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Face to Face Group Discussion Exercise Support System

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Abstract: To help students solve exercise problems on information modeling systems, we introduced face-to-face group discussions during which each group member explains his or her own solution, and then all members explore a solution as a group. Improved motivation levels, and other beneficial effects, were observed in participants following their completion of discussion exercises. In this paper, we describe a system to support such face-to-face group discussion exercises. The results of the system's in-class trial suggested that it had several benefits.

Keywords: Group discussion, collaborative learning, learning management system

1. Introduction

In recent years, university student diversity has increased significantly. Consequently, it has become necessary to devise lessons adapted to a wide range of student attitudes toward learning and academic achievement in order to help all students attain the required level of understanding. We proposed a course design that combines ICT-based individual studies and face-to-face collaborative learning, for students taking introductory object-oriented modeling classes; and then demonstrated the design's effectiveness (Takai et al 2009 & 2011). However, some problems emerged as a result of this new course format, such as increased instructor workload resulting from the need to prepare for group discussions. To address these problems, this study aims to develop a system that supports face-to-face group discussions when solving exercise problems. We call this system the Group Discussion Exercise Support System (GDS).

In the field of information system design and development, various support systems for collaborative learning have been developed (Hazeyama 2000, Beghaei et al 2007, Nakamura et al 2006). The purpose of these support systems is to help students practice developing information systems and executing modeling projects. On the other hand, the GDS has distinctive features supporting face-to-face group discussion exercises.

2. Practice of the Course Blending Individual and Collaborative Learning

2.1 Outline of Target Course

The target course called "Laboratory on Information Systems 2" consists of 15 classes, each comprising two consecutive periods, and is held for juniors in the Department of Human Information Systems. The course concerns the practice of modeling that is part of upper processing in information system development, and course goals include being able to describe a modeling outcome, as well as being able to create a program that corresponds to a given model.

The entire course consists of four learning components: (1) programming basics using a database, (2) modeling basics, (3) modeling practice, and (4) system development programming corresponding to a model. However, this study focuses on the second and third components: modeling basics and modeling practice.

2.2 Design of the Entire Course

The course is divided into two parts (each with a different learning-style focus): (1) acquiring basic skills, principally through individual learning; and (2) gaining practical skills, principally through collaborative learning. The first part consists of learning management system (LMS)-based individual learning and exercise problems. Basic skills and knowledge relating to programming, databases, and modeling are acquired in this part of the course. Figure 1 shows the learning activity design for basic skills acquisition.

The first part of the course, described above as "(1) acquiring basic skills, principally through individual learning," incorporates LMS-based individual learning, in the form of self-learning style lessons. In previously conducted lessons, we were able to confirm that individual learning with a self-learning style is an effective approach for acquiring knowledge and improving student motivation (Sasaki et al 2005).

The modeling practice portion of Figure 1 employs a method combining both individual and collaborative learning. Students first work individually to find solutions for given exercises, and then submit their solutions. Following the submission of their solutions, students engage in a group discussion activity.

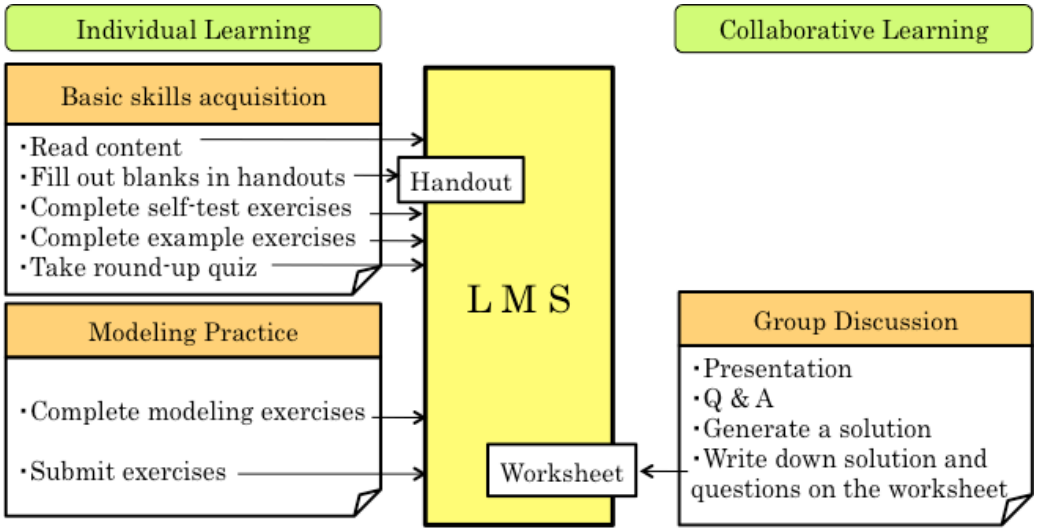


Figure 1. Learning Activity Design for Basic Skills Acquisition.

2.3 Introduction of Group Discussions and Its Effects

Students must complete exercise problems as part of their individual learning, and they must submit their solution files to the LMS before the next class. As face-to-face collaborative learning, students engage in a face-to-face group discussion for the first 30 minutes of each class following the submission of solution files.

In group discussion, each group member presents his or her own solution (reached individually) to the group; after which the group as a whole must come up with a solution. During this process, we expect students to improve their understanding through peer teaching, and by clarifying for each other any issues that may have been unclear prior to the discussion. In addition, we have made a rule that during Q&A each member must comment on each presentation. We expect students to become comfortable with giving presentations, asking questions, and forming opinions through discussion. After the group discussions, the instructor provides feedback to the entire class for the given exercises by referring to the respective worksheets that have been submitted.

We did not include group discussion of exercise problems in our initial implementation of this course. Later, after introducing group discussions, we evaluated their effectiveness by comparing test results from before and after the introduction of discussions, and found no significant difference in terms of students' acquisition of basic skills. However, we discovered that the group discussions were effective in improving students' acquisition of basic skills for putting modeling into practice. In

addition, the results of student surveys revealed that students felt the group activities had helped them grow and acquire communication skills. Further student interviews revealed that the introduction of group discussion was effective in improving student motivation, as a result of students becoming more familiar with their peers and more comfortable with discussion (Takai et al 2011).

3. Group Discussion Support System(GDS)

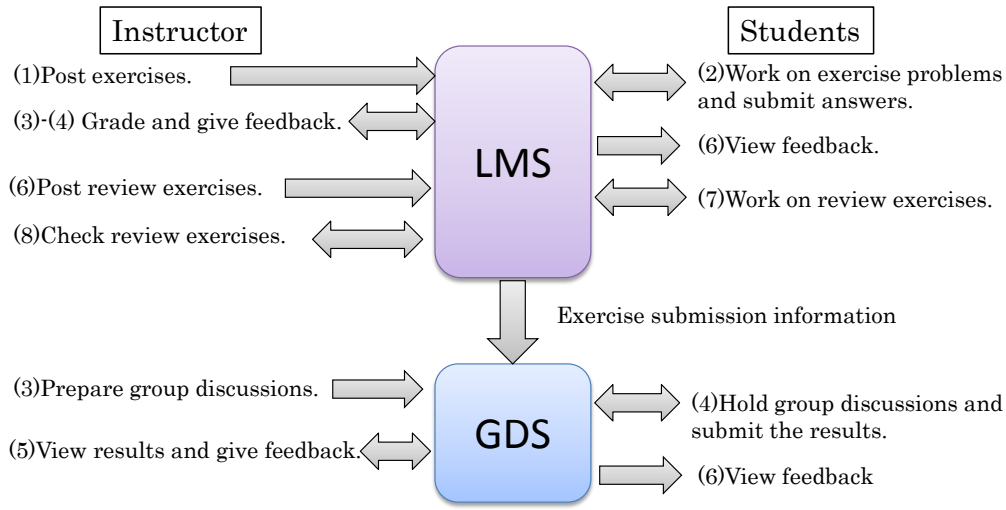
3.1 How does the System(GDS) support Group Discussion

The procedures for the group discussion exercises supported by the GDS are described in greater detail in Section 2. These group discussions have the following distinctive characteristics:

- They are a face-to-face, 30-minute group activity conducted during class, and the discussions are held simultaneously by all groups in the class.
- There are three or four members in each group, membership is assigned by the instructor, and groups disband after each group discussion session.
- During group discussion, each member first presents his or her own individual solution, and then the group as a whole generates a solution.
- There is a rule requiring all members to make comments because one of the goals of the group discussion is to practice working cooperatively in a group.

The GDS aims to address several problems and issues affecting current classes:

1. There is significant instructor workload involved in preparing for group discussions. The instructor must divide students into groups, and create a seating chart and worksheet. The GDS automates student grouping and seating chart generation.
2. Current worksheets are paper-based, and only the instructor has access to them once submitted. Digitizing the worksheets will allow the instructor and students to share information and promote the review of worksheets by students.
3. The GDS will support the instructor in providing feedback. Currently, the instructor gives a brief lecture (including feedback) based on the collected solutions and questions. However, the instructor is typically unable to answer all student questions in this time. The GDS will allow the instructor to focus his or her in-class feedback on the most important points, while answering other comments electronically after class.
4. The GDS will enable students to view worksheets submitted by other groups, as well as instructor feedback. It is expected to enhance student understanding.



LMS: Learning Management System GDS: Group Discussion Support system

Figure 2. Relationship between the Learning Management System (LMS) and the proposed Group Discussion Exercise Support System (GDS).

3.2 Relationship between the LMS and the GDS

Figure 2 shows the relationship between the LMS we are using in our course and the proposed GDS. The numbers shown in the figure correspond to specific actions, taken by the instructor or students, in the order they are performed (separate actions indicated by the same number are performed simultaneously).

In our course (including group discussions), we employ an LMS (Blackboard Learn R9.1) that has already been implemented at the university, to support individually performed course components. For these components, the LMS is used to deliver instructional materials, test student understanding, collect reports, and provide individual feedback. The GDS supports face-to-face discussions, and provides access to discussion outcomes after they have been submitted.

3.3 GDS Functions for Students

The GDS has the following functions for students:

- Viewing exercise problems and seating charts
- Filling-out worksheets during group discussion
- Functions for viewing feedback after group discussion

Figure 3 is an example of a screenshot, showing the worksheet students use to input their answers and/or comments. The upper half is used when each student presents his or her personal solution to the group, and the bottom half is used when creating a group solution.

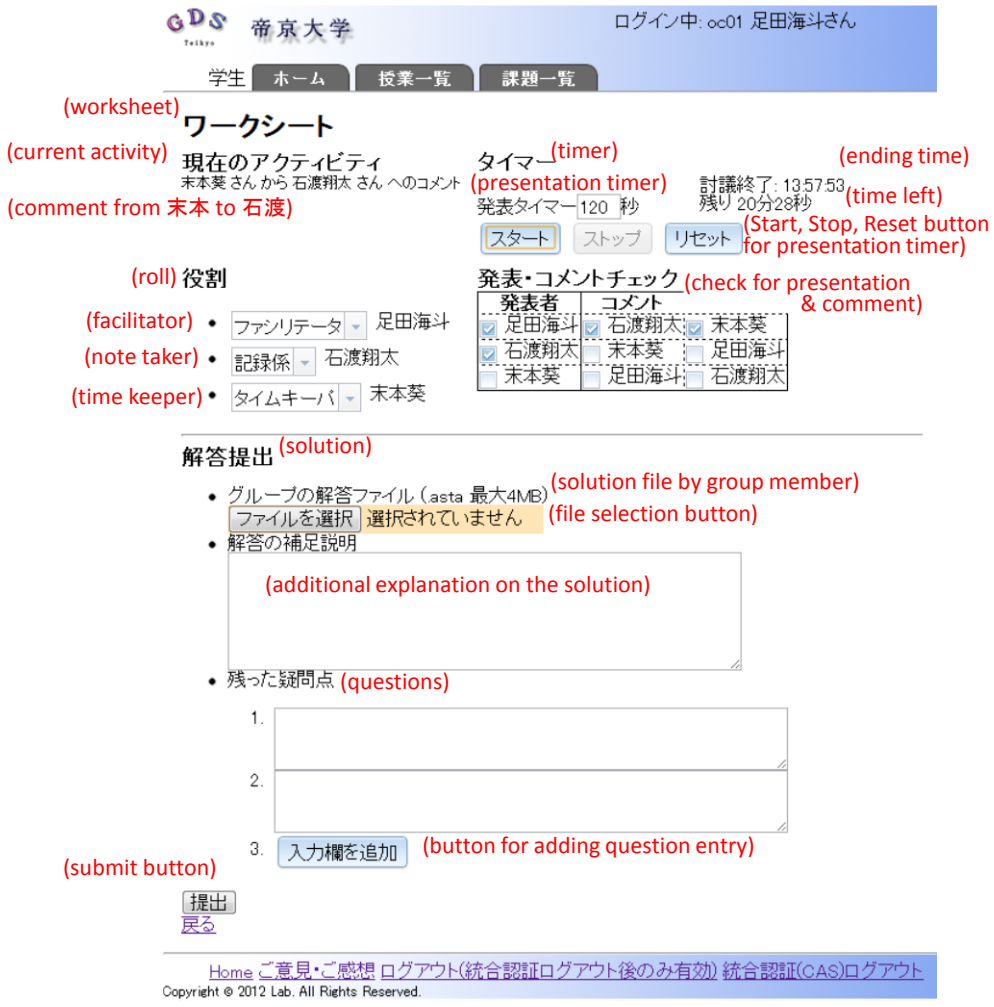


Figure 3. An Example of an Electronic Worksheet.

3.4 GDS Functions for Instructors

The GDS has the following functions for Instructors:

- Management of exercise problems and users
- Input of IDs of students with submissions, and generation of groups
- Management of start and end time of group discussions
- Viewing the worksheet and entering feedback

Groups can be generated automatically by the GDS, or the instructor can manually assign groups. Automatic grouping by the GDS follows these guidelines: Students who submitted exercise problems are divided into groups of three; however, groups of four can be created, if there are remaining students. Grouping is done randomly; however, students who were members of the same group in previous discussions are not grouped together again, where possible.

4. Trial Use of GDS in the Classes and Evaluation

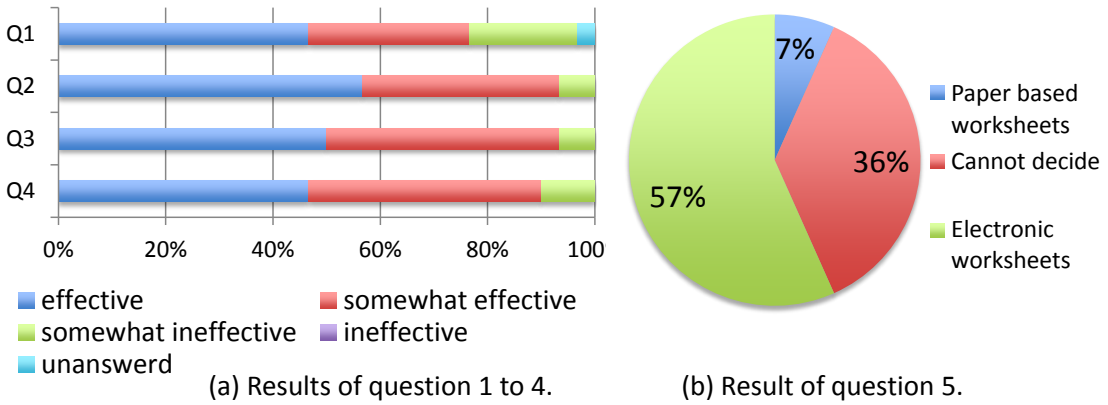
We tested the GDS in two classes of "Laboratory on Information System 2" course, held during the first semester of 2012. The class consisted of 31 juniors, and they held group discussions using paper-based worksheets from the third through sixth class sessions. In the seventh session, group discussions were held using both the GDS and paper-based worksheets. Group discussions during the eighth session were conducted using only the GDS. The exercise themes for the seventh and eighth sessions were class diagrams and sequence diagrams, respectively; and in both sessions, the number of discussion groups was nine.

For both the seventh and eighth sessions, the instructor entered feedback to student questions after the discussion period, and allowed all students to view other groups' answers, questions, and instructor feedback. The seventh session had 12 entries for student questions and comments, and 10 instructor feedback entries. The eighth session had 10 student and 11 instructor entries.

After each session, students were asked to submit individual answers to a review exercise by the following week. In addition, students took a survey regarding the GDS during the time when the seventh and the eighth sessions were held.

The survey consisted of the following questions:

Q1 Was the system effective overall in advancing the learning activities?
Q2 Was the ability to refer to other groups' worksheets effective?
Q3 Was the ability to receive instructor comments on an individual basis effective?
Q4 Was the ability to view worksheet content after its submission effective in encouraging review of the exercise?
Q5 Do you prefer paper-based or electronic worksheets (or cannot decide)?
Q6 Based on your response to Q5, explain why you chose paper-based or electronic worksheets (or could not decide)?
Q7 Do you have any other impressions or concerns?



(a) Results of question 1 to 4. (b) Result of question 5.

Figure 4. Results of the survey. The number of respondents was 30, representing a collection rate of 97%.

Figure 4(a) shows the compiled results for Q1 through Q4. The Q1 results reveal that the GDS was considered, overall, as effective or somewhat effective. The Q2 results show that the ability to view other groups' worksheets was considered especially effective. In addition, many students felt that receiving individual feedback from the instructor (Q3), and being able to view submitted worksheets at a later time (Q4) were effective. More students answered "somewhat ineffective" to Q1 than they did to Q2 through Q4; thus improvements should be made to the GDS in areas other than those referenced in Q2 though Q4.

Figure 4(b) shows the results for Q5. The majority of students preferred electronic worksheets; though quite a few students answered "cannot decide." Few students preferred paper worksheets.

In response to Q6, those who preferred paper-based worksheets gave reasons such as being able to write small notes, being able to write important points quickly, and that it was easier to remember things written on paper. On the other hand, the reasons for preferring electronic worksheets included (in addition to the benefits described in Q2 through Q4) that writing was more efficient with a computer than by hand, that it was easier to formulate answers using the electronic worksheets, and that such worksheets were environmentally friendly.

In one of the responses to Q7, the student's comments regarding the advantages of the GDS mirrored our own goals for the system:

Using the GDS while studying was very helpful, as I could view the final answers submitted by other groups while I worked on the review exercise.

Nevertheless, some students did note areas where they felt usability could be improved.

5. Conclusion

This paper describes the group discussion support system (GDS) that we have developed, and the results of its trial in-class implementation. The GDS helps students practice presenting their own solutions in face-to-face small-group discussions, and explore solutions as a group. The survey conducted after the trial indicated that many students considered the GDS effective. We intend to study the problematic areas pointed out in the survey, and make improvements to the system in the future.

Acknowledgements

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