

“Learning Sketch”: A tool for Learning Reflection Activity

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In this study, we developed a tool, the Learning Sketch, for both students and instructors to reflect and confirm the student's effort and perceived outcomes during a semester of the story-centered curriculum. Students see what and how they learned through each activity and then unify all compulsory course activities into a series of learning activities provided in a unique curriculum, namely, the story-centered curriculum (SCC). In this paper, we report the results of providing the Learning Sketch for students to use after two semesters: fall and spring. The Learning Sketch enabled students to make learning activities visible, because the tool presents a series of all activities conducted throughout each semester. Our intent that the comments by students in the Learning Sketch are unrestrained and all students expressed their feelings freely was confirmed from the students responses.

Keywords: reflection, story-centered curriculum, situated learning, learning environment, visualizing learning activities

Introduction

Among the approaches to improve learning activities, the problem-based approach is used as an educational strategy in teaching problem-solving skills with authentic problems (Lohman, 2002). This approach is a way to provide knowledge and skills that learners gain in a realistic learning environment similar to a real world situation. This idea comes from the theory of how people learn, for example, Case-Based Reasoning (Schank, 1994; Riesbeck, 1996). To support this approach, instructional design activities need to be more concerned with the context and exploited contextual resources (Tessmer & Richey, 1997) as well as arguments of authenticity

and quality of instructional design (Parrish, 2007).

We employed the Story-Centered Curriculum (SCC) approach to refine and enrich the students learning experience in a graduate program of Instructional Systems (Suzuki, Nemoto, Oyamada, & Shibata, 2009). In this study, we developed a tool, "Learning Sketch," to recognize and confirm, within one semester, the student's achievement in the story-centered curriculum; students, at the end of the course, see what and how they learned by doing each activity and unifying all the activities of compulsory courses into a series of learning activities provided within a unique curriculum: the story-centered curriculum. In problem-solving approaches, reflections are seen as essential parts in a complete activity, and several approaches, such as problem-based learning (Hmelo-Silver, 2004; Hmelo-Silver & Barrows, 2006), request reflection as one of the activity steps. We also see reflection as an essential part of our SCC project, but there is no academic study that shows how teachers and designers bring in the SCC design.

In this paper, we report how we designed the Learning Sketch, the result of our provision, and the students' use of it after both the fall and spring semesters. Also, we discuss effective uses of the learning sketch for reflection activities in the SCC.

Visualizing Learning Activities

In all learning activities, when learners monitor their own learning activities it is important for them to recognize their progress and level of achievement. The learners need to monitor independently, but, we as educators, can scaffold the monitoring process with various techniques that include tutoring, guiding, navigating, and providing information that the student needs. Technology is a way to scaffold visualizing learning activities.

Visualization is an assumed method to support learning activities. Scientific virtualization tools in science education are cases in application in which science specialists use existing technologies (Roy, 1993; Edelson & Gordin, 1998). Many of the visualizing tools for learning activities are related to Computer Supported Cooperative Learning (CSCL) (Jermann, Soller & Muehlenbrock, 2001) such as visualizing participation status in a CSCL environment (Janssen, Erkens, Kanselaar & Laspers, 2007). In constructivist learning environments (CLEs), cognitive tools "enable learners to see phenomena in different ways" and "help learners think in appropriate ways" (Jonassen, 1999, p. 70).

As seen above, visualization is used to support cognitive processes at various learning steps in and after learning. From the preceding studies, we see that providing a visualizing tool will help students, who learn in the SCC, consider their own learning experience as a series of activities. The advantage of the use of SCC is that the students conduct activities, related to several courses, as they follow an original story based on the relationship among the courses. A visualizing tool is a way to reflect on their activities, but more important is that by revisiting their activities, we expect our students to reflect on the activities on the story.

Lesh and colleagues have focused on the development of models for the construction,

description, or explanation of complex systems (Lesh & Harel, 2003; Lesh & English, 2005). Their idea started from mathematic education, but has been expanding to other areas such as problem solving, curriculum development, student development, and teacher development. Models are used for constructing and describing other systems, and they are expressed by using a variety of interacting representational media (Lesh & Harel, 2003).

Narrative Diagram

The Narrative Diagram (Parrish, 2007) is one of the design tools in planning or revealing the dramatic arc of learning. This emphasizes authentic instructional design for the task of creating engaging instructions. Generally, instructional designers use tools and methods for organizing and including the target skills and information in the materials or class implementations, considering various learning settings, and then find the best approach, with the selected instructional tools, for the target instructional setting. Those are important steps to complete the instructions, but they become rigid formats; Parrish makes a point that it is a more esthetic experience for students, and that constructing learning activities from the viewpoint of the target learners is necessary in designing for a learning engagement.

The diagram in Figure 1, introduced by Parrish (2007), shows the learning flow from the beginning of the learning process until the end. The Y-axis shows the level of action, including learning engagement and complexity, and the X-axis shows time. Time can be the sequence of events or storyline as well as chronological time. The teachers or designers plot the learners' activities. There are incline and decline slopes, depending on the degree level of action. The narrative descriptions help designers understand how students experience the lesson and the relationship of activities from point-to-point.

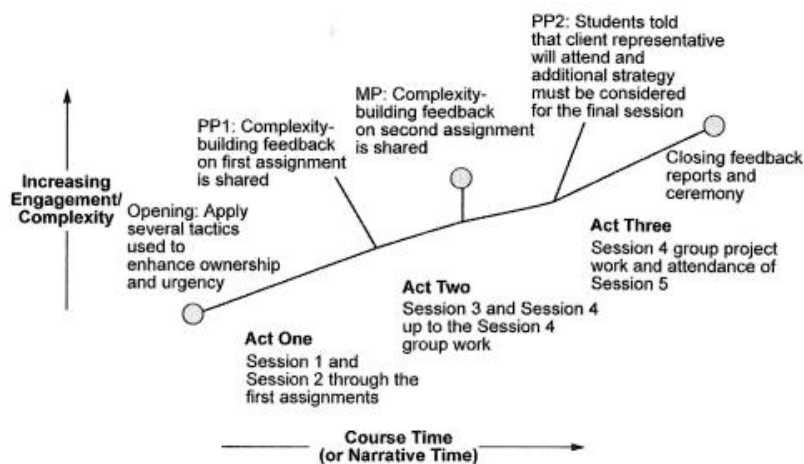


Figure 1. Narrative Diagram

Comparing Visual Instructional Design Languages: A Case Study (p. 322)

The purpose of the diagram is to imagine and draw the learner's holistic learning experience, which is unlike other instructional specifications such as simply listing learning objectives. People can use the narrative diagram with other instructional design tools that enable users to use the diagram at various points in the process, like design and analysis.

We used the idea of the narrative diagram that expresses, by designers, a series of students' activities. We took the tool for designers and arranged it as a tool for our students.

Design of the “Learning Sketch”

Background Context

Since 2008, in this master's program we have employed a SCC approach (Schank, 2007), which is used for the curriculum-level design by providing an architecture for higher scalability without losing the learning-by-doing nature of Goal-Based Scenarios (GBS) (Schank, 1996; Schank et al., 1993; Schank et al., 1999; Nemoto & Suzuki, 2004). GBS is a model for designing simulations to learn higher-order skills by doing them in a virtual environment, and making mistakes (Schank, 1996; Schank et al., 1993; Schank et al., 1999; Nemoto & Suzuki, 2004; Schank, 2007).

Because students usually take courses from various disciplines, concurrently, within a given semester, the SCC introduces a story from a real-world situation that is common across multiple disciplines (Suzuki, Nemoto, Oyamada, & Shibata, 2009). The SCC also emphasizes that the knowledge obtained in the learning context is to be applied in other contexts that the learner would face in future real life situations. This idea is also valued in other studies (Lesh & Harel, 2003). The SCC has been successfully implemented at Carnegie Mellon University's software engineering and e-business curricula, at the master's level (Schank, 2007).

The SCC unites multiple courses, usually taken concurrently within a given semester, by first introducing a story from a real-world situation common to multiple courses, in which the target program would be expected to work as a professional. Within such an authentic context, the students would act as if they were already in such a situation, but with assistance from faculty when needed.

Figure 2 shows the learning sequence in our SCC. Although students take their courses concurrently within a given semester, in the SCC the students' learning is story-driven, and they complete their tasks one by one from week to week. Therefore this approach allows the learner to concentrate on one task at a time.

Based on the sequential dependency of the existing assignments and rearranged study sequence, a cover story is depicted to include all the components in the first semester. The story selected was in e-learning business, because the majority of our students are from corporate settings. Our program aims at improving the skill of a learning designer who will know both corporate and academic fields and who has knowledge in educational technology; then we set two stories that include distinctions, as in Table 1.

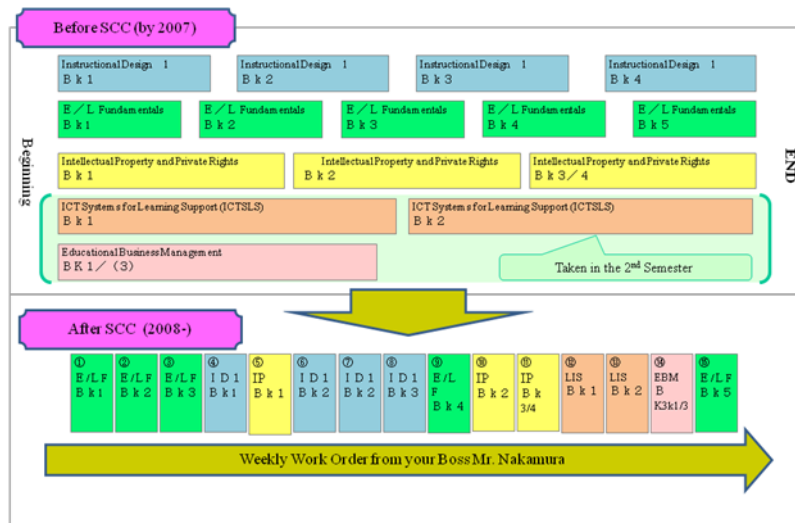


Figure 2. Learning Sequence in our SCC

Table 1. Two Stories in our SCC

Items	1 st semester	2 nd Semester
Story area	Cooperation	University
Students' role	Company staff member	An intern
Goal of a SCC (determine what students obtain from the story)	Recognize existing four main concepts behind the Program (Instructional Design, Information technology, Information Management, and Intellectual Property)	Deepen application skills with acquired skills

Method and Procedures

The SCC design team members focus on how they can provide the compulsory courses as a series of cohesive sets so that students can understand the relationship among the courses. Prior studies and articles by other scholars of the SCC guided us how to provide our curriculum with the SCC approach, but they did not inform how to determine to what degree the students understand the relationship among the courses, after experiencing the SCC, or how to determine how students feel about the unique SCC learning environment. Therefore, to reflect on activities in curriculum-level design, we developed a new approach for reflection that can provide the necessary feedback from the students: the Learning Sketch. We decided that at the end of each term students should retrace their own progress with a visual guide, and, therefore, we would embed a short reflection activity with the Learning Sketch tool. In the SCC section for reflection, in 2009, we embedded the Learning Sketch as a new tool to aid learners in their reflection. Reflection is one of the key activities in learning, but the balance of reflection with other activities and the method that fits into the target practice are very important with the efficiency of time and students' cognitive load. So we set the reflection activities to be as brief as possible.

The design of the Learning Sketch has taken a cue from the Narrative Diagram by Parrish (2007), which we modified to fit into our context. After designing and developing the Learning Sketch, our team conducted a review and a formative evaluation of the Learning Sketch tool; then, we offered the students in the 2009 program an activity section for reflection at the end of their SCC activities. The process of the students using the Learning Sketch was examined through the access history from the Website tool. There was no question from the learners about how to use the Learning Sketch tool. When we reviewed the results of the learners, we compared the graph that the students created and grouped based on the shape of the graph and other distinguished aspects of the data. We noticed the distinctive findings with the corresponding evidence. In this paper, we include in the findings several student examples as cases.

Learning Sketch

The Learning Sketch (Figure 3) is a tool for students to reflect on the learning activities throughout the SCC, from two viewpoints: 1) effort: ambition, time, and ingenuity to pursue the goals; and 2) perceived outcomes: confidence, skill, knowledge, know-how, and useful lessons for the future. With this graphic tool, users can intuitively create a graph to show their learning experience; on an 11-point scale from 0 to 10, they rate the 15 weeks of learning activities of that semester. Also, they can add comments to explain their graphic markings. To reduce the burden on the learners, those comments are recommended. After creating a graph with the tool, as one step in the process of the visualizing experience, each learner uploads the result with the Learning Sketch onto a discussion board by copying the HTML source that we provide.

At the end of each term, for students to express their experience, gains, and thoughts after using the SCC support tools, we offered an activity section for reflection on the SCC activities. In addition to the section for reflection, in 2009 we embedded the Learning Sketch as a new tool to aid learners in their reflection.

For example, in the first semester, a student takes five courses through the SCC approach. Following a story delivered weekly, the learner accesses one of the course assignments every week. After fifteen weeks, the student completes all course activities and assignments in the SCC. The reflection activities that encompass the SCC were provided after the completion of all activities. The Learning Sketch tool is provided as the first part of reflection activities to get a quick overview while respecting that the learner's participation in the Learning Sketch activities is given freely.

Purposes

There are three purposes for using the Learning Sketch:

- (1) To provide a tool for learning reflection—promote learners' reflection and have them confirm the trajectory.
- (2) To discover points of improvement for the SCC—search for clues to improve the storyline, its outcomes from students, instructional contents, learning tools or aids used in the SCC, etc., as well as to compare the learners' graphs to find the discrepancies and similarities.

(3) To have data collection for incoming students—a reference for incoming students to see how former students felt about the process.

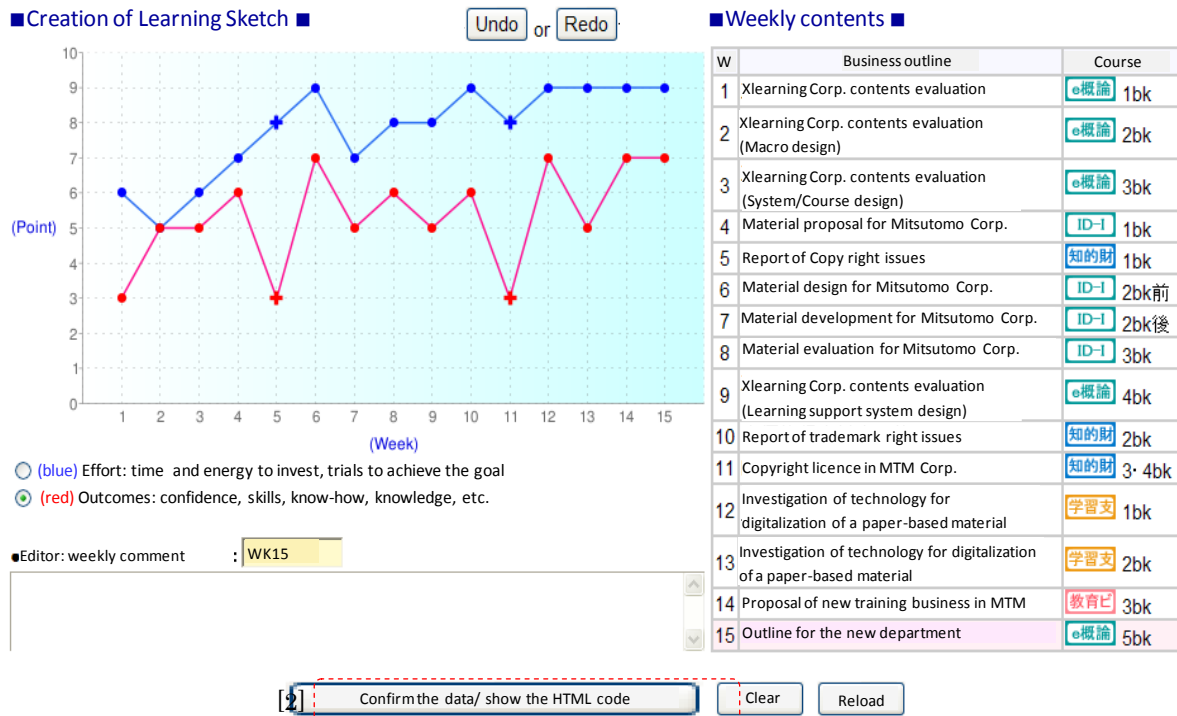


Figure 3. Example of the Learning Sketch Tool

The Method of Design and Development of the Learning Sketch

When we designed the Learning Sketch interface, our decisions were aimed at the activity of the Learning Sketch to be incorporated into other activities. The Figure 4 diagram includes the perspectives we considered when we decided the design. We put the target goal of the activity in the center, and the first thing we decided was activities. We kept in mind two areas in activities: focus and visualization. Focusing on the objective of the activity is essential for getting expected outcomes as well as reducing the student's load; we needed to avoid unnecessary duplication with any other activities. As designers, we chose to anticipate how the learners' would think according to various factors, such as time, range, depth, and challenge level, which we called Balance. For instance, we put the Learning Sketch activity as an introduction to the reflection section (Focus), because we considered the visual design to be simple and fun (Visual). Following Parrish (2007), we provided the web graphical site where students can complete all activities to make a match with the student's intuition. About smaller specifications, such as the number of viewpoints and numerical rankings offered to the students, we went through the time limitation, the range of reflections (Balance) as well as the consideration of focus and visualization issues. Lastly, we added information enabling students to complete the activity in a quick and efficient manner (Support).

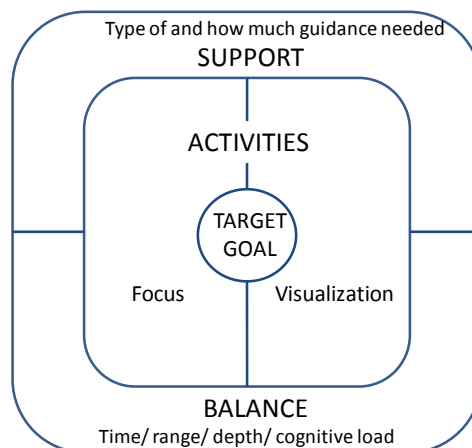


Figure 4. *Diagram for Design Decisions of the Learning Sketch Activity*

As shown in Figure 3, we used JavaScript to save plotting activities, manage student comment data, and create the dynamic web pages. For graph drawings, we selected Google Chart API (2010) web service. The Google Chart Tool enables adding charts to any web page; as in response to a URL GET or POST request, this tool generates graphic PNG images. This function enables us to insert any graph on the web pages.

We could select various charts, colors, labels, and styles from Google API, but we needed to create the comment function ourselves to save the graph data; as a result, we used the HTML Image Map and JavaScript for our original operation web page for the Learning Sketch (Figure 3). For instance, if the user clicks on any two charted dots on the graph, a line connecting between the two dots will appear. When the user clicks on the point again, the area for comment appears. The plus sign (+) indicates that a comment has been inserted; the bullet sign (●) indicates that no comment has been inserted (Figure 3 [1]).

We also added an “Undo” and a “Redo” button to enable the users to edit easily. As default conditions, we set five bullet points in the center of the graph as a base for evaluating their judgment of effort (blue line) and perceived outcomes. When users click on the “confirm the data/show the HTML code” button (Figure 3 [2]), the graph data that the user created is sent to the drawing system; the server of the Learning Sketch saves the information as log data, then it returns to the HTML code (Figure 5 [1]) and previews the graph as a response to the browser (Figure 5 [2]).

Results

Spring Semester

Among 12 students who completed the first semester, 7 completed the graph creation and uploaded the data on the WebCT discussion board. Four of the 5 students who did not use the Learning Sketch, took several accredited courses, as part-time non-degree students, before they became full-time degree students. The other students partially created a graph, but did not complete all the activities.

「学びのスケッチグラフ」…WebCTへの投稿用HTMLソースコード

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■WebCT貼付用HTMLコード■

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