"Learning Sketch": A Learning Reflection Activity Design

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Abstract: In this study, we developed a tool, the Learning Sketch, for both students and instructors to recognize and confirm the student's achievement, within a semester in a story-centered curriculum. Students see what and how they learned through each activity and then unify all compulsory courses activities into a series of learning activities provided in a unique curriculum, namely, a story-centered curriculum (SCC). In this paper, we report the results of providing the Learning Sketch for students to use after 2 semesters: fall and spring. The Learning Sketch enabled students to have visible learning activities, because the tool presents a series of all activities conducted throughout the SCC. The comments in the Learning Sketch are unrestrained and all students expressed their feelings freely. At the presentation we will present the lessons learned.

INTRODUCTION

Among the approaches to improve learning activities is the story approach, which is used as an educational strategy. This approach is a way to provide knowledge and skills that learners learn 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. In this study, we developed a tool, Learning Sketch, to recognize and confirm, within one semester, the student's achievement in a story-centered curriculum; students see what and how they learned through doing each activity and unifying all activities of compulsory courses into a series of learning activities provided within a unique curriculum: the story-centered curriculum. In this paper, we report the result of our provision and the students' use of the "Learning Sketch" after both the fall and spring semesters.

VISUALIZING LEARNING ACTIVITIES

In all learning activities, for the learners, when monitoring their own learning activities in a learning process it is important for them to recognize their own progress and the level of the achievement. The learners need to monitor on their own, 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 assumed as a method to support learning activities. Scientific virtualization tools in science education a case 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 origial story based on the relationship among the courses. Visualizing tool is a way to reflect on their activities, but more important is that by revisiting their activities, we expect our students to do reflect the story.

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 knowledge into the materials or class implementations, considering various learning settings, and then find the best approach, with the tools, for the target instructional setting. Those are important steps to complete the instructions, but become rigid formats; Parish makes a point that it is 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 of the level of action. The narrative descriptions help designers understand how students experience the lesson and the relationship of activities from point-to-point.

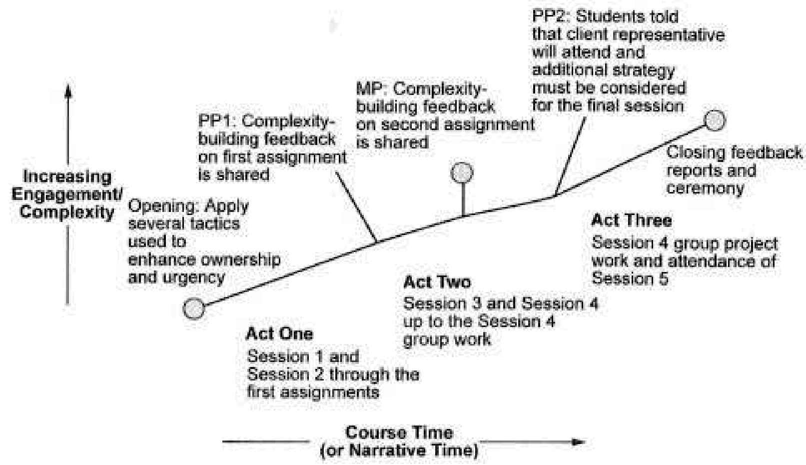

Figure 1. Narrative Diagram
Comparing Visual Instructional Design Languages: A Case Study (p. 322)

The purpose of the diagram is to image and draw the learner's a holistic learning experience, which is unlike from 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 processes 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 arrange it as a tool for our students.

DESIGN OF THE "LEARNING SKETCH"

Background Context

Since 2008, we have employed a Story-Centered Curriculum (SCC) approach (Schank, 2007), in this master's program, 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, and making mistakes, in a virtual environment (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). An SCC has been successfully implemented at Carnegie Mellon University's software engineering and e-business curricula, at the master's level (Schank, 2007).

Learning Sketch

The Learning Sketch (Figure 2) 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 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 reflecting on activities, in 2009 we embedded the Learning Sketch as a new tool to aid learners in their reflection.

Purpose

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.; 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.

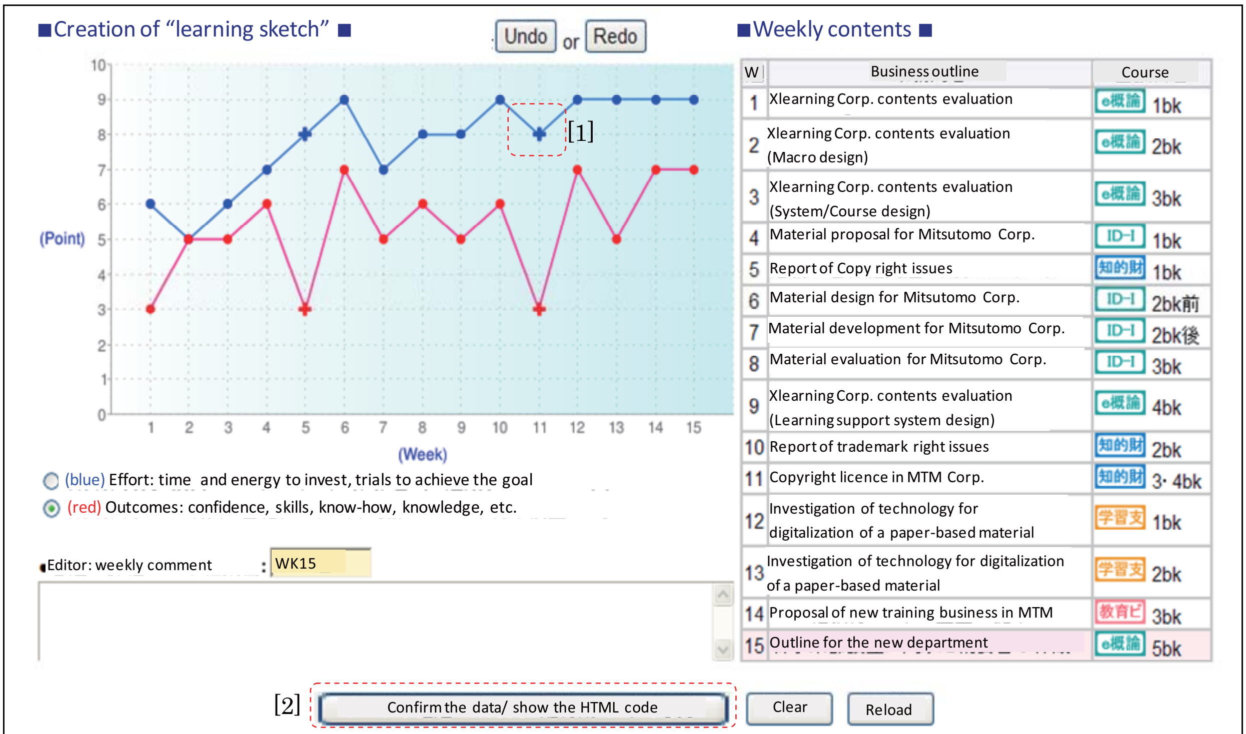

Figure 2. Example of the Learning Sketch Tool

Development Method of the Learning Sketch

As shown in Figure 2, we used JavaScript to save plotting activities, manage student comment data, and create the dynamic web pages. For graph drawing, 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 2). 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 2 [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 2 [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, and then it returns to the HTML code (Figure 3 [1]) and preview the graph as a response to the browser (Figure 3 [2]).

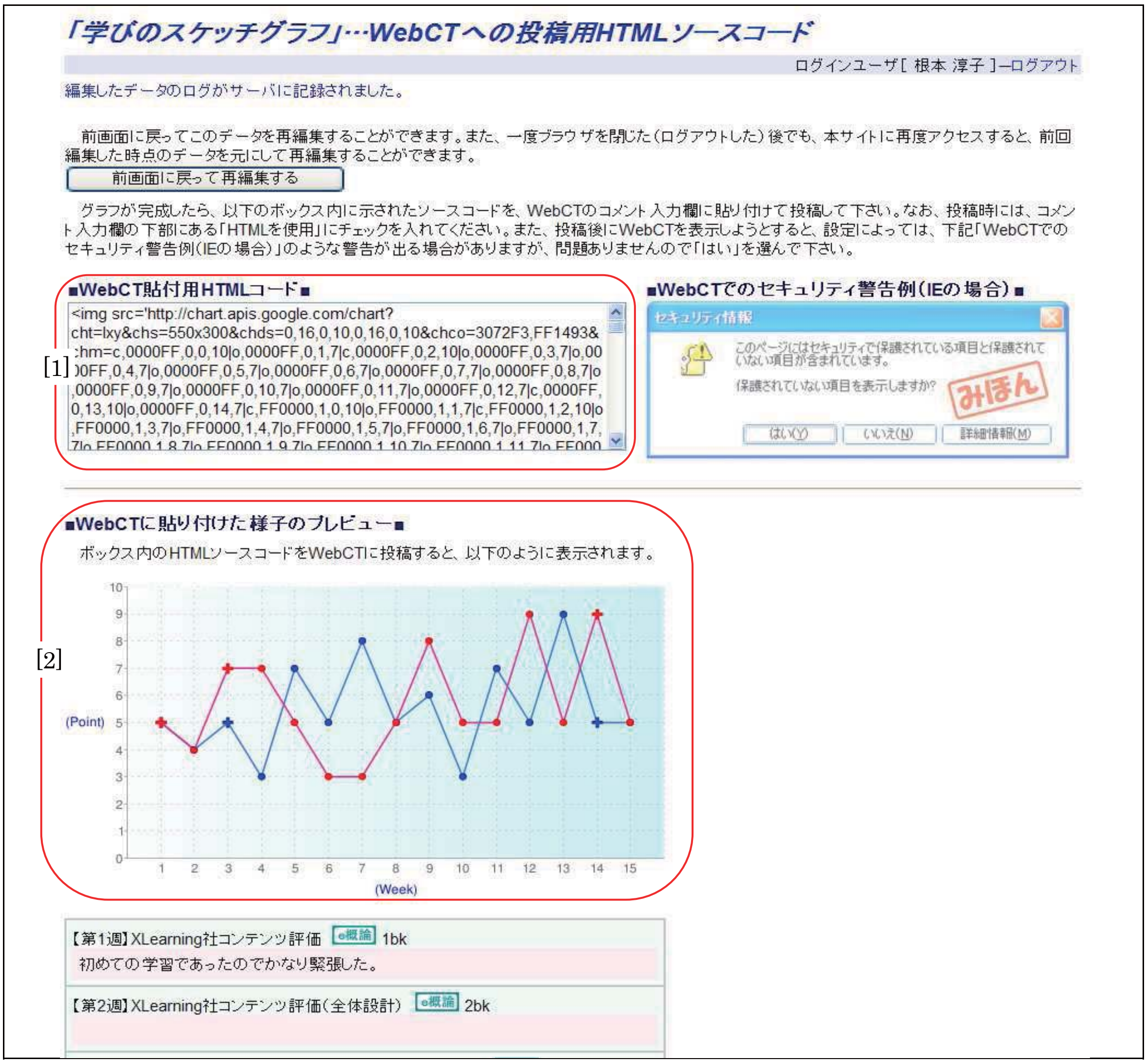

Figure 3. Learning Sketch Preview Window with the HTML Source Code

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 nondegree students, before they became full-time degree students. The other students partially created a graph, but did not complete all the activities.

The weekly "effort" and "perceived outcomes" scores have similarities. Also, for most of the weeks, the "effort" scores were higher than the "perceived outcomes." In each category, there were 2 to 5 comments, and a total of 52 postings in the optional comment areas ($\bar{x} = 3.5$); but 2 students did not post any comment on the tool. When we see each student's response, "effort" was higher than "perceived outcome" in most of the 15 weeks. Among the total of 105 responses (15 answers x 7 students), the number of the responses that the students scored "effort" higher than the score of "perceived outcomes" was 43 (36%), and the score of "effort" and "perceived outcomes" was the same in 44 responses (37%). On the other hand, the students scored "perceived outcomes" higher than "effort" in 18 responses only (18%). This indicates that the students felt that they put more effort into their work than the degree to which they actually accomplished the work. There are several significant points from each student's graph.

(1) A similar graphic shape (Students A and B)
The shape of the graph created by students A and B is very similar. Both gave a low score to "Intellectual Property and Private Rights in the Network Society," but we assume the reason was preknowledge of the subject, as in the following comments:

A: I think I could work without much difficulty about legal subjects. I opened a book of "six major laws" after a long interval and this reminds some memories.
B: I had some knowledge about copyrighting, so the content was easy. Handwriting tasks were a bit astonished.

Both had IT skills related to the subject, which helped them do their tasks
A: I have development experience but Flash and VOD were new to me. I could imagine what they are, although it was only an introduction.
B: Practical activities are fun. I definitely would like to take other IT related course.

(2) Higher satisfaction after taking each course (Student C)
Student C gave a 5 point score to two-thirds of the 15 weeks and a 10 point score to the remaining one-third. It seems that she gave a 5 point score to areas that she did not need to study; she had taken those course areas as a part-time before she became a full-time student.

(3) Reexamination of the final assignment
The final assignment is for students to create a business plan for a new department in which they integrate knowledge they learned in the first semester. The average score of "effort" for the final activity was over average, but we thought that the score of 6.6 for "perceived outcomes" was low for a final activity. Also, there is a difference between the scores of "effort" and "perceived outcomes." The designers expected the students to gain confidence by applying their knowledge, but they still do not have enough experience to meet such high expectations.

Table 1. Result of “Learning Sketch”: effort (spring, 2009)

Week	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
Average	6.1	6.7	7.1	8.0	6.0	8.1	8.7	7.9	7.7	6.9	6.6	6.9	6.6	7.9	8.1	7.3
Min	5	5	5	5	1	5	5	5	5	3	3	5	5	7	6	4.7
Max	9	9	9	10	10	10	10	10	10	10	10	9	8	10	10	9.6
SD	1.46	1.25	1.57	1.83	2.89	1.68	1.80	1.68	1.70	2.48	2.44	1.46	0.98	1.07	1.35	1.7

Table 2. Result of “Learning Sketch: ”perceived outcomes (spring, 2009)

Week	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
Average	6.0	6.4	6.7	7.4	6.0	7.6	7.6	6.7	7.0	6.6	6.4	6.1	6.4	6.9	6.6	7.0
Min	5	5	5	5	2	5	5	5	5	4	4	5	5	6	4	4.7
Max	8	8	9	10	10	10	10	10	9	10	10	8	8	8	10	9.4
SD	1.15	1.40	1.80	1.62	2.38	1.62	1.72	1.70	1.73	1.90	2.30	1.35	1.51	0.69	2.07	1.7

Fall Semester

The spring semester ran SCC activities weekly, and the students completed an assignment each week. In the fall semester, students worked course assignments as project-type activities, as shown in Figure 4, and they could schedule their activities in an assigned timeline. In the Learning Sketch of the fall semester, we listed, in a recommended order, the 13 activities that were to be finished. Tables 3 and 4 show that the average scores of two perspectives of the Learning Sketch in the fall semester was lower than in the spring semester.

The 10 students who learned with the SCC posted the graph with the Learning Sketch. Tables 3 and 4 show the score the students marked in both “effort” and “perceived outcomes” of each assignment. The minimum score 0 resulted from the student who did not participate in the course, because she took the courses as a nondegree student before the fall semester. All compulsory courses are in the SCC, which is common condition to all the students, even the students took the course before. They are not required to retake the course, but welcomed to participate activities such as discussions they are interested in.

When we see each student’s response, in the same way of the spring semester, “effort” was higher than “perceived outcome” in most of the 15 weeks. Among the total of 130 responses (13 answers x 10 students), the number of the responses that the students scored “effort” higher than the score of “perceived outcomes” was 64 (36%), whereas the score of “effort” and “perceived outcomes” was the same in 49 responses (27%). The students scored “perceived outcomes” higher than “effort” in 17 responses only (9%), which is the half percentage of the spring semester (18%).. The total number of comments was 97, and each student posted a range of 1 to 10 comments.

Each student responded differently about each week’s experience, and this also appears in the SD, as shown in the above tables. From their comments, the students were observant about several issues:

(1) The difference between the number of the comments from new students and from students who have taken courses in advance
The degree of their participation is evident in the Learning Sketch comments. The average number of comments from new students was 11.5, whereas the average number of comments from the 4 students who have taken several of the target courses, was 4.8, and the length of their comments is obviously shorter than the new students. This indicates how involved the students became in the activities related to the spirit of engaging in the Learning Sketch activities.

(2) Learning experience from different viewpoints
Most students expressed their personal experience in the activities. For instance, student D, who could not meet any of the deadlines, mentioned her lateness in 6 of her 13 comments. She expressed several contributions to the team work, but most were her struggles to complete activities. Student E’s comments were based on the activities’ features such as synchronous lectures and meetings, asynchronous meetings in which students express their opinion about the difference of the activities.

Figure 4: Schedule of the Fall Semesters in the SCC (fall, 2009)

Table 3. Result of "Learning Sketch": effort (fall, 2009)

activities	1	2	3	4	5	6	7	8	9	10	11	12	13	Total
Average	6.0	5.3	6.9	5.1	7.7	5.4	5.4	8.2	5.9	7.8	6.4	5.7	6.0	6.3
Min	1	0	3	4	4	4	4	6	0	5	3	0	5	3.0
Max	9	9	10	8	10	8	7	10	9	10	10	9	10	9.2
SD	2.6	2.4	2.3	1.6	2.0	1.2	1.1	1.5	2.5	1.7	2.2	2.4	1.5	1.9

Table 4. Result of "Learning Sketch: "perceived outcomes (fall, 2009)

activities	1	2	3	4	5	6	7	8	9	10	11	12	13	Total
Average	6.2	5.4	5.9	4.6	6.0	4.7	4.4	5.6	5.2	6.1	4.7	5.4	5.0	5.8
Min	1	0	1	1	2	3	3	1	0	3	1	0	3	2.3
Max	9	9	10	7	10	6	7	10	9	10	10	9	8	9.0
SD	2.8	2.4	2.9	2.1	2.5	0.9	1.4	3.1	2.3	2.6	2.5	2.3	1.5	2.1

(3) Chorological changes within the activities

From the comments of student F, it gradually appeared through stress reduction about his team working online. This person commented that he gradually began to enjoy the teamwork because of less stress of the work. From their comments, these changes in feelings were not observed many of the students, but some expressed the changes they felt.

DISCUSSION

The inclusion of the Learning Sketch enabled students' learning activities to become visible. The tool presents a series of all activities conducted throughout the SCC. All students appear to have expressed their feelings freely in the Learning Sketch comments.

From the written and statistical results, we found that being able to see what the students think about their course activities, which cannot be seen through the ordinal mode of activities, helps teachers learn how to support the students in their learning process. Also, several direct comments show that there is a need to improve the contents of the course. That students who had taken courses before the SCC were less involved the Learning Sketch, seems to relate their satisfaction.

From some students' comments, we see that they made various efforts to complete each activity. We observed some clear changes to the students' attitudes or feelings, which helps improve their learning process, but we need to be aware that the Learning Sketch only shows the students' activities and achievement, rather than their entire course experience.

The information obtained from the Learning Sketch tool is limited. Therefore, further analysis will provide students' learning patterns and suggestions to improve the course contents and assignments. The analysis with the combined use of the graphic data, supplemental comments, and other results that we obtained are necessary for improving the student learning experience and outcomes in the SCC.

Reference

Edelson, D. C., & Gordin, D. (1998). Visualization for learners: a framework for adapting scientists' tools. *Computers & Geosciences, 24*(7), 607-616.

Google Chart API (2010) http://code.google.com/intl/ja/apis/chart/

Roy, D. P. (1993). The collaborative visualization project. *Commun. ACM, 36*(5), 60-63.

Janssen, J., Erkens, G., Kanselaar, G., & Jaspers, J. (2007). Visualization of participation: Does it contribute to successful computer-supported collaborative learning? *Computers & Education, 49*(4), 1037-1065.

Jermann, P., Soller, A., & Muehlenbrock, M. (2001). From mirroring to guiding: A review of state of the art technology for supporting collaborative learning. Paper presented at the European Conference on Computer-Supported Collaborative Learning EuroCSCL-2001, Maastricht : Pays-Bas

Jonassen, D. H., & Rohrer-Murphy, L. (1999). Activity theory as a framework for designing constructivist learning environments. *Educational Technology Research and Development, 47*(1), 61-79.

Schank, R. C. (2007). The story-centered curriculum. *eLearn, 2007,* 1.

Nemoto, J., & Suzuki, K. (2004). GBS checklist for training application. A paper presented at the International Symposium and Conference on Educational Media in Schools, Kansai University,

August 3-4, 2004, Osaka, Japan, 75 - 82.

Suzuki, K. (2009). From Competency list to curriculum implementation: A case study of japan's first online master's program for e-Learning specialists training. *International Journal on E-Learning*, *8*(4), 469-478. Chesapeake, VA: AACE.

Suzuki, K., Nemoto, J., Oyamada, M., Miyazaki, M., & Shibata, Y. (2009) Upgrading an online master's degree program based on Story-Centered Curriculum (SCC): A case study, Proceedings of *ED-MEDIA 2009*, pp. 591-598.

Tessmer, M., & Richey, R. (1997). The role of context in learning and instructional design. *Educational Technology Research and Development, 45*(2), 85-115.

Schank, R. C. (2007). The Story-centered curriculum. *eLearn Magazine*, Feature Article 47-1, Association for Computing Machinery [Available online] http://www.elearnmag.org/subpage.cfm?section=articles&article=47-1

Schank, R. C. (1996). Goal-Based Scenarios: Case-Based Reasoning Meets Learning by Doing. In D. Leake (Ed.), *Case-Based Reasoning: Experience, Lessons & Future Directions*. Cambridge: AAAI Press/MIT Press.

Schank, R. C., Fano, A., Bell, B., & Jona, M. (1994). The Design of Goal-Based Scenarios. *The journal of the learning sciences*, 3(4), 305.

Schank, R. C. (1994). *What we learn when we learn by doing*. Evanston, IL: Northwestern University. Document Number)

Parrish, P. (2007). Plotting a Learning Experience. In S. Luca Botturi & T. Stubbs (Eds.), *Handbook of visual languages for instructional design: theories and practices* (pp. 91).

Riesbeck, C. K. (1996). Case-based teaching and constructivism: Carpenters and tools. In B. G. Willson (Ed.), Constructivist learning environments: Case studies in instructional design (pp. 49-61). Englewood Cliffs, NJ: Educational Technology Publications.