

Improving drawing education for Department of Applied Chemistry students

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Abstract

To acquire creative engineering skills, drawing and introductory manufacturing education have been introduced for first-year students of all departments at Akita National College of Technology. However, students of the Department of Applied Chemistry are uninterested in drawing because they think that drawing is unrelated with their specialization. The author has strived to teach drawing to those students who report no sense of purpose. From this year, the author has sought to teach drawing using the gamification method. This report clarifies changes in attitudes and educational effects of using the gamification method in drawing. Gamification is the process of using game thinking and game mechanics to raise a learner's motivation and to stimulate the learner's interest. Examples of gamification in drawing are awarding points to students according to their level of achievement and using leader boards. Survey results reveal that student motivation was increased. Improvement activities using gamification methods and their associated effects and problems are examined.

Keywords: *Drawing, Gamification, Student motivation, Educational improvement, Survey results*

Introduction

To acquire creative engineering skills, drawing and introductory manufacturing education have been introduced for first-year students of all departments (Y.kobayashi et al. 2011). In this context, the author has strived to teach drawing to those students who report no sense of purpose. Application of game design techniques to motivate learning and to enhance learning experiences is a growing trend known as gamification. The author takes a notion to teach using the gamification method in drawing. This study demonstrates clearly how gamification was introduced into drawing, its introductory methods, and its effects.

Drawing at the Department of Applied Chemistry

Drawing class and introductory manufacturing education are held for first year students of all departments at the Akita National College of Technology. The author takes charge of the drawing class for students in the Department of Applied Chemistry. The syllabus of the specialized subjects in the Department of Applied Chemistry is presented in Table 1. Drawing class lectures, which are 100 min long, are held once a week for about 15 times in one semester. In the class, students receive instruction in basic knowledge such as projection drawing, isometric drawing, cabinet projection drawing, dimensioning and exercises of those techniques. For exercises in a given subject, students who do not complete them within a certain time must complete them as homework. The submitted exercise subject is graded and returned. The drawing grade is evaluated by exercise results (60%) and test results (40%).

A questionnaire for drawing class and introductory manufacturing education was conducted at the beginning of the lesson. Figure 1 shows survey results. The questionnaire survey was administered to 42 students (26 men and 16 women.) and was evaluated on

Table 1. Syllabus of the specialized subject

Subjects	Credits by Year		
	1st	2nd	3rd
Information Processing		2	
Introduction to Industrial Chemistry		2	
Basic Chemistry		2	
Drawing	1		
Manufacturing Technology Workshop Practice	1		
Analytical Chemistry			2
Organic Chemistry			2
Experiments in Analytical Chemistry			2
Experiments in Organic Chemistry			2
Organic Chemistry			1
Applied Physics I			2
Inorganic Chemistry			2
Fundamental Physical Chemistry			2
Biological Chemistry			2
Chemistry of Natural Products			1
Basic Chemical Engineering			1
Experiments in Inorganic Chemistry			2
Experiments in Biotechnology			2
Total	8	8	15

a five level scale. Results clarified that the feelings of necessity and interest of drawing are lower than those related to introductory manufacturing education. Moreover, the result in which man is uninterested in drawing than woman was obtained.

Gamification

In 2011, Deterding et al. (2011) defined gamification as the use of game design elements, a characteristic of games, in non-game contexts. Although the concept has been explored primarily in marketing areas, the potential for its application has been extended to other

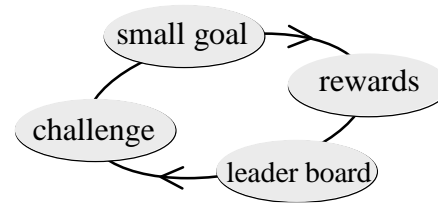


Figure 2 Gamification loop.

fields such as health, environment, government, and education (Lee and Hammer, 2011). Especially in education, gamification offers great potential to motivate students.

Gamification is typically achieved using achievement badges or points, and leader boards to show how close students are to completing a task, systems for exchanging points, and so on. A gamification loop is portrayed in Figure 2.

Introduction of gamification to drafting lessons

Achievement points and leader boards were first introduced. Partial points were given, although only overall points were attached to show which areas are weak in the submitted drafting. As an example of a partial points, usage of lines, accuracy of drafting, and the date of submission were checked. To usage of the line and accuracy of drawing, 0–5 points were awarded. In addition, 5 points were awarded if a student turned the report in by the assigned date. The mark of drawing was opened to the student of all class members. By exposing the point, it is possible to check on the students themselves. Those approaches led to a high number of students showing good effects, but no effect was seen for poorly achieving students.

Therefore, we considered the use of a mechanism to introduce a team system for cooperation in the class. Class members were divided into seven groups (Figure 3) and numbers of points were released for each group. Then, cooperative action in each group was visible. Especially, actions by which good students taught bad students and pointed out errors were observed.

The questionnaire was administered again at the end of the course. Survey results are presented in Figure 4. Results show a decreased number of students who think

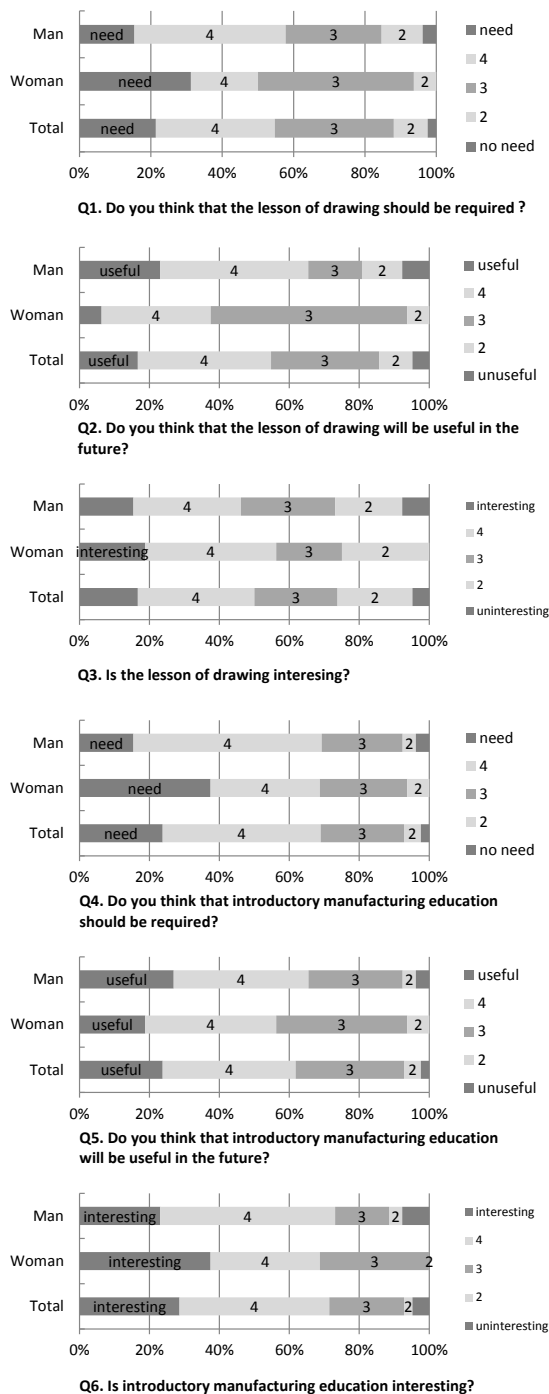


Figure 1 Survey results related to drawing and introductory manufacturing education.

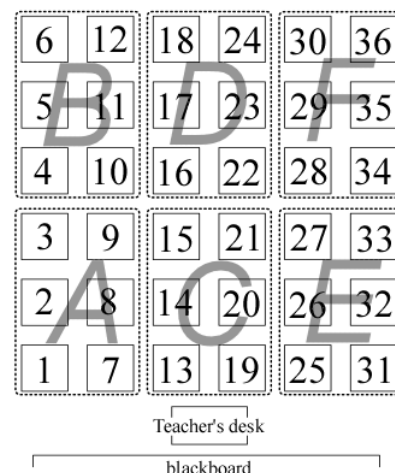


Figure 3 Grouping in the class.

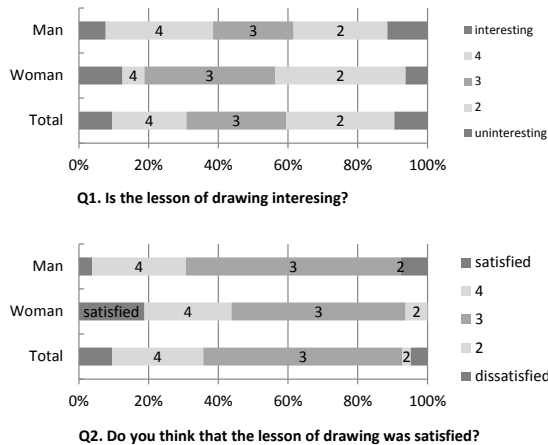


Figure 4 Survey results related to drawing after gamification introduction.

that drawing is interesting. It's necessary to make a detailed analysis of the causes of this results. And results show a number of students who think satisfied and more or less satisfied about gamification are 40%.

Conclusions

The authors introduced a system of gamification into the lesson of drawing, with a challenge related to drawing exercises, small goals that were subdivided and evaluated, a reward system that assigns points, and a leader board showing totals and points for each group. The questionnaire results showed that mutual communication was encouraged, and the student's motivation was improved. In this trial stage, changes were observed in student motivation. Gamification is regarded as offering further possibilities for improvement of learning outcomes.

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