-portfolio systems to be used in all potential cases and to reduce redundant work due to lack of using e-portfolio systems**
	8	**Students' lack of exploration of their final grades**	Students	● Concerns about the reliability of assessment results ▶ Some students acknowledged that it meight be practically difficult for professors to remain objective in the student assessment because professors are not educator but clinical experts ▶ Assessment Criteria were net specifically opened to students so that students were often Anxious and Confused ▶ Students Could not know even Whether They got Proper assessment Results	**#7**	**Facilitate students' clear and coherent understanding of assessment standard**
Professors	**9**	**Junior faculty's increased awareness of the value of the clerkship e-portfolio**	Faculty	● Some of Young Professors Showed Positive Perception on Adoption and Use of the EP Partially Because of Institution's Efforts to Provide Several Orientations of EP	**#3 (2)**	**Invest sufficient time and effort in promoting users' understanding of the value of e-portfolio systems**
	10	**Senior faculty's lack of e-portfolio use due to technological difficulties**	Faculty	● Senior Professors Had Difficulties in Adapting and Using the EP Because of the Lack of Sufficient and Individualized User Training Program ▶ Such a Difficulty in Using the EP was one of the Causes of Faculty's Disinterest in EP and preference of verbal and written feedbacks ▶ Difficulties in Assessing Students' Works and Providing Feedbacks Through the EP	**#8**	**Design and provide customized user training program tailored to individual faculty's technological abilities**
			Students	● Students Had Difficulties in Getting Feedbacks Through the EP Because some Professors Barely Know How to Provide Feedbacks Through the EP		
	11	**Faculty's predominant disinterest in using the clerkship e-portfolio due to time constraints**	Faculty	● Individual Professors has pressured by their heavy duties of Patient Care, Research, and Education ● Lack of Interest in the EP Itself Due to the Lack of time ● Led to the lack of encouragement for students to use the EP	**#9**	**Require institutions to encourage faculty to make sufficient commitments to student education and assessment**
	12	**Faculty's practical challenges in student assessment and providing feedback**	Faculty	● The lack of Time for Student Assessment and Providing Feedbacks Due to Such Busy Schedules ▶ In many cases, faculty left assessment works to the last week of the clerkship rotation ▶ In case of the last minute assessment works, professors mostly conduct student assessment with clear memories of students' performances although their paper works were submitted ● The change in current working condition of professors is the first-priority task for proper student assessment		
	13	**Faculty's strong preference for oral and written feedback over the clerkship e-portfolio feedback**	Faculty	● Most Professors Preferred Providing Feedbacks Verbally or by Hand Writing Because of its Promptness and Convenience ● Few feedbacks were given through EP because faculty mostly provided feedbacks verbally	**#10**	**Encourage use e-Portfolios for feedback exchange despite faculty's strong preference for oral and written feedback**
			Students	● Students Typically Got Feedbacks Verbally or on Separate Paper Forms by Hand Writing Rather Than Through the EP.		

Professors	**14**	**Faculty's lack of consensus on interpretation of assessment criteria and its implementation**	Faculty	● Although Individual Assessment Criteria was Described in the Rubrics, Understandings of the Descriptions Among Professors Might Different and Resulted in Variation of Assessment Results. ● Lack of consensus Among Professors and Clear Guidelines from the institution About How to Grade students' paper works and performances by Using the Five-point Scale.	**#11**	**Provide clear guidelines and offer trainings for assessment criteria to minimize variation in assessment results**
IT & H/W Infra.	**15**	**Students' challenges in using the clerkship e-portfolio with tablets due to insufficient wireless internet network**	Students	● Students Had Difficulties in Using the EP Because of the Unstable Wireless Internet Access ● Students had used the off-line mode application when wireless Internet was not available or stable ● Some students personally subscribed unlimited data plans and used Mobile Internet	**#12**	**Build or expand IT and H/W infrastructure for reliable use of e-portfolio systems**
	16	**Students' financial burdens due to individual purchasing of tablets**	Students	● Many students frustrated due to lack of using own tablets in most clerkship practices ● Students had financial burdens of purchasing tablets		

Discussion

The two primary findings of this study are (1) students' lack of quality reflections and (2) the faculty's lack of use of the clerkship e-portfolio for providing feedback. Thus, this study produced few if any observations of the clerkship e-portfolio succeeding at promoting students' reflection cycle.

Discussion on the Lack of Proper Use of the Clerkship E-portfolio in Students' Reflection Cycle

In medical education, portfolios have been widely adopted as learning and assessment tools due to the movement toward competency-based medical education (Buckley et al., 2009; Driessen et al., 2005) and an increased emphasis on reflective practice (Buckley et al., 2009; General Medical Council, 2013). As described in chapter 2, IUCM's clinical clerkship involves the three iterative stages of reflection: reflection-for-action (Killion & Todnem, 1991), reflection-in-action, and reflection-on-action (Schön, 1987). Regarding reflection-for-action, students are asked to build daily and weekly study plans. Reflection-in-action occurs while students perform clerkship practices. Finally, students reflect on their previous clerkship experiences and faculty feedback when they write reflective journals. Likewise, as mentioned in chapter 3, the clerkship e-portfolio also aimed to systematically facilitate students' reflection-for-action and reflection-on-action by providing both the web and mobile interfaces. Particularly, regarding reflection-on-action, the clerkship e-portfolio system supported the voice recording feedback to promote sufficient and immediate faculty feedback. Based on these features of the clerkship e-portfolio system, the researcher of the study initially expected to examine e-portfolio's role and its effectiveness in the reflection cycle. Thus, questions asking perceived e-portfolio's role and its

effectiveness in the reflection cycle were included in both online surveys and individual interviews.

However, the analysis results revealed that the clerkship e-portfolio system was rarely used to provide faculty feedback, and reflective journals were written out of a sense of obligation in many cases. According to the analysis results, three primary reasons for the lack of using the clerkship e-portfolio for faculty feedback were as follows: the mixed use of separate paper forms and e-portfolio forms, strong preference for oral and written feedback over e-portfolio feedback, and lack of use of the voice recording feedback. Also, three major reasons for students' obligatory writing of reflective journals were identified as following: lack of proper rewards for students' efforts in building e-portfolios, lack of understanding of the purpose and value of the reflective journal, and insufficient amount of noticeable events for reflection. Therefore, promoting e-portfolio feedback, improving students' understanding of the purpose and value of reflective journals, and adjusting the number of required reflective journals are the viable solutions for the existing problem. Concerning the faculty's scant use of the clerkship e-portfolio system to offer feedback, the following section discusses the faculty's incomplete adoption of the clerkship e-portfolio based on the diffusion of innovation theory (Rogers, 2003).

Discussion on Faculty's Incomplete Adoption of the Clerkship E-portfolio

The initial version of the clerkship e-portfolio system had been used for the entire year 2015. One of the primary goals of the institution was to successfully replace the previous paper-based portfolio forms with the clerkship e-portfolio. Thus, the institution expected the clerkship e-portfolio system to be used by all third-year students and clerkship professors. While students experienced difficulties in using the clerkship e-portfolio, they were observed to use the

e-portfolio system during most clerkship activities. On the other hand, against the institution's expectation, the clerkship faculty showed incomplete adoption of the clerkship e-portfolio. Many clerkship professors were actually indifferent to the use of the clerkship e-portfolio or even the clerkship e-portfolio itself. Also, as mentioned in the previous section, clerkship professors mostly did not use the clerkship e-portfolio system for providing feedback. This clearly indicates that the clerkship e-portfolio was not completely accepted by all faculty members. In order to discuss possible reasons for the incomplete adoption of the e-portfolio use, the diffusion of innovation theory (Rogers, 2003) is adopted. Rogers (2003) proposed five variables that decisively impact an innovation's rate of adoption such as perceived attributes of innovations, types of innovation-decision, communication channels, nature of the social system, and extent of change agents' promotion efforts. The following section discusses reasons for faculty's resistance according to the five variables.

The five perceived attributes of innovations. Rogers (2003) proposed the five perceived attributes of innovations as a predictor of the rate of adoption of innovations: relative advantage, compatibility, complexity, trialability, and observability.

Relative advantage. Relative advantage of an innovation refers to the perceived benefits an innovation has in comparison with the previous one replaced. Rogers (2003) argued that relative advantage is the most influential attribute in predicting the rate of adoption of innovations. Thus, the relative advantage is crucial in convincing the potential adopters to use of innovations. However, according to the analysis results, clerkship faculty was not aware of advantages of using the clerkship e-portfolio. The faculty mostly perceived working with the e-portfolio as more inconvenient and time-consuming than working with the previously-used paper

portfolios despite indicating enhanced data management and ease of accessibility as benefits. There might be three possible reasons for faculty's negative impression of e-clerkship portfolios. First, the initial version of the clerkship e-portfolio did not provide many benefits as an educational tool, because it was developed by transferring the paper-based portfolios to its web-based electronic forms. As such, functions that maximize the potential of the e-portfolio system, such as automatic loading of relevant data or analytical reports for students, faculty, and the institution, were not offered by the initial version. Second, the voice recording feature failed to partially replace oral feedback and promote immediate feedback. The function was never used for feedback exchange due to professors' hesitation in recording their voices and the short length of their oral feedback. Lastly, the faculty was dissatisfied with the limited interface design. For example, many professors pointed out that it was hard to distinguish between tasks that had been completed and tasks that were to be completed due to lack of sufficient indicators.

Compatibility. Compatibility means to what extent an innovation succeeded the existing values, past experiences, and needs of an individual or group members. Fundamentally, the clerkship e-portfolio was developed based on the previous paper portfolios so that the clerkship e-portfolio has compatibility in many cases. However, the clerkship e-portfolio did not meet the individual departments' needs for separate forms and failed to replace oral or written feedback with e-portfolio feedback. As a result, the clerkship e-portfolio had not been used for preliminary exam practices and rarely used for exchanging faculty feedback in most cases.

Complexity. Complexity is the perceived ease of understanding or use of innovations. IUCM provided several personal or group training sessions to support clerkship faculty's e-portfolio use. However, according to the analysis results, many professors experienced

technological difficulties in using the clerkship e-portfolios and felt the need for a more systematic and individualized user training program. In terms of the web interface design, many professors commonly pointed out that it was challenging to find what they had to do and access to necessary clerkship data although there were some other professors who were satisfied with the web interface.

Trialability. Trialability is the degree to which the more potential adopters have chances to try an innovation, the faster adoption of the innovation may occur. In case of the clerkship e-portfolio, the clerkship e-portfolio system was not evaluated in the clerkship environment by a sufficiently large number of students and clerkship faculty. In addition, introductory and user training sessions that mainly relied on presentation and demonstration did not provide enough time and opportunities for hands-on trial of the system by students and faculty before the clerkship. As a result, many clerkship professors faced difficulties in using the clerkship e-portfolio system for the first several months or throughout the clerkship period.

Observability. Observability is the perceived visibility of the results of an innovation. Regarding the observability, IUCM initially provided introductory sessions to introduce what the clerkship e-portfolio is, what the e-portfolio system looks like, how the clerkship is proceeded with the use of e-portfolio system, and so forth. Some experienced clerkship professors were able to partially anticipate how they would use the clerkship e-portfolio in their clinical environments and what possible changes or challenges would occur based on the introductory sessions. However, it appeared that the introductory sessions and other explanatory sessions could not sufficiently reduce the uncertainty of the results of using the clerkship e-portfolio in the clinical clerkship because the e-portfolio system was not practically tested in the clerkship environment.

In addition, although students and clerkship faculty from the two departments—internal medicine and obstetrics and gynecology—intensively used the e-portfolio system during the trial period, their meaningful experiences could not be a role model for other departments because the trial of the two departments was conducted in the middle of the clinical clerkship.

The benefit resulted from authority innovation-decision. Rogers (2003) proposed three types of innovation-decision: optional, collective, and authority depending on subjects who decide whether to adopt or reject innovations. Optional innovation-decision is the decision made by individuals independently. Collective innovation-decision implies that decision is made by consensus among potential adopters. Finally, authority innovation-decision means that decision is made by a small number of institutional leaders. In case of IUCM, the e-portfolio project was initiated by institutional leaders so that the e-portfolio project could make a significant progress in are relatively short timeframe. In addition, making decisions based on consensus among clerkship professors might be more desirable in certain cases, because the e-portfolio project was already initiated and supported by institutional leaders.

Communication channels. Rogers (2003) stated that diffusion is occurred when messages between individuals or groups pass through communication channels. He proposed two communication channels including mass media and interpersonal communication. In case of diffusion of the e-portfolio use, interpersonal communication is one possible communication channel, but little information was found in the analysis results.

Nature of the social system. Diffusion of innovations occurs in a social system such as a university or an organization, so diffusion process is naturally affected by the nature of the social system (Rogers, 2003) such as traditions, cultures, norms, and institutional missions

(Jaffee, 1998). Jaffee (1998) asserted that routine practices and cultural traditions can be barriers to innovations in educational environments. According to the analysis results, faculty's lack of sufficient time and willingness to properly use the clerkship e-portfolio, faculty's strong preference for oral and written feedback over e-portfolio feedback were the major obstacles to the diffusion of the e-portfolio use among faculty members. Adding to the obstacles, lack of proper incentive for clerkship faculty was observed to be another barrier to the e-portfolio use.

Extent of change agents' promotion efforts. Rogers (2003) defined a change agent as an individual who tries to convince potential adopters of innovation-decisions that fit an institution's intention. Van Tartwijk, Driessen, Van Der Vleuten, and Stokking (2007) considered faculty and students as key change agents for successful introduction of e-portfolios and emphasized the importance of their investment of time and efforts into their e-portfolio work. At IUCM, institutional leaders and a group of clerkship faculty from internal medicine and obstetrics and gynecology departments were actively involved in the implementation and operation of the clerkship e-portfolio. The group of clerkship faculty members had tried to spread the e-portfolio use as change agents, but their influence was limited to their own departments. According to the analysis results, no professors in other departments had encouraged their students to actively use the clerkship e-portfolio. Thus, it is necessary for institutional leaders and change agents to expand their efforts to all major departments.

Limitations of Study

This study endeavored to collect students' and faculty's various experiences using the clerkship e-portfolio system. The analysis results reported such various experiences of students and faculty. However, a number of limitations were also revealed in this study.

First of all, it was the first year of using the clerkship e-portfolio for the clinical clerkship, so the preparation of the clerkship e-portfolio system was somewhat limited in several aspects. Program errors occurred for the first three months. The program errors were corrected quite fast, but students and faculty had difficulties using the clerkship e-portfolio system. Also, as indicated earlier, wireless internet service was not stable or available for many areas of hospitals. Due to those issues, there was an overall decrease in using the e-portfolio system in the early stage. As a result, many of the collected experiences of students and faculty were related to the clinical clerkship program or clinical environments rather than the clerkship e-portfolio system. Thus, this study had difficulty in focusing on experiences of using the e-portfolio system itself.

In addition, there was a predominant disinterest in the clerkship e-portfolio system so that many professors did not have enough experiences of using the clerkship e-portfolio system to share. Thus, it was quite difficult to listen to their rich experiences of using the clerkship e-portfolio system. In the case of students, only two groups of students were asked to use the clerkship e-portfolio system intensively for the two clinical rotations, and they were the only students who were given the wireless keyboards. Thus, the interviews with students were limited to those groups of students. Particularly, their experiences of using the clerkship e-portfolio were also limited because they mostly had not used the clerkship e-portfolio after they completed the two clinical rotations. However, this study conducted student and faculty online surveys and most faculty and students responded to the online surveys. Based on the survey responses, the analysis could find generalized opinions of students or faculty in certain topics.

Moreover, the interviews and the online surveys were conducted once at the last stage of the clinical clerkship. Thus, variations of students' and faculty's experiences of using the clerkship e-portfolio or performing clerkship practices with the e-portfolio system throughout a year could not be captured and analyzed. Finally, the institution's intention for the clerkship e-portfolio system was to transfer the paper clerkship forms to e-portfolio forms. Thus, the potential of the e-portfolio had not been fully realized yet. Accordingly, this study could not reveal much about the e-portfolio system itself.

Suggestions for Future Research

This year marked the institution's first year of incorporating e-portfolios in medical clerkship. In which paper clerkship forms were transferred to their electronic counterparts. Accordingly, the findings of the study provided worthy foundational research data for future studies. Thus, additional studies based on the foundational data are required in order to accumulate empirical data and examine various aspects of the clerkship e-portfolio. Based on the repeated studies with improved e-portfolio products, more robust and trustworthy design framework will be able to be developed.

Also, sufficient follow-up studies with increased number of students from more diverse major departments should be conducted to better capture more dynamic and broad experiences of using the clerkship e-portfolio. In this study, the individual interviews were conducted with a small number of students and faculty who from only two departments. Also, data was collected only once. Thus, the amount of data was limited. Therefore, the research with more number of participants in various departments can provide more diverse and generalizable data for the study.

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APPENDIX A

QUESTIONNAIRE FOR CLERKSHIP FACULTY

E-Portfolio User Experience Survey for Faculty

This questionnaire aims to learn about your experience with the clerkship e-Portfolio and to explore its educational effect in clinical clerkship. **Please base your answers on your experience with clerkship e-Portfolios after June 29** as the system was unstable prior to the date at the beginning of administration. Your answers will help us improve the current e-Portfolio system. Your responses are completely anonymous and will be used only for the purpose of the study. We value your honest and detailed responses.

Basic questions

Q1. Please type the name of your affiliation (e.g., Busan Baek Hospital).

Q2. Please type the name of the department you are in charge of (e.g., Internal medicine).

Q3. What year did you start working at your hospital (e.g., 2005)?

Q4. Have you ever been in charge of clinical clerkship in your department?

□ Yes

□ No

(Asked if ‘Yes’ is selected in Q4)

Q5. How many years have you been in charge of clinical clerkship in your department in total?

(e.g., 3 years)

Q6. Are you aware of the fact e-portfolio system is accessible through two versions-PC (Web) and a tablet?

□ Yes

□ No

(Asked if ‘Yes’ is selected in Q6)

Q7. During clerkship, did you use both the PC (Web) version and the tablet version?

□ Yes, I’ve used both versions.

□ No, I’ve only used the PC (Web) version.

(Asked if ‘Both versions’ is selected in Q7)

Q8. Which version of the e-portfolio system do you prefer to use?

□ Tablet version

□ PC (Web) version

□ Both; I have no preference

(Asked if ‘Both versions’ is selected in Q7)

Q9. Have you ever used the tablet application for faculty? (There are two versions of mobile applications available- one for students and the other for faculty.)

□ Yes

□ No

(Asked if ‘Both versions’ is selected in Q7)

Q10. Are you aware of the voice recording feedback feature offered in the tablet version?

□ Yes

□ No

(Asked if ‘Both version’ is selected in Q7 AND if ‘Yes’ is selected in Q10)

Q11. Have you ever used the voice recording feature when providing feedback to students?

□ Yes

□ No

Q12. If you’ve mostly used the PC (Web) version of the clerkship e-Portfolio, please check **ALL** your reasoning for your preference from below.

□ The PC version was enough to use for clerkship activities.

□ I do not own a tablet.

□ I am unfamiliar with the operation of tablets.

□ I do not know how to use the tablet application for faculty.

□ I faced difficulties in using my tablet due to program errors.

□ iOS-based tablet devices were not supported for the mobile interface.

□ I used both the PC (Web) version and the tablet version.

□ Other: (_____)

This section asks for your opinion on the effectiveness of e-Portfolios in clerkship. Please provide answers based on your experience with using the clerkship e-Portfolio.

Q13. Do you agree that the clerkship e-Portfolio system is useful in the following main clerkship activities?

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
(1) Overall clinical teaching activity	□	□	□	□	□
(2) Individual consulting	□	□	□	□	□
(3) Evaluation of clinical performances (e.g., clinical practices, case presentation, or PBL)	□	□	□	□	□
(4) Evaluation of clerkship reports (e.g., clerkship reports, reflective journals)	□	□	□	□	□

(5) Providing feedback to students	□	□	□	□	□

Q14. How strongly do you agree that the clerkship e-Portfolios are helpful in terms of the following aspects (because the clerkship e-Portfolio system is available online)?

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
(1) Less location constraints	□	□	□	□	□
(2) Less time-consumption for student evaluation	□	□	□	□	□

In this section, we would like to gauge your opinion on the effectiveness of the clerkship e-portfolios in terms of quantity, quality, spontaneity, and the method of feedback exchange. Please answer the following questions based on your experience with the clerkship e-Portfolio.

Q15. Evaluate the helpfulness of e-portfolios in the following aspects of feedback exchange from faculty to students.

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
(1) Quantity of feedback given	□	□	□	□	□
(2) Level of detail in feedback	□	□	□	□	□
(3) Frequency of feedback exchange	□	□	□	□	□
(4) Punctuality of feedback return	□	□	□	□	□

Q16. Please rate the following on a scale of 1 (not at all true for me) to 5 (very true for me).

When I provide feedback to a student…	1 (Not at all)	2	3	4	5 (Very true)
(1) I mostly provide oral feedback.	□	□	□	□	□
(2) I mainly use the clerkship e-Portfolio.	□	□	□	□	□
(3) I try to provide feedback for preliminary exams as immediately as possible.	□	□	□	□	□

(4) I try to hold individual, consultative meetings with my students.	□	□	□	□	□
(5) I only hold individual meetings at students' request.	□	□	□	□	□
(6) I often experience difficulty in recall students' clinical performances off the top of my head.	□	□	□	□	□
(7) I try to provide feedback for all required items as much as possible.	□	□	□	□	□
(8) I believe it is appropriate to pay greater attention to certain items to ensure quality feedback.	□	□	□	□	□

Q17. Please rate the following on a scale of 1 (Strongly disagree) to 5 (Strongly agree).

Regarding immediate feedback and face-to-face feedback, I believe…	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
(1) The time constraint is the major barrier to providing immediate feedback.	□	□	□	□	□
(2) I often have trouble providing	□	□	□	□	□

immediate feedback due to the lack of availability of PCs near me.					
(3) The voice recording feedback feature, if satisfactorily improved, would be useful in providing immediate feedback.	□	□	□	□	□
(4) The e-Portfolio promotes immediate feedback.	□	□	□	□	□
(5) A proper number of face-to-face feedback is needed to improve students' clinical performances.	□	□	□	□	□
(6) The feedback mechanism of the e-portfolio system may prevent face-to-face interactions between faculty and students.	□	□	□	□	□

(Asked if "Agree" or "Strongly agree" is selected in Q17-5)

Q18. Please check **ALL** reasons why you think face-to-face feedback is necessary.

□ A more personal, individualized feedback can be offered through meaningful conversations.

□ It fosters relationship with students.

□ Students can gain better understandings of the offered feedback.

□ Oral feedback is often more effective than written feedback.

□ Asking questions can assess students' level of performance in clerkship activities.

□ Additional consulting can be provided at students' request and questions.

□ Other: (_____)

(Asked if "Agree" or "Strongly agree" is selected in Q17-5 and Q17-6.)

Q19. Please share any suggestions you have for improving the current e-portfolio system and its use in clinical clerkship.

In this section, we would like to learn about your experience with student evaluation. Please rate the following items based on your experience with clerkship e-Portfolios.

Q20. Please rate the following on a scale of 1 (Strongly disagree) to 5 (Strongly agree).

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
(1) An objective evaluation is performed using rubrics.	□	□	□	□	□
(2) Description of each evaluation item in rubrics is easy to understand.	□	□	□	□	□
(3) I have an additional set of evaluation criteria besides the evaluation criteria stated in rubrics.	□	□	□	□	□
(4) The currently-used rubric has rooms for improvement.	□	□	□	□	□
(5) The 5-point Likert scale in current use is appropriate for student evaluation.	□	□	□	□	□
(6) I often faced difficulties in offering objective evaluation due to time constraints.	□	□	□	□	□

In this section, we would like to gauge your opinion on the effect of the e-Portfolios on students' reflection cycle of performing clerkship activities, obtaining evaluation results and faculty feedback, and reflecting on faculty feedback.

Q21. Please rate the following on a scale of 1 (Strongly disagree) to 5 (Strongly agree).

I think the clerkship e-Portfolio is useful in…	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
(1) Promoting students' reflection on what they've practiced.	□	□	□	□	□
(2) Promoting students' reflection on or additional studies for faculty feedback.	□	□	□	□	□
(3) Improving students' future clinical performances based on their reflections.	□	□	□	□	□

In this section, we would like to learn about your experience with the user training program. Please answer the following.

Q22. Have you attended any user training sessions for the use of the clerkship e-portfolio system?

□ Yes

□ No

(Asked if ‘Yes’ is selected in Q22)

Q23. Did you ever feel the need for a more systematic user training program?

□ Yes

□ No

(Asked if ‘Yes’ is selected in Q22)

Q24. Which type(s) of user training did you receive?

□ Individual training

□ Group training

□ Both

□ Neither

Q25. Do you think the user training you received has improved your understanding and use of the clerkship e-Portfolio system?

□ Yes

□ No

(Asked if 'No' is selected in Q24.)

Q26. Please explain why the user training you received was unhelpful. Share your suggestions you have for improving the current user training program, if you have any.

In this section, we would like to gauge your overall satisfaction with the clerkship e-Portfolio system. Please answer the following based on your experience with the clerkship e-Portfolio after June 29.

Q27. Please rate your level of satisfaction of the e-portfolio system on a scale of 1 (Completely dissatisfied) to 7 (Completely satisfied) for the following activities.

	1	2	3	4	5	6	7
Overall clinical clerkship activities	□	□	□	□	□	□	□
Use of the faculty application for tablets	□	□	□	□	□	□	□
Use of PC(Web)-based environments	□	□	□	□	□	□	□
Checking the list of items available for assessment using the faculty application	□	□	□	□	□	□	□

Checking the list of items available for assessment using the PCs							
Providing text feedback	□	□	□	□	□	□	□
Providing voice-recorded feedback	□	□	□	□	□	□	□
Consulting students' learning plans	□	□	□	□	□	□	□
Evaluating student's clerkship activities (e.g., clinical performances, case presentation, PBL)	□	□	□	□	□	□	□
Evaluating student's clerkship reports (e.g., clerkship reports, reflective journals)	□	□	□	□	□	□	□

Thank you for completing this survey.

APPENDIX B

QUESTIONNAIRE FOR STUDENTS

E-Portfolio User Experience Survey for Students

This questionnaire aims to learn about your experience with the clerkship e-Portfolio and to explore its educational effect in clinical clerkship. **Please base your answers on your experience with clerkship e-Portfolios after June 29** as the system was unstable prior to the date at the beginning of administration. Your answers will help us improve the current e-Portfolio system. Your responses are completely anonymous and will be used only for the purpose of the study. We value your honest and detailed responses.

Basic questions

Q1. Please select your gender.

□ Male

□ Female

Q2. Have you used the clerkship e-portfolio system throughout the entire clinical clerkship?

□ Entire clerkship period

□ Never used

□ Mixed use of paper forms and e-portfolio forms

(Asked if 'Mixed use…' is selected in Q2)

Q3. What were the reasons for the mixed use of paper forms and e-portfolio forms?

Q4. Are you aware of the fact the e-portfolio system is accessible through two versions-PC (Web) and a tablet?

□ Yes

□ No

(Asked if ‘Yes’ is selected in Q4)

Q5. Have you used both the PC (Web) version and the tablet version?

□ Yes, I’ve used both versions.

□ No, I’ve only used the PC(Web) version.

(Asked if ‘Both versions’ is selected in Q5)

Q6. Which version of the e-portfolio system do you prefer to use?

□ Tablet version

□ PC(Web) version

□ Both; I have no preference

(Asked if ‘the PC(Web) version’ is selected in Q5)

Q7. Please check **ALL** reasons you’ve mostly used the PC (Web) version of the clerkship e-Portfolio.

□ The PC version was enough to use for clerkship activities.

□ I am unfamiliar with the operation of tablets.

□ No professor has encouraged use of tablets.

□ Professors appeared to be uncomfortable in using tablets.

□ I faced difficulties in using my tablet due to program errors.

□ Tablets were inconvenient to carry around.

□ There were few opportunities for tablet use during clerkship.

□ I was afraid my tablet would get damaged or lost.

□ iOS-based tablet devices did not support the mobile interface.

□ Other: (_____)

(Asked if 'Both versions' is selected in Q5)

Q8. Are you aware of the voice recording feedback feature offered in the tablet version?

□ Yes

□ No

(Asked if 'Yes' is selected in Q8)

Q9. Have you ever received any voice-recorded feedback?

□ Yes

□ No

This section asks your opinion on the effectiveness of e-Portfolios in clerkship. Please provide answers based on your experience with using the clerkship e-Portfolio.

Q10. Evaluate the usefulness of e-portfolios in completion of the following paperwork.

	Completely useless	Slightly useless	Neutral	Useful	Extremely useful
(1) Overall clerkship paperwork	□	□	□	□	□
(2) (Daily, weekly, and departmental) study plans	□	□	□	□	□
(3) Systematic recording of clerkship activities	□	□	□	□	□
(4) Receiving evaluation results and faculty feedback	□	□	□	□	□
(5) Reflecting on past clerkship practices and faculty feedback	□	□	□	□	□
(6) Checking progress using the index page	□	□	□	□	□

Q11. How strongly do you agree that the clerkship e-Portfolios are helpful in terms of the following aspects (because the clerkship e-Portfolio system is available online)?

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
(1) Paperwork can be completed without time constraints.	□	□	□	□	□
(2) Paperwork can be completed without physical (location) constraints.	□	□	□	□	□

Q12. Please rate the following on a scale of 1 (Strongly disagree) and 5 (Strongly agree).

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
(1) Program errors discourage me from using e-portfolios.	□	□	□	□	□
(2) I do not understand the need for drafting clerkship reports.	□	□	□	□	□
(3) I write clerkship reports out of obligation.	□	□	□	□	□

(4) I consider easy and convenient revisions to be the best feature of e-portfolios.	□	□	□	□	□
(5) I write preliminary exam reports first on the paper, and then transfer the reports to the e-portfolio.	□	□	□	□	□
(6) I have experienced discomfort in using e-portfolios due to technological difficulties (such as poor internet connection).	□	□	□	□	□
(7) I have gained helpful insight from reviewing past clerkship records.	□	□	□	□	□

In this section, we would like to gain your perspective on the effectiveness of the clerkship e-portfolio in terms of quantity, quality, spontaneity, and the way of exchanging of feedback with faculties. Please provide answers based on your experience with the clerkship e-Portfolio.

Q13. Please rate the following on a scale of 1 (Strongly disagree) and 5 (Strongly agree).

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
(1) I received faculty feedback for majority	□	□	□	□	□

of items.					
(2) Content of faculty feedback was specific enough.	□	□	□	□	□
(3) Immediate feedback was given quite often.	□	□	□	□	□
(4) Most faculty feedback were given within a week.	□	□	□	□	□
(5) Voice feedback would be useful in providing immediate feedback if its usability is improved.	□	□	□	□	□
(6) The clerkship e-portfolio promotes timely faculty feedback.	□	□	□	□	□

Q14. Please rate the following on a scale of 1 (Strongly disagree) and 5 (Strongly agree).

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
(1) Most faculty feedback was given verbally.	□	□	□	□	□

(2) Few faculty feedback were given via e-portfolios.	□	□	□	□	□
(3) I was often asked to draft clerkship reports on paper.	□	□	□	□	□
(4) Most faculty feedback for preliminary exam practices were given immediately after the exam or within the same day.	□	□	□	□	□
(5) It is nearly impossible for clerkship faculty to provide feedback for all items.	□	□	□	□	□
(6) It is appropriate to pay greater attention to certain items in order to receive quality feedback.	□	□	□	□	□
(7) Sufficient amount of face-to-face interaction is necessary for quality feedback.	□	□	□	□	□
(8) The e-portfolio feedback process limits opportunities for face-to-face interactions between students and faculty.	□	□	□	□	□

(Asked if answer to Q14-7 is greater than or equal to 4)

Q15. Please check **ALL** reasons for why you think face-to-face feedback is necessary.

□ We can receive individualized feedback through real-life interaction.

□ It can help foster relationships between faculty and students.

□ We can gain better understanding of faculty feedback.

□ We can obtain extra guidance.

□ I think oral feedback is often more effective than written feedback.

□ Other: (_____)

Q16. Please check **ALL** reasons why you think the voice recording function is not useful in providing feedback.

□ Feedback was not recorded due to program errors.

□ It was not that easy to turn on the voice recording function when feedback was given.

□ Taking brief notes is more efficient than recording feedback due to the short length of oral feedback.

□ Faculty members were hesitant to record their own voice.

□ Students were not obligated to use the voice recording feature.

□ Other: (_____)

In this section, we would like to gain your perspectives on the effect of the clerkship e-Portfolio on students' reflection cycle of performing clerkship activities, obtaining evaluation results and faculty feedback, and reflecting on faculty feedback.

Q17. Please rate the following on a scale of 1 (Strongly disagree) and 5 (Strongly agree).

I think the clerkship e-Portfolio is useful in…	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
(1) Promoting reflection on what I've practiced.	□	□	□	□	□
(2) Promoting reflection on additional studies for faculty feedback.	□	□	□	□	□
(3) Improving future clinical performances based on past reflections.	□	□	□	□	□

Q18. Please rate the following on a scale of 1 (Strongly disagree) and 5 (Strongly agree).

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
(1) Feedback or confirmation were not given for most e-portfolio reports.	□	□	□	□	□

(2) Open reflection was inhibited as all reflective journal entries were evaluated by professors.	□	□	□	□	□
(3) I have tried to write reflective journals on a regular basis.	□	□	□	□	□

In this section, we would like to learn about the objectivity of student evaluations. Please answer the following questions based on your experience of being evaluated.

Q19. Please rate the following on a scale of 1 (Strongly disagree) and 5 (Strongly agree).

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
(1) Evaluation criteria varied between professors.	□	□	□	□	□
(2) I had to invest unnecessarily more time and effort into e-portfolio works due to lack of sufficient information on evaluation criteria.	□	□	□	□	□
(3) There was no way to check the objectivity of the evaluation I received.	□	□	□	□	□

Q20. Please share any suggestions you have for improving the current e-portfolio system and its use in clinical clerkship.

In this section, we would like to gauge your overall satisfaction with the clerkship e-Portfolio system. Please answer the following based on your experience with the clerkship e-Portfolio after June 29.

Q21. Please rate your satisfaction with the clerkship e-Portfolio system on a scale of 1(Completely dissatisfied) and 7 (Completely satisfied) in terms of the following activities.

	1	2	3	4	5	6	7
Use for performing overall clerkship activities	□	□	□	□	□	□	□
Use of tablet environments for clerkship work.	□	□	□	□	□	□	□
Use of PC(Web) environments for clerkship work	□	□	□	□	□	□	□
Progress checking by using the index page	□	□	□	□	□	□	□
Use for systematic recording of clerkship activities	□	□	□	□	□	□	□

Use for developing study plans (daily, weekly, and departmental)	□	□	□	□	□	□	□
Use for obtaining faculty feedback	□	□	□	□	□	□	□
Use for obtaining evaluation results	□	□	□	□	□	□	□
Use for conducting reflection and writing reflective journals	□	□	□	□	□	□	□

In this section, we would like to gauge your opinion on purposes of using an e-Portfolio. Please answer the following questions based on your usual thoughts about an e-portfolio.

Q22-1. Please rate the following on a scale of 1 (Strongly disagree) and 5 (Strongly agree).

I think that an e-portfolio is…	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
(1) A learning tool.	□	□	□	□	□
(2) Mainly used for studying.	□	□	□	□	□
(3) Is a useful platform for organizing what I've learned.	□	□	□	□	□
(4) Helpful for reflection due to the previous artifacts accumulated in the e-	□	□	□	□	□

portfolio.					
(5) A continuous educational tool that can be used throughout my life.	□	□	□	□	□

Q22-2. Please rate the following on a scale of 1 (Strongly disagree) and 5 (Strongly agree).

I think that an e-portfolio is…	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
(1) An evaluation tool.	□	□	□	□	□
(2) Useful for promoting fair evaluation.	□	□	□	□	□
(3) The most beneficial when it is used for evaluation.	□	□	□	□	□
(4) Useful for evaluating processes as well as results.	□	□	□	□	□
(5) Must be customized in terms of structure and contents according to subjects who evaluate the e-portfolio.	□	□	□	□	□

Q22-3. Please rate the following on a scale of 1 (Strongly disagree) and 5 (Strongly agree).

I think that an e-portfolio is…	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
(1) A tool that can demonstrate my competences.	□	□	□	□	□
(2) My life-time resume.	□	□	□	□	□
(3) Can be used to find jobs.	□	□	□	□	□
(4) Helpful for long-term management of my professional career.	□	□	□	□	□
(5) A useful tool that presents my academic, professional, and personal identities to a group of people.	□	□	□	□	□

Thank you for completing this survey.

APPENDIX C

INTERVIEW PROTOCOL

Interview Protocol for Students and Clerkship Faculty

Introduction

- Greetings
- The purpose of research
- A brief overview of the research

Interview questions and relevant themes

- Student interview

Main Themes	Key Interview Questions	Relevant Themes
Basic information	1. What department have you been enrolled in recently? 2. Could you tell me how the	

	e-portfolio were incorporated during clerkship activities? 3. Did you use paper clerkship forms alongside its electronic counterparts? 4. If you have used the paper forms, could you share your motivation for doing so?	
Overall experiences with e-portfolios during clerkship	5. What is your overall impression of the use of the e-portfolio in clerkship?	*Purposes of use *Use of tablets *User training program
Experiences with the e-portfolio in reflective cycles during clerkship	6. Please describe your experience with the e-portfolio in receiving faculty feedback and performing reflection?	*Voice-recorded feedback *Quantity and quality of faculty feedback through the clerkship e-portfolio *Drafting reflective journals
Challenges and limitations	7. Could you describe the challenges you faced while using	*Infrastructure

	the e-portfolio?	*Program errors
Suggestions	8. Could you share your suggestions for improving the current e-portfolio system?	

- Faculty interview

Main Themes	Key Interview Questions	Relevant Themes
Basic information	1. How many years have you serviced as a member of clerkship faculty? 2. Please walk me through a typical day of clinical clerkship in your department. 3. Could you tell me how the clerkship e-portfolio is used in your department during clerkship?	
Overall experiences with e-portfolios during	4. What is your overall impression of the use of	*Comparison of paper-based portfolios and its

clerkship	e-portfolio in clerkship?	electronic counter parts. *Purposes of use *User training program
Experiences with the e-portfolio in reflective cycles during clerkship	5. Please describe your experience with the e-portfolio in receiving faculty feedback and performing reflection.	*Voice-recorded feedback *Providing feedback *Student assessment *Assessment criteria
Challenges and limitations	6. Could you describe the challenges you faced while using the e-portfolio?	*Infrastructure *Program errors *Difficulties in usage
Suggestions	7. Could you share your suggestions for improving the current e-portfolio system?	

Closing statement

APPENDIX D

AN EXAMPLE OF DATA CODING PROCEDURE

First cycle of coding – Initial coding

First, it is a clear benefit to me that [1]our clerkship records are accrued on a daily basis.	[1] Effective in accumulating clerkship data: (+)
[2]We can access the previous records and	[2] Easy access to the previous clerkship data: (+)
[3]avoid the risk of losing our clerkship records because the clerkship e-portfolio is a web-based system	[3] Free from worrying about loss: (+)
Well, unlike our professors, we are very familiar with typing with computers although it's also comfortable for us to write by hand. So, [4]it was good for me to write and edit my clerkship reports with computers or other electronic devices.	[4] Convenience in writing and editing: (+)

Second cycle of coding – Initial coding

Category: POSITIVE EXP / ADVANTAGES OF WEB-BASED SYSTEMS

First, it is a clear benefit to me that [1]our clerkship records are accrued on a daily basis.	[1] Effective in accumulating clerkship data: (+)
[2]We can access the previous records and	[2] Easy access to the previous clerkship data: (+)
[3]avoid the risk of losing our clerkship records because the clerkship e-portfolio is a web-based system	[3] Free from worrying about loss: (+)
Well, unlike our professors, we are very familiar with typing with computers although it's also comfortable for us to write by hand. So, [4]it was good for me to write and edit my clerkship reports with computers or other electronic devices.	[4] Convenience in writing and editing: (+)

Analysis result of data coding

- positive experiences / advantages of web-based systems
    - Effective in accumulating student data
    - Easy access to the previous clerkship data for review
    - Free from worrying about loss
    - Convenience in writing and editing

Key theme

Convenience of using the EP due to the advantages of the web-based system

Recommendation

Provide maximum benefits from web-based system for convenient data use and management

APPENDIX E

CONSENT FORM FOR FACULTY

UNIVERSITY OF GEORGIA

CONSENT FORM

[A Study on Designing Multi-purpose e-Portfolio System for Clinical Clerkship**]**

Researcher's Statement

We would like to invite you to participate in a research study entitled 'A Study on Designing Multi-purpose e-Portfolio System for Clinical Clerkship'. Before you decide to participate in this study, it is important that you understand why the research is being done and what it will involve. This form is designed to give you the information about the study so you can decide whether to participate in the study or not. Please take the time to read the following information carefully. Ask the researcher if there is anything that is not clear or if you need more information. When all your questions have been answered, you can decide whether to participate in the study or not. This process is called "informed consent." A copy of this form will be given to you.

Principal Investigator: Ikseon Choi

Career and Information Studies

212 River's Crossing

Athens, GA 30602

Phone: 706.583.0794

Email: ichoi@uga.edu

Purpose of the Study

The purpose of this study is to study (1) features and design guidelines of successful e-Portfolio for clinical clerkship to promote students' and faculty's clinical clerkship experiences, (2) role of well-designed clinical clerkship e-Portfolio in promoting practices of clinical clerkship, faculty feedback exchange, and student reflection, and (3) students' and faculty's perceived purposes of using e-Portfolio for clinical clerkship.

Study Procedures

If you agree to participate, you can expect the following:

- Your participation will involve responding to an intensive face-to-face or an online interview and three online surveys. The individual interview will take only about 30 - 40 minutes, and each online survey will take less than 15 minutes to complete.
- The Associate Dean of Academic Affair will explain the study at the orientation meeting for e-portfolios and ask whether you consent to participating in the study. You will be given enough time to ask questions about this study to the Researcher via SKYPE, phone call, or

email before you confirm your participation. Once you decide to participate in the research, you will be asked to carefully read and sign this consent form. Then, a face-to-face or an online interview will be scheduled at your convenience. The interview will be carried out at a scheduled time.

- No personal or sensitive questions will be asked. Instead, we will ask questions regarding your experience in using e-Portfolio during your clinical clerkship.

Risks and discomforts

- We do not anticipate any risks on your behalf from participating in this research.

Benefits

- No monetary compensation will be provided for participating in the study.
- The findings from this research will be used to improve the current e-Portfolio system for clinical clerkship and Korean medical education.

Audio/Video Recording

Your interview will be digitally recorded. Audio data will be transcribed and analyzed for this study. Transcribed data will include no personal information. At the end of this study, the audio file will be deleted.

Please initial below to indicate whether you consent to audio recording of your interview. You may still participate in this study even if you do not provide consent for recording.

__I do not want to have my interview recorded.

__I am willing to have my interview recorded.

Privacy/Confidentiality

- All of data that we collect will remain confidential. The data files will be protected by a strong password, and only the Researcher will be given the access to the data. If you decide to stop or withdraw from the study at any process, the information/data collected from or about you up to the point of your withdrawal will be kept as part of the study and may continue to be analyzed.
- The results of the research study will be published, but your name or any identifying information will not be used.

Taking part is voluntary

Your involvement in the study is voluntary, and you may choose not to participate or to withdraw at any time without penalty or loss of benefits to which you are otherwise entitled.

If you have questions

If you have any questions about this research project, please feel free to reach me, Ikseon Choi, via phone at (706) 583-0794 or email at <choi@uga.edu>. Questions or concerns about your rights as a research participant should be directed to The Chairperson, University of Georgia

Institutional Review Board, 629 Boyd GSRC, Athens, Georgia 30602; telephone (706) 542-3199; email address <irb@uga.edu>.

Research Subject's Consent to Participate in Research:

To voluntarily agree to take part in this study, you must sign on the lines below. Your signature below indicates that you have read or have this entire consent form read to you, and all of your questions have been answered.

_____	_____	_____
Your Name	Your Signature	Date
_____	_____	_____
Researcher's name	Researcher's Signature	Date

APPENDIX F

CONSENT FORM FOR STUDENTS

UNIVERSITY OF GEORGIA

CONSENT FORM

[A Study on Designing Multi-purpose e-Portfolio System for Clinical Clerkship**]**

Researcher's Statement

We would like to invite you to participate in a research study entitled 'A Study on Designing Multi-purpose e-Portfolio System for Clinical Clerkship'. Before you decide to participate in this study, it is important that you understand why the research is being done and what it will involve. This form is designed to give you the information about the study so you can decide whether to participate in the study or not. Please take the time to read the following information carefully. Ask the researcher if there is anything that is not clear or if you need more information. When all your questions have been answered, you can decide whether to participate in the study or not. This process is called "informed consent." A copy of this form will be given to you.

Principal Investigator: Ikseon Choi

Career and Information Studies

212 River's Crossing

Athens, GA 30602

Phone: 706.583.0794

Email: ichoi@uga.edu

Purpose of the Study

The purpose of this study is to study (1) features and design guidelines of successful e-Portfolio for clinical clerkship to promote students' and faculty's clinical clerkship experiences, (2) role of well-designed clinical clerkship e-Portfolio in promoting practices of clinical clerkship, faculty feedback exchange, and student reflection, and (3) students' and faculty's perceived purposes of using e-Portfolio for clinical clerkship.

Study Procedures

If you agree to participate, you can expect the following:

- Your participation will involve responding to an intensive face-to-face or an online interview and three online surveys. The individual interview will take only about 30 - 40 minutes, and each online survey will take less than 15 minutes to complete.
- A clerkship faculty in your department will explain this study at the regular conference meeting and ask whether you consent to participating in the study. You will be given enough time to ask questions about this study to the Researcher via SKYPE, phone call, or email

before you confirm your participation. Once you decide to participate in the research, you will be asked to carefully read and sign this consent form. Then, a face-to-face or an online interview will be scheduled at your convenience. The interview will be carried out at a scheduled time.

- No personal or sensitive questions will be asked. Instead, we will ask questions regarding your experience in using e-Portfolio during your clinical clerkship.

Risks and discomforts

- We do not anticipate any risks on your behalf from participating in this research.

Benefits

- No monetary compensation will be provided for participating in the study.
- The findings from this research will be used to improve the current e-Portfolio system for clinical clerkship and Korean medical education.

Audio/Video Recording

Your interview will be digitally recorded. Audio data will be transcribed and analyzed for this study. Transcribed data will include no personal information. At the end of this study, the audio file will be deleted.

Please initial below to indicate whether you consent to audio recording of your interview. You may still participate in this study even if you do not provide consent for recording.

__I do not want to have my interview recorded.

__I am willing to have my interview recorded.

Privacy/Confidentiality

- All of data that we collect will remain confidential. The data files will be protected by a strong password, and only the Researcher will be given the access to the data. If you decide to stop or withdraw from the study at any process, the information/data collected from or about you up to the point of your withdrawal will be kept as part of the study and may continue to be analyzed.
- The results of the research study will be published, but your name or any identifying information will not be used.

Taking part is voluntary

Your involvement in the study is voluntary, and you may choose not to participate or to withdraw at any time without penalty or loss of benefits to which you are otherwise entitled. Your decision to participate or not will have no bearing on your grades or class standing.

If you have questions

If you have any questions about this research project, please feel free to reach me, Ikseon Choi, via phone at (706) 583-0794 or email at <choi@uga.edu>. Questions or concerns about your

rights as a research participant should be directed to The Chairperson, University of Georgia Institutional Review Board, 629 Boyd GSRC, Athens, Georgia 30602; telephone (706) 542-3199; email address <irb@uga.edu>.

Research Subject's Consent to Participate in Research:

To voluntarily agree to take part in this study, you must sign on the lines below. Your signature below indicates that you have read or have this entire consent form read to you, and all of your questions have been answered.

_____	_____	_____
Your Name	Your Signature	Date
_____	_____	_____
Researcher's name	Researcher's Signature	Date

APPENDIX G

SUMMARY OF THE FACULTY SURVEY RESPONSES

[Q7] During clerkship, did you use both the PC (Web) version and the tablet version?

#	Answer	Response	%
1	Yes, I've used both versions	15	33%
2	No, I've only used the PC (Web) version	31	67%
	Total	**46**	**100%**

[Q8] Which version of the e-portfolio system do you prefer to use?

#	Answer	Response	%
1	Tablet version	1	7%
2	PC (Web) version	11	73%
3	Both; I have no preference	3	20%
	Total	**15**	**100%**

[Q11] Have you ever used the voice recording feature when providing feedback to students?

#	Answer	Response	%
1	Yes	0	0%
2	No	11	100%
	Total	**11**	**100%**

[Q12] If you've mostly used the PC (Web) version of the clerkship e-Portfolio, please check **ALL** your reasoning for your preference from below.

#	Answer	Response	%
1	The PC version was enough to use for clerkship activities	18	31%
2	I do not own a tablet	24	41%
3	I am unfamiliar with the operation of tablets	6	10%
4	I do not know how to use the tablet application for faculty	6	10%
6	I faced difficulties in using my tablet due to program errors	10	17%
7	iOS-based tablet devices were not supported for the mobile interface	6	10%
8	I used both the PC (Web) version and the tablet version	8	14%
9	Other	9	16%

[Q13] Do you agree that the clerkship e-Portfolio system is useful in the following main clerkship activities?

		Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Total Responses	Mean	SD
1	Overall clinical teaching activity	5	14	27	8	0	54	2.70	0.84
2	Individual consulting	5	18	22	9	0	54	2.65	0.87
3	Evaluation of clinical performances (e.g., clinical practices, case presentation, or PBL)	6	17	21	9	1	54	2.67	0.95
4	Evaluation of clerkship reports (e.g., clerkship reports, reflective journals)	3	11	24	15	1	54	3.00	0.89
5	Providing feedback to students	5	14	28	6	1	54	2.70	0.86

[Q16] Please rate the following on a scale of 1 (not at all true for me) to 5 (very true for me).

#	Question	1 (Not at all)	2	3	4	5 (Very true)	Total Responses	Mean	SD
1	I mostly provide oral feedback.	0	3	13	32	5	53	3.74	0.71
2	I mainly use the clerkship e-Portfolio.	8	25	15	5	0	53	2.32	0.85
3	I try to provide feedback for preliminary exams as immediately as possible.	2	7	12	25	7	53	3.53	1.01
4	I try to hold individual, consultative meetings with my students.	1	8	15	23	6	53	3.47	0.95
5	I only hold individual meetings at students' request.	5	26	17	5	0	53	2.42	0.80
6	I often experience difficulty in recall students' clinical performances off the top of my head.	2	19	19	11	2	53	2.85	0.93
7	I try to provide feedback for all required items as much as possible.	2	15	20	13	3	53	3.00	0.96
8	I believe it is appropriate to pay greater attention to certain items to ensure quality feedback.	1	2	11	28	11	53	3.87	0.86

[Q17] Please rate the following on a scale of 1 (Strongly disagree) to 5 (Strongly agree).

#	Question	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Total Responses	Mean	SD
1	The time constraint is the major barrier to providing immediate feedback.	0	7	25	19	0	52	3.71	0.82
2	I often have trouble providing immediate feedback due to the lack of availability of PCs near me.	0	13	24	14	0	52	2.87	0.95
3	The voice recording feedback feature, if satisfactorily improved, would be useful in providing immediate feedback.	0	10	21	19	1	52	2.42	0.87
4	The e-Portfolio promotes immediate feedback.	0	3	13	28	7	52	3.98	0.85
5	A proper number of face-to-face feedback is needed to improve students' clinical performances.	0	8	20	21	2	52	3.13	0.91
6	The feedback mechanism of the e-portfolio system may prevent face-to-face interactions between faculty and students.	0	7	14	25	5	52	3.27	0.95

[Q18] Please rate the following on a scale of 1 (Strongly disagree) to 5 (Strongly agree).

#	Question	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Total Responses	Mean	SD
1	Promoting students' reflection on what they've practiced.	6	14	24	7	0	51	2.63	0.87
2	Promoting students' reflection on or additional studies for faculty feedback.	4	20	21	6	0	51	2.57	0.81
3	Improving students' future clinical performances based on their reflections.	3	17	24	7	0	51	2.69	0.79

[Q19] Have you attended any user training sessions for the use of the clerkship e-portfolio system?

#	Answer	Response	%
1	Yes	37	73%
2	No	14	27%
	Total	**51**	**100%**

[Q20] Did you ever feel the need for a more systematic user training program?

#	Answer	Response	%
1	Yes	38	75%
2	No	13	25%
	Total	**51**	**100%**

[Q24] Which type(s) of user training did you receive?

#	Answer	Response	%
1	Individual training	7	14%
2	Group training	41	80%
3	Both	3	6%
	Total	**51**	**100%**

[Q25] Do you think the user training you received has improved your understanding and use of the clerkship e-Portfolio system?

#	Answer	Response	%
1	Yes	30	59%
2	No	21	41%
	Total	**51**	**100%**

APPENDIX H

SUMMARY OF THE STUDENT SURVEY RESPONSES

[Q7] Please check **ALL** reasons you've mostly used the PC (Web) version of the clerkship e-Portfolio

#	Answer	Response	%
1	The PC version was enough to use for clerkship activities	30	83%
2	I am unfamiliar with the operation of tablets	5	14%
3	No professor has encouraged use of tablets	9	25%
4	Professors appeared to be uncomfortable in using tablets	11	31%
5	I faced difficulties in using my tablet due to program errors	8	22%
6	Tablets were inconvenient to carry around	26	72%
7	There were few opportunities for tablet use during clerkship	30	83%
8	I was afraid my tablet would get damaged or lost	8	22%
9	iOS-based tablet devices did not support the mobile interface	7	19%
10	Other	9	25%

[Q9] Have you ever received any voice-recorded feedback?

#	Answer	Response	%
1	Yes	3	9%
2	No	30	91%
	Total	**33**	**100%**

[Q10] Evaluate the usefulness of e-portfolios in completion of the following paperwork.

#	Question	Completely useless	Slightly useless	Neutral	Useful	Extremely useful	Total Responses	Mean	SD
1	Overall clerkship paperwork	18	12	34	27	2	93	2.82	1.12
2	Study plans (daily, weekly)	19	18	30	24	2	93	2.70	1.13
3	Systematic recording of clerkship activities	12	16	37	27	1	93	2.88	1.01
4	Receiving evaluation results and faculty feedback	18	35	24	16	0	93	2.41	0.99
5	Reflecting on past clerkship practices and faculty feedback	21	23	36	12	1	93	2.45	1.02
6	Checking progress using the index page	22	21	34	14	2	93	2.49	1.08

[Q12] Please rate the following on a scale of 1 (Strongly disagree) and 5 (Strongly agree).

#	Question	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Total Responses	Mean	SD
1	Program errors discourage me from using e-portfolios	3	15	32	30	13	93	3.38	1.02
2	I do not understand the need for drafting clerkship reports	1	9	30	17	36	93	3.84	1.09
3	I write clerkship reports out of obligation	0	16	23	32	22	93	3.65	1.03
4	I consider easy and convenient revisions to be the best feature of e-portfolios	4	10	23	41	15	93	3.57	1.03
5	I write preliminary exam reports first on the paper, and then transfer the reports to the e-portfolio	2	1	15	28	47	93	4.26	0.92
6	I have experienced discomfort in using e-portfolios due to technological difficulties (such as poor internet connection)	1	13	29	27	23	93	3.62	1.04
7	I have gained helpful insight from reviewing past clerkship records	19	20	28	20	6	93	2.72	1.20

[Q13] Please rate the following on a scale of 1 (Strongly disagree) and 5 (Strongly agree)

#	Question	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Total Responses	Mean	SD
1	I received faculty feedback for majority of items	19	35	31	7	0	92	2.28	0.88
2	Content of faculty feedback was specific enough	20	36	31	5	0	92	2.23	0.85
3	Immediate feedback was given quite often	38	28	19	7	0	92	1.95	0.96
4	Most faculty feedback were given within a week	28	31	27	6	0	92	2.12	0.92
5	Voice feedback would be useful in providing immediate feedback if its usability is improved	41	26	23	2	0	92	1.85	0.88
6	The clerkship e-portfolio promotes timely faculty feedback	30	40	20	2	0	92	1.93	0.80

[Q14] Please rate the following on a scale of 1 (Strongly disagree) and 5 (Strongly agree).

#	Question	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Total Responses	Mean	SD
1	Most faculty feedback was given verbally	6	11	28	36	11	92	3.38	1.06
2	Few faculty feedback were given via e-portfolios	1	10	31	30	20	92	3.63	0.98
3	I was often asked to draft clerkship reports on paper	7	23	33	17	12	92	3.04	1.13
4	Most faculty feedback for preliminary exam practices were given immediately after the exam or within the same day	9	19	25	23	16	92	3.20	1.23
5	It is nearly impossible for clerkship faculty to provide feedback for all items	1	3	16	27	45	92	4.22	0.92
6	It is appropriate to pay greater attention to certain items in order to receive quality feedback	2	7	21	28	34	92	3.92	1.05
7	Sufficient amount of face-to-face interaction is necessary for quality feedback	2	4	28	36	22	92	3.78	0.94

8	The e-portfolio feedback process limits opportunities for face-to-face interactions between students and faculty	5	21	33	18	15	92	3.18	1.13

[Q17] Please rate the following on a scale of 1 (Strongly disagree) and 5 (Strongly agree).

#	Question	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Total Responses	Mean	SD
1	Promoting reflection on what I've practiced	21	24	31	14	2	92	2.48	1.07
2	Promoting reflection on additional studies for faculty feedback	19	32	36	4	1	92	2.30	0.89
3	Improving future clinical performances based on past reflections	24	23	35	10	0	92	2.34	0.99

[Q18] Please rate the following on a scale of 1 (Strongly disagree) and 5 (Strongly agree).

#	Question	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Total Responses	Mean	SD
1	Feedback or confirmation were not given for most e-portfolio reports	2	9	29	36	16	92	2.48	1.07
2	Open reflection was inhibited as all reflective journal entries were evaluated by professors	3	9	32	25	23	92	2.30	0.89
3	I have tried to write reflective journals on a regular basis	13	18	30	20	11	92	2.34	0.99

[Q19] Please rate the following on a scale of 1 (Strongly disagree) and 5 (Strongly agree).

#	Question	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Total Responses	Mean	SD
1	Evaluation criteria varied between professors.	1	1	21	39	30	92	4.04	0.84
2	I had to invest unnecessarily more time and effort into e-portfolio works due to lack of sufficient information on evaluation criteria.	1	3	36	25	27	92	3.80	0.94
3	There was no way to check the objectivity of the evaluation I received.	1	2	28	36	25	92	3.89	0.87