

# Design for Object-Oriented Modeling Course Blending Individual and Collaborative Learning Activities

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**Abstract:** In this paper, we describe that we have designed an object-oriented modeling course by CMS-based individual learning and face-to-face collaborative learning. In 2008, we conducted classes based on the course design in which students learn in two phases. In the first phase, students learn basic knowledge and concepts in individual learning. In the second phase they apply the knowledge and concepts to the modeling of information systems through a collaborative learning. The results showed that the design was effective for students to reach an adequate level of basic knowledge and to enhance their experience of collaborative development.

**Keywords:** collaborative learning, individual learning, learning design

## Introduction

In the domain of information system development, the importance of education on modeling has been increased. We conducted classes for undergraduate students while practices of modeling education for engineers[1] and for graduate students[2] have been reported.

One of the most important activities for students is the practical application of knowledge in close association with knowledge attainment. Therefore, appropriately combined individual learning processes for acquiring new knowledge and concepts with collaborative team learning based on obtained knowledge will be effective.

In this paper we propose an effective design of object-oriented modeling(OOM) course by blending individual and collaborative learning activities. We have conducted individual learning style courses using a course management system (CMS) in programming education and suggested their effectiveness in acquiring knowledge and developing learning skills for students[3][4]. Based on the experience, we adopted a combination of CMS-based individual learning and face-to-face collaborative learning. The reason why we adopted face-to-face collaboration is that our target is one of on-campus courses in the university.

## 1. Methodology

The target, object-oriented modeling course is set for third year students and has seven 180 minute classes. Students are required to finish Java-language Programming 1 to 4 before their third year and they have learnt object-oriented programming in Programming 3.

We adopted Unified Modeling Language (UML) to describe results of modeling. The learning goal of the course is to facilitate team modeling at the initial stages of the process of information system development and to describe the results.

Figure 1 illustrates the outline of the course design in year 2008. Experiencing team modeling is essential for the achievement of learning goals. In addition, it is necessary to acquire basic knowledge before increasing the level of learning for good results through team modeling. Based on this recognition, we developed a program in which basic knowledge is acquired by individual learning in the first half of the course and team modeling is used as a form of collaborative learning in the second half of the course.

First, students experience individual learning processes to understand UML. They develop basic knowledge by studying course contents on CMS and printed handouts. Then, they work on tasks to draw the UML diagrams and write Java programs, and take a short test so as to make sure that they have met the initial learning goals. Students repeat these learning processes three times and take an examination which consists of multi-choice questions, to test their acquisition of basic knowledge about the notations and meanings of the UML diagrams. We call this the basic knowledge-confirmation test.

Following these steps, students collaborate in designing an information system and draw a model using UML. We constructed the team of students as a formal group [5] for this collaboration. They present on their results and team up to modify the models on the basis of comments and other feedback.

At the end of the course individual students are assigned to prepare final reports with consideration given to the results of modeling practices. This report is subject to one of the achievement evaluation methods. In addition, in the final class, students take an examination to which focuses on the ability of drawing UML diagrams from scratch. We call this exam the achievement level-evaluation test.

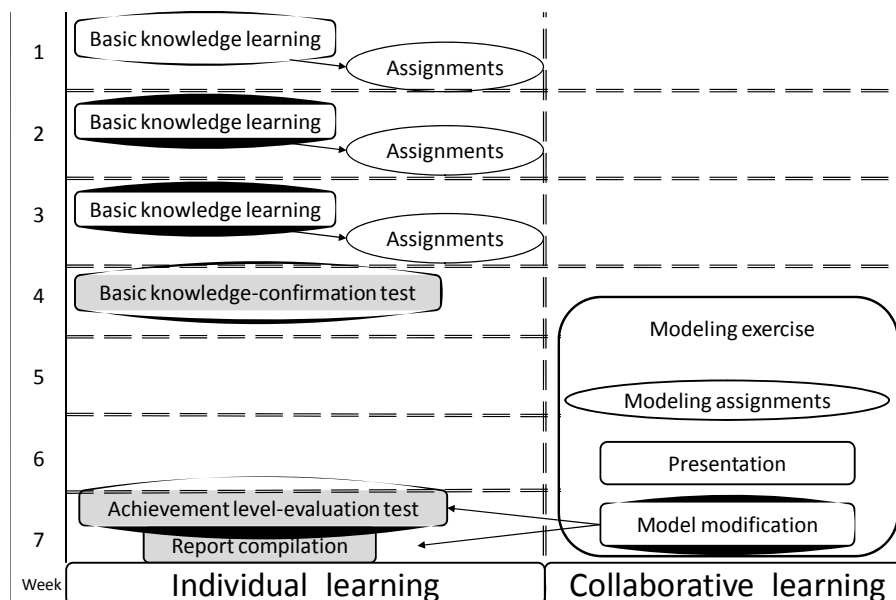


Figure 1: Outline of Class Practices

## 2. Results and Discussion

We applied these approaches to Information Science Exercise 2 for third year students in the Department of Human Information Systems, Faculty of Science and Engineering, Teikyo University, in the first semester of year 2008. There were 87 students in the two courses. We conducted a questionnaire survey after the seven classes had been completed and had 83 valid responses.

In the students' questionnaire, we asked students if they understood "UML diagrams necessary to model at initial stages of the information system development" through the entire course. In response to the questions, 73% of the students answered that they had understood those subjects well or to a certain extent.

Comments on the entire course suggest that many students understood system development for imaging and their understanding included what collaborative work should be like. In addition, presentations and question-and-answer sessions helped students develop their ability to express their opinions or to communicate with others. Students have a positive opinion for the collaborative learning activity done in the latter half.

The course design for year 2008 was intended to nurture students' ability to describe modeling results through the assignments after the basic knowledge learning in the first to third classes and the team modeling exercise in the fourth to seventh classes. The average score of the basic knowledge-confirmation test was 77.2 out of 100points. The score was fairly high and it shows the individual study done in the first half of the curriculum has worked very well. This might be because we have designed very effective class by adopting the learning material development method for a CMS-based individual learning based on instructional design concepts. Meanwhile average score of the achievement level-evaluation test was 53.9 out of 100points. The score was not high enough and there is room for improvement.

It is possible to guess from above, we think that our course design is successful to some extent. On the other hand, we have found that the attainment level to describe a modeling result is different from student to student. We plan to investigate in blending individual and collaborative learning more finely to improve student's achievement level for modeling in UML.

### 3. Conclusion

In the object-oriented modeling course using Unified Modeling Language, we conducted classes by combining individual learning to acquire new knowledge and concepts through collaborative learning to put the classes to their utmost use. The practical results showed the design for course blending CMS-based individual learning and face-to-face collaborative learning was effective for students to reach an adequate level of basic knowledge and to enhance their experience of collaborative development.

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