

## Design-Based Research of Authentic Learning: Lessons Learned From Improving an Online E-learning Specialist Graduate Program

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**Abstract** This paper describes part of an ongoing large-sized study that is pursuing a new model of authentic course design with design-based research. Throughout the design-based research process for designing, implementing, and refining two practicum courses, this study shows: 1) how a unique practicum was improved that was designed for building knowledge and skills for potential professional instructional designers in the graduate program; and 2) the recommendations derived from the improvement. This study was conducted in an online graduate program in Instructional Systems in Japan. The target courses we redesigned were Practicum in e-Learning I and II. We adopted a story and included both courses in the same story, with a context of real clients and a real organization. A questionnaire for students, after each course implementation, showed an upward trend in the 2008–09 trial conducted after using the Story-Centered Curriculum (SCC), compared to the previous year, 2007–08. Throughout the design-based research process, we analyzed and confirmed some issues needed to be solved in the current practice in the two courses. Adding a story to the context provided a chance for students and instructors to be aware of the importance of adding detailed context that includes each stakeholder's role; the story enhanced the learning resources. Lastly, recommendations gained from this study are listed as a guide to develop similar courses.

**Keywords:** authentic learning, practicum, design-based research, e-Learning, Story-Centered Curriculum

### 1. Introduction

Graduate schools utilized for professional education that focuses on practice have a long history, in which each professional field has selected and used its own optimal teaching approach. A wide range of knowledge is a requirement to becoming a professional, as well as knowing professional techniques that support practice of the profession. To obtain professional skills, learner-centered activities are essential. As Schon<sup>(1)</sup> noted: "Students learn by practicing the making or performing at which they seek to become adept" (p.16); certainly, practice is an effective way to gain skills.

In higher education, a "practicum" has been considered valid to provide learners a practical experience to link the theory with the practice that they learned in their activities in a class and it is used in various fields from medical to social sciences<sup>(2–4)</sup>. As Ryan et al.<sup>(3)</sup> described, there are several opportunities for students to apply their knowledge and skills in a practical setting; to

progressively develop competencies through participation in a range of practical experiences; to test their commitment to a career; to gain insight into professional practice; and to evaluate their progress and identify areas where further personal and professional development are needed. There are several research topics that require further investigation on the methodology and approach used by practitioners<sup>(3)</sup>.

The present research aims are to find an optimal design for two practicum courses in a graduate program where students gain skills of an educational design professional via an online course; and to ensure the level of the graduates. This paper describes part of the ongoing large-sized study that is pursuing a new model of authentic design with design-based research<sup>(5–8)</sup>. Through the design-based research process for designing, implementing, and refining two practicum courses, this study shows: 1) how a unique practicum, designed for building knowledge and skills for potential professional instructional designers in the graduate program, was improved; and 2) the recommendations derived from the improvement.

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## 2. Background Context

### 2.1 Master's program at KU

The Instructional Systems program at Kumamoto University, where we teach, provides a two-year online master's program in Instructional Systems; the students are from various geographical areas throughout Japan<sup>(9)</sup>. Most of the full-time students take courses online to pursue a degree while they are working full-time at a job. We focus on both training and research for learners who expect to develop educational design knowledge by using technologies. Putting Instructional Design in the center of the curriculum, the students learn technology and management by integrating them throughout the two-year program. Our mission in the master's program is to provide a practical learning environment that trains our students to become experts in the educational design field. For students, we set competencies that cover basic capabilities in the professional field emphasized in the program<sup>(9)</sup>. The core competencies list 12 capabilities that would be developed by taking the required courses of the program. All the assignments in the required courses are mapped with one of the 12 competencies, which represent the basic knowledge and skills for e-learning professionals.

### 2.2 Story-centered curriculum

Since 2008, we have employed a Story-Centered Curriculum (SCC) approach<sup>(10)</sup> in this master's program. SCC is used for curriculum-level design by providing an architecture for higher scalability without losing the learning-by-doing nature of the Goal-Based Scenario (GBS)<sup>(10-13)</sup>. The GBS is a model for designing simulations for learning higher-order skills by doing, and making mistakes, in a virtual environment<sup>(10-14)</sup>.

The SCC unites multiple courses that students usually take concurrently, within a given semester, by introducing a story from a real-world situation and is common across multiple courses<sup>(15)</sup>. SCC has been successfully implemented by Schank and his colleagues in Carnegie Mellon University's software engineering and e-business curricula at the master's level<sup>(10)</sup>. The two practicum courses that we focus on in this paper were also embedded in the SCC, and we redesigned the courses to fit into the SCC context.

### 2.3 Design-based research

Design-Based Research (DBR) is "a series of approaches, with the intention of producing new theories, artifacts, and practice that account for and potentially impact learning and teaching in naturalistic settings" (p. 2)<sup>(5)</sup>. DBR focuses on addressing complex problems in a real context, integrating known and hypothetical design principles with technological affordance, and finding and explaining theories, phenomena, and production, throughout iterative flexible design revision<sup>(5, 8, 16)</sup>. Doing research in a real complex situation and improving the practice so that it has an impact on local and global settings is the purpose of using DBR. Our study goal fits the aim of DBR, which is to refine and improve the quality of the course as well as summarize our findings to contribute to other learning-design settings. There are several ways<sup>(6, 7)</sup> to express DBR, such as a design experiment<sup>(17)</sup>, formative research<sup>(18)</sup>, and engineering research<sup>(6)</sup>. In this paper, we use the most common expression.

There are several concepts showing how to conduct DBR in educational settings, including the guidelines by Collins et al.<sup>(16)</sup> and the four steps by Reeves<sup>(19)</sup>. For instance, Reeves elaborated the DBR processes as an iterative in four steps: "Analysis of practical problems by researcher and practitioners in collaboration, development of solutions informed by existing design principle and technological innovations, integrative cycles of testing and refinement of solution in practice, and reflection to produce design principles and enhance solution implementation." The results of DBR are considered to return findings into practical solutions. Presenting design principles is an approach, as shown by Brown<sup>(17)</sup>, and McKenney<sup>(20)</sup> illustrated from the result of the research she conducted. Other approaches using recommendations<sup>(21, 22)</sup> and guidelines<sup>(23)</sup> as a list lesson learned for application in different educational settings in the future are also ways to express antecedent findings. For instance, McKenney and van den Akker's research in curriculum development and teacher professional development with computers<sup>(22)</sup>, presented five recommendations from their practice and the tenets that came from the five recommendations to guide research and development activities. One of their recommendations about bridging research and practice in the professional development environment was described by Stuessy and

Metty <sup>(21)</sup> as follows: "Think of the professional development in which you are engaged (as providers or as participants) as a system of interactive elements that effect change through feedback. (p. 745)"; we followed their interpretation in our study.

### 3. Role and Value of Practicum in e-Learning I & II

#### 3.1 Combination of the practicum in e-Learning I & II

Since we launched the program in 2006, we have conducted Practicum in e-Learning I and Practicum in e-Learning II (PIEL-I and II) as two unit courses, every year, by keeping our focus on PIEL-I and II to provide students the opportunity to apply the skills and knowledge that they previously learnt in the program<sup>(24)</sup>.

PIEL-I and II are paired compulsory courses in the second and third semesters that students take after several prerequisite courses. In PIEL-I and II, to gain work experiences as an instructional designer, it is important for the students to practice and apply their knowledge and skills that they obtain in this program as they do their class activities. The mission of the students in the practicum is to design and manage the development of an e-learning course for the assigned client who is a professor from another department. Most of the client professors' courses are conventional classes for which they expect to blend e-learning technology to conduct their classes more effectively and efficiently. Therefore, for client professors, it is voluntary to join the PIEL-I and II.

Students form groups and work as a group with an assigned client, under the supervision of our course instructors. The two practicum courses are taught by seven instructors and one instructor is assigned to each team to follow up all activities throughout the year. The practicum is the collaborative work of four stakeholders: our graduate students; the client professors; the staff of the Institute of e-Learning Development (IeLD), who develop e-learning courses; and us, the practicum instructors. Developing several e-learning components for on-campus courses in our online graduate program is the unique aspect of the practicum. There are several challenges that we need to overcome for all activities to fit in the two practicum courses.

#### 3.2 Practicum in e-Learning I

As a first step, students form groups by selecting a client course that they are interested in. Each group has an average of three members. The goal of PIEL-I is to develop a proposal based on the client's Request for Proposal (RFP) that meets the client's needs and expectations (Figure 1). Students follow the steps that are provided in the practicum and collect resources under the supervision of the course instructors. Among their tasks, students are expected to pose questions to clients, prepare presentation documents, create and prototype contents to give clients an image of the proposal; in the end, the students make a proposal and submit a development plan to complete their assignment. Each student group also creates a development plan draft for the IeLD. The leader of the Institute, who is a professor of the Institute as well as one of the course instructors, determines the feasibility and adequacy of the proposal for approval. In practice, all instructors participate in the process of judging the proposal with prepared proposal key points, before the development starts.

#### 3.3 Practicum in e-Learning II

PIEL-II is based on the result of PIEL-I; students manage an e-learning content development and deliver the product to the client (Figure 2). In PIEL-II, students make a request to the Institute's staff to develop the course that they proposed to the Institute. The goal in the practicum is for students to create and manage the development process of the e-learning material in unison with the Institute's staff. In other words, the students should not create the e-learning material by themselves.

Students begin PIEL-II by reviewing the proposal submitted and, then, modifying its development plan that was created in PIEL-I. After receiving approval from the instructors to proceed to the next step, they request creation for the target course to the staff in the IeLD. Conveying their request explicitly and inspecting the delivery for accuracy toward meeting the target course are included as requirements in PIEL-II.

The students experience a real process of e-learning development throughout the two courses. It is very challenging for students to manage all the processes by thinking and designing freely, and make decisions with the guidance of the instructors, during the course activities.

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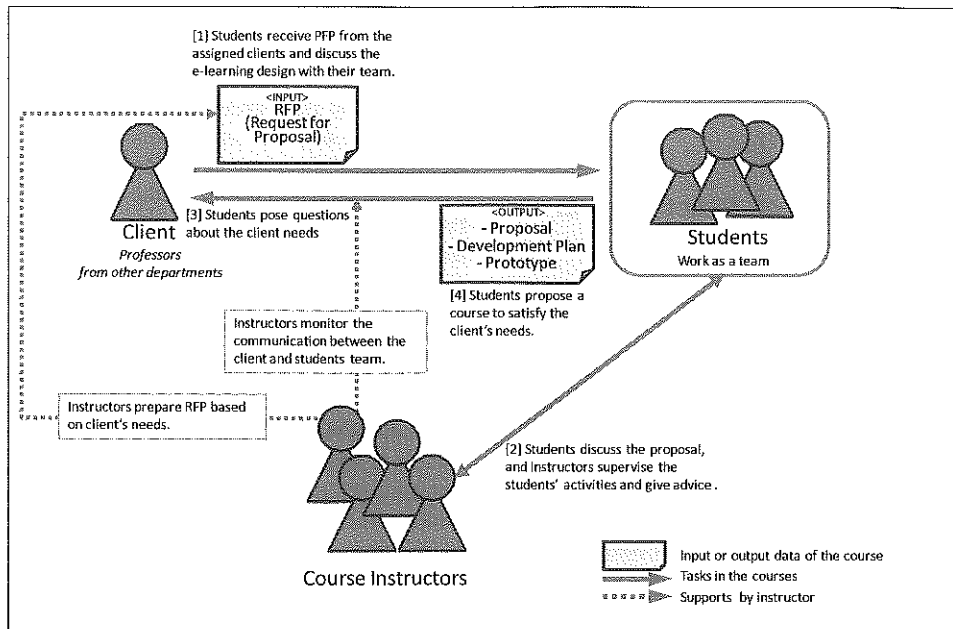


Figure 1. Overview of Practicum in e-Learning I.

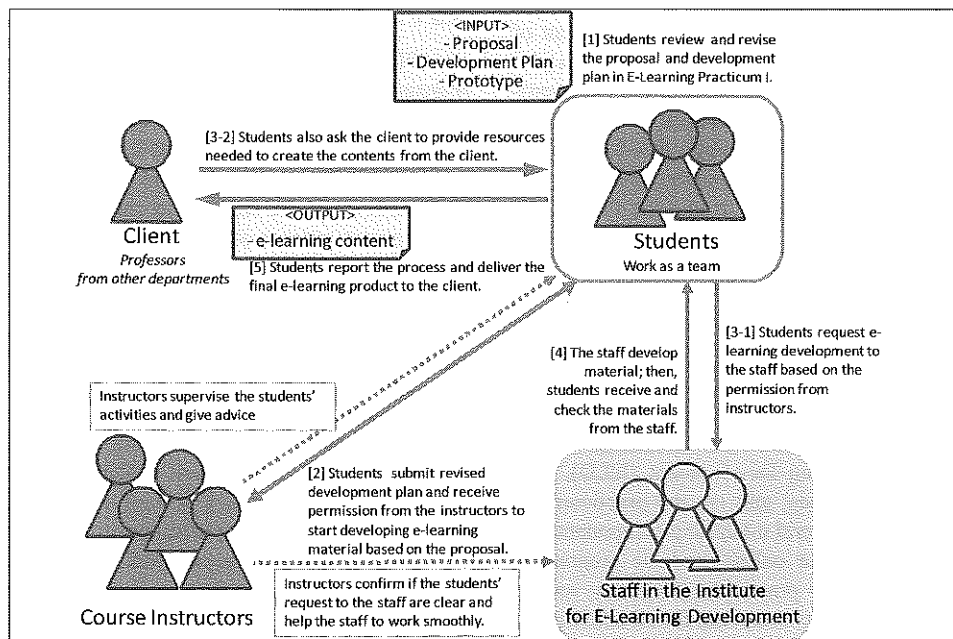


Figure 2. Overview of Practicum in e-Learning II.

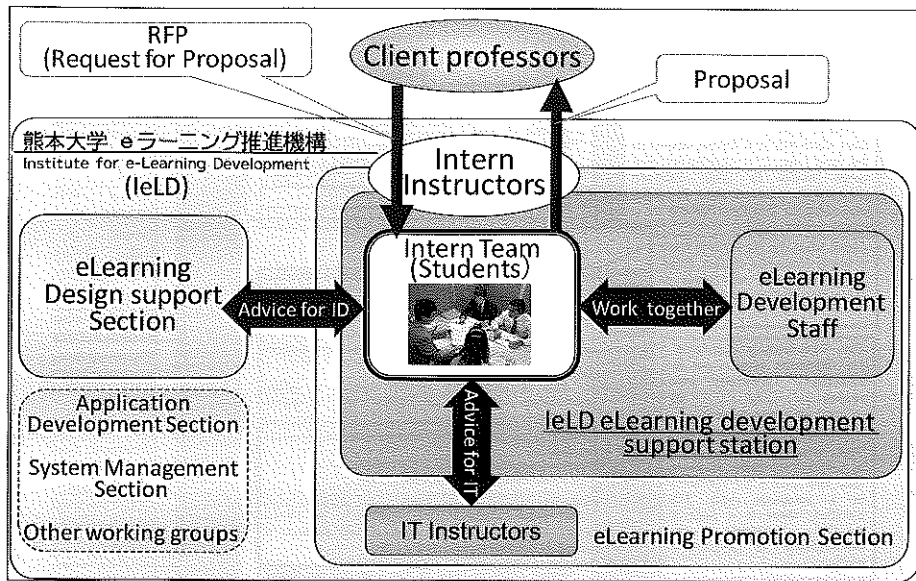


Figure 3. Stakeholders' Relationship.

Figure 4. Introductory Material for the Two Courses.

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This section includes important information for identifying students' motivations, such as whether there are any prerequisite subjects, whether it is an elective or required subject, and departments from which students come. Also, since this is a course offered in the first year, it is anticipated that there would be gaps between students in terms of their IT skills, depending on their departments.

Check when the instructors want to begin using the system. Some class instructors will want to begin class preparations soon.

The "21st-century objectives" are objectives established by Kumamoto University and shared by all general education subjects.

Tasks using WebCT are required in preparatory study. However, since this class is not conducted in a classroom with PCs installed, there is a need to consider ensuring the thoroughness of preparatory study.

The short reports covered above under learning activities are not mentioned here. This needs to be checked.

### e-Learning Development Subject Survey Sheet

Fact sheet (survey of implementation conditions and)

Faculty	All departments	Starting year of class	Year 1
Term	Second semester	Unit	2
Subject category	Main subject	Elective	Elective
Prerequisite	None	Prerequisite	Approximate No.
Instructor	D		
Room	1101		

2008 (planned)

Textbook: Not used. Printouts are distributed as appropriate.

Materials: Instructed as appropriate.

21st-century objectives related to this course: A, B, and F.  
Objectives achieved in this course:  
1) Able to understand concepts related to citizen participation and urban development, and to explain the concepts.

Number of personnel: one (no teaching assistants or others assigned).  
Curriculum restrictions: none in particular.  
Classroom: lecture hall (no PCs installed).

Lectures: 10, 10, 10, 10, 10, 10, 10, 10, 10, 10  
Group: 10, 10, 10, 10, 10, 10, 10, 10, 10, 10  
Seminar: 10, 10, 10, 10, 10, 10, 10, 10, 10, 10

This course explains the significance of citizen participation and basic terminology and concepts of urban development.

General evaluation based on final exam and two thematic reports. Students missing one-third or more of lectures may not

Summary of subject: This course explains the basic terminology and urban development case workshops methods implement these methods.

Figure 5. Guideline for Understanding the Syllabus.

[Proposal Idea Check Sheet] Date (Y/M/D): / /

Subject for development:

### Proposal Idea Check Sheet

Category	Items to check	Status (Describe specifically matters such as how this is realized and whether there are any questions for the class instructor)
Conditions of the subject for development	Exit	Does the proposal match the learning objectives identified by the class instructor?
		Does the proposal match the evaluation methods identified by the class instructor?
	Entrance	Does the proposal match the anticipated levels of knowledge already possessed by students?
		Does the proposal match the anticipated characteristics of students (such as their IT skills)?
	Structure	Does the proposal make clear targets and timing for use in the learning structures and systems planned by the class instructor?
	Plans	Is the proposal one that can be used within the learning formats planned by the class instructor?
	Environment	Is the proposal one that can be used with the class location and number of class staff members indicated by the class instructor?
	Is the proposal one that can be used in the class hours indicated by the class instructor and individual study time outside class hours, to a reasonable, commonsense degree?	
RFP	Does the proposal include responses to all items on the RFP? (If priorities have been assigned by using substitute ideas to express requests more succinctly, is that point noted?)	

Figure 6. Worksheet Example (Proposal Ideas).

#### 4. Adoption of the Story in the Practicum

Throughout the initial two years' implementation, from the second semester in 2006 to the first semester in 2008, the instructors prepared the necessary learning resources for the practicum. During the semester, most of the tasks for the course instructors were to try to accommodate various types of clients' (professors from other departments) needs and stance, and to adjust the degree of intervention with student activities, as needed. Although each student team could complete all the activities and achieved a certain level in the assessment, the instructors thought the quality of the final product by the students could be improved.

The students have a chance to review their e-learning development process by submitting a reflection paper that is required at the end of the term. The comments we received from students in the reflection papers were positive in terms of experience in blended-type e-learning development: learning how to conduct and complete group projects, and gaining skills to use Learning Management System (LMS) effectively. And, those comments from the students were related to the program's competencies as we expected, but we felt it was still necessary to improve the program and make it more efficient for the students as well as the clients. We, the instructors, wanted to have students learn particular skills, such as analysis techniques, proposal development, and balance of the client needs with the application of the design principle, which was described less frequently in the reflection papers than we expected it would be. Also, the reflection papers showed that the course could be improved, for instance, by adding the relationship among the other courses in the program, presenting clearer objectives for the final product in the early phase of the course, and enhancing effective activities by providing supplemental courses.

When we started the review and modification phase in 2008, for the third year's implementation, the program faculty decided to use the SCC from the beginning of 2008<sup>(15)</sup>; we redesigned the two practicum courses to be included in the story. Adopting a story and including both courses in the same story, with a context of real clients and a real organization, was a unique and challenging approach. Based on the reflection papers from students and the feedback from instructors, we decided on a solution shown in Table 1.

**Table 1.** Modifications with a Story.

	Pending issues (before SCC)	Resolution (after SCC)
1	deficiency in the learners' role and mission, in the practicum	-story setting and detailed context (Figures 3 and 4) -assigning mission and role (Figure 4)
2	deficiency in the relationship between Practicum in e-Learning I and II	-adding messages from instructors and providing related tasks with clear instruction within a context
3	absence of the image of the interim and final products for the learners	-showing the interim and final product examples (Figures 5 and 6)
4	insufficient recognition of learners' responsibility to their role	-reporting role allotment -team members' evaluation -individual evaluation -client' evaluation -development staff's evaluation

##### *- Issue & resolution 1 [Role, mission, and context]*

For students, the practicum environment is new and some have difficulties to understand the context and role of stakeholders. Students face two types of professors in the practicum courses: the course instructors and clients; and in PIEL-II, they also work with the staff in the IeLD. Because there are three types of stakeholders who have different roles, students always need to get a clear picture of the relationship among stakeholders.

As a resolution, we first set a cover story that students work for a virtual e-learning development company, MTM; then in the story used in PIEL-I and II, students were dispatched from MTM to Kumamoto University as interns who worked for the IeLD. The course instructor's position was as the intern's adviser; the position of the client professor and staff in IeLD also became explicit (Figure 3) since the role and setting provided clearer context. Not only did we add a written description, we added pictures with graphic information about the stakeholders as a resource.

*-Issue & resolution 2 [Relationship between the two practicum courses]*

The two practicum courses are closely tied: PIEL-I is the design part and PIEL-II is the development part in the e-learning development process. However, some students had difficulty getting an overview of the practicum activities and the whole process, because the antecedent is divided into two different courses. Students tend to concentrate on tasks-at-hand and easily forget to look at the whole process in the PIEL-I and II together. By adding messages from instructors in the context of both practicum courses, such as reasons and advantages for conducting the assigned tasks, it was intended to alert students if they did not follow the instructions, and to add information where the assigned task fit in the whole practicum process, as well as to provide related tasks with clear instruction within the context.

*-Issue & resolution 3 [Clear objectives and products, with examples]*

Although students have worked on several instructional projects previously, including the development of paper-based materials, an analysis of existing e-learning classes, and the development of a proposal for existing e-learning materials, in the prerequisite courses, carrying out the whole process in e-learning development in a continuous manner was a new challenge for students. Therefore, adequate instructors' support for the students was critical for a successful experience in the practicum.

We collected previous students' products and modified them as resources for the current students. We showed some good and bad examples based on previous students' products and had students compare and analyze the example products to inspire their own ideas.

*-Issue & resolution 4 [Learner's autonomy]*

Some students had insufficient recognition of their responsibility in their group. For instance, some students did not contribute well in teamwork and, therefore, became passive members. Some missed the deadline. We prepared a worksheet to write down role allotments in the group and had the student production plan scheduled in a given period of

time to make them aware of their responsibilities.

In addition, to enrich the story environment, the instructor's team reviewed the practicum schedule at regular intervals and confirmed together the feedback timing and key points where students needed help. Also, we decided to keep the position of the instructors only as learning resources by not providing students quick answers to design and development of the proposal, rather we provided a lot of clues to let students think according to the resources that were available in the courses.

## 5. Results

Questionnaires for students, completed after each course, showed upward trends in the 2008–09 trial done after implementing the SCC, compared to the previous year, 2007–08. The questionnaires were answered by 16 students who took the courses in 2007–08 and 17 students who took the courses in 2008–09. The number of students who took the courses varied from year to year, and some did not participate in the questionnaire because it was not required. The questionnaire had a four-point scale; 4 points meant the most affirmative response to the question, and 1 point was the least affirmative response. Table 2 shows the results of the questionnaire: main effect of the course ( $F(1, 30)=7.72, p<.01$ ) and year ( $F(1, 30)=9.31, p<.01$ ), and the interaction between the course and the year ( $F(1, 30)=8.84, p<.01$ ) were found to be statistically significant for the question "Ideas to make the course easily understood." Also, in the question "Interactive dialogs with instructors, such as Q&A, comments, and feedback," there was a significant effect ( $F(1, 30)=5.40, p<.05$ ) in the interaction between the course and the year in the question.

The score of the fifth question, about interactive dialogs, was not higher in 2009 than in 2008, but this was because there were variances in responses (7 answered "frequent and timely," 4 points; and 2 answered "not so included," 2 points), although 9 students gave positive responses.

The impact of introducing the story in the practicum was not definitively determined. However, there were positive effects in Table 2 because we modified the courses with the story. Among the four major modifications in Table 1, we assumed some improvements were related to the second modification (relationship between the two practicum courses), such as adding



**Table 2.** Questionnaire Results.

Questions	2007–08		2008–09	
	PIEL-I (07)	PIEL-II (08)	PIEL-I (08)	PIEL-II (09)
Q1. Intelligibility of objective [Resolution 1, 3]	3.6	2.7	3.6	3.4
Q2. Clarity in material descriptions and directions [Resolution 3, 4]	2.2	2.4	2.8	2.7
Q3. Ideas to make the course easily understood [Resolution 2]	3.2	2.1**	3.2	3.3
Q4. Effectiveness of web materials to understand the course [Other: operational]	3.2	2.6	3.1	2.9
Q5. Interactive dialogs with instructors such as Q&A, comments, and feedback [Other: operational]	3.6	2.4*	3.3	3.5

(N=5) (N=7) (N=14) (N=8)

NOTE. \* $p < .05$ , \*\* $p < .01$ 

PIEL-I stands for "Practicum in e-Learning I"

PIEL-II stands for "Practicum in e-Learning II"

[Resolution X]: Relation to the resolution in Section 4

explanations about the overview of the two practicum courses, providing samples and suitable document formats, if needed; and showing several examples, developed as past assignments by former students, led to the positive responses to the question, Q3 "Ideas to make the course easily understood." Reorganizing the four modifications shown in Table 1, they gave instructors other perspectives in running the practicum: in particular, reviewing it to see if there was enough time to answer all the important questions, in the instructors' interactions with students contributed to the reaction in Q5 "Interactive dialogs with instructors such as Q&A, comments, and feedback."

In contrast, there were no remarkable differences in the PIEL-I between 2007–08 and 2008–09; we discov-

ered the reason was probably because the students could not easily imagine how to use the examples and format we prepared. From the results, we obtained ideas how to make further improvements in the contents. For instance, from the results of Q2 "Clarity in material descriptions and directions," we should modify the prepared examples and add more contents to explain the intention of the activity to increase the effect of modification 4 (learner autonomy).

## 6. Discussion

We identified several issues and solutions in the course implementation and, then, applied them into the next year's course material. The biggest difficulty is the degree to which we let students work by themselves and when we need to provide help. Students need time to understand the context for working with the stakeholders in the practicum, and how to work with them and the resources.

Throughout the DBR process, we analyzed and confirmed some issues needed to be solved in the two practicum courses. Adding a story to the context provided a chance for students and instructors to be aware of the importance of adding the detailed context that includes each stakeholder's role; the story enhanced the learning resources. The following recommendations were gained as a guide to develop these practicum courses. The italic words relate to the issues and resolutions shown in Section 4.

### Recommendation 1 [*Role, mission, and context*]

Use a story that gives students the role, mission, and context from which students will draw a context:

Placing an emphasis on context leads students to a successful learning process<sup>(16)</sup>. Some scholars and practitioners consider the learning of skills an authentic activity<sup>(12)</sup>. Seeing practicum as a large size activity and as an unfolding learning activity, throughout a story, provides a comprehensive and retentive learning environment. In the given story, the students work voluntarily, because the story supplies a clear mission.

### Recommendation 2 [*Relationship between the two practicum courses*]

Show the relationships of all factors to solve the tasks assigned within a context:

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The learning activities need to be connected with each other, because the skills students obtain are not always straightforward. If students can see the relationship between each activity by themselves, they will find the relationship among the activities, as a whole. However, if they cannot imagine how the activities would lead to the expected goal, we need to make explicit the relationship among the activities and toward the goal. A story is a strong tool to show the contexts.

### Recommendation 3 [Clear objectives and products, with examples]

Externalize the interim and final outcomes in a practical context:

Providing the learning goal is one of the critical factors in instructional design. Expressing the objectives in terms of the skills is directly related to the outcomes. One effective use of a story is to embed a set of target skills to be learned and practiced in the story before students embark on their mission<sup>(13)</sup>.

### Recommendation 4 [Clear objectives and products, with examples]

Carve out the minimum requirements and supplemental resources to reach the goal:

To convey the instructors' expectations explicitly to the learners, text information is not sufficient, and the learners often want to see the expected outcomes, concretely. Especially in a new situation that students have never experienced, concrete examples guide them to understand what the learners' outcomes are.

### Recommendation 5 [Learner's autonomy]

Show students what they have accomplished, even a small milestone, so they can confirm their own progress:

For learning success, students require confirmation about where they are in the learning process and finding the next step they need to take, based on the current status. Even if instructors provide a cognitive situation for the learner, this approach does not yield a good result without the learner's metacognitive activities. Showing learners where they stand and requiring them to think of how to proceed from their position to the next one will lead to profound learning.

### Recommendation 6 [Learner's autonomy]

Provide the students a chance to think for themselves:

Learners can proceed after they consider the problem (task) and make a decision. If learners have a chance to think by themselves, they have the opportunity to practice within a context.

### Recommendation 7 [Operational]

Keep in mind the position of instructors as learning resources:

To enrich the story-based practicum, the instructors must stand firm as facilitators to support the learners' activities. If learners want a quick answer, instructors should have interactions with them to make them aware of what they are missing to solve the problems, without giving them a direct answer.

### Recommendation 8 [Operational]

Schedule feedback from and for the students in advance; prepare to be able to coax students to work in a timely manner:

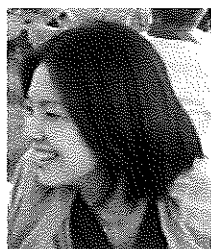
To keep the position of instructors as learning resources, preparation is the major point for efficiency and effectiveness. Collecting the questions and problems from previous programs as a guide for instructors to use and being prepared for variant students' attitudes are good options.

In this paper, we described a new design within a realistic and practical environment using a learning approach called SCC. To satisfy the mission and role of the two practicum, PIEL-I and PIEL-II, in the program, we redesigned them by enriching the context. As a result, we also proposed 8 recommendations as the lessons learned from our revision effort. Nevertheless, we need to investigate some points further to validate our practice values critically. For instance, by having learner evaluations from the perspective of competency and by comparing the students developed e-learning products using a rubric. The recommendations should then be revisited to make them more applicable to our future practicum courses.

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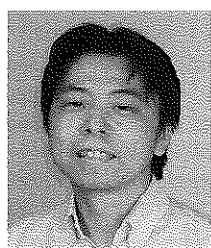
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DESIGN-BASED RESEARCH OF AUTHENTIC LEARNING: LESSONS LEARNED FROM IMPROVING AN ONLINE E-LEARNING SPECIALIST GRADUATE PROGRAM



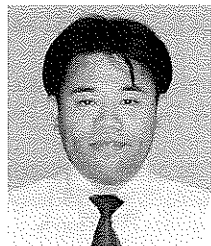
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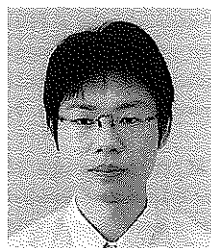
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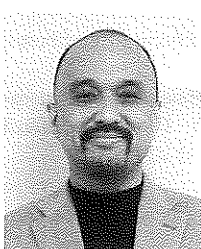
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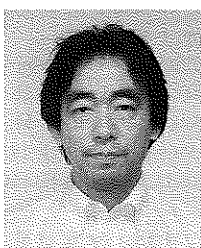


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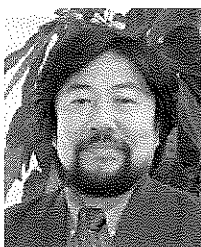


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