Formative Evaluation of a Social Networking Platform in an Electric Vehicles Design Contest

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Abstract: This study designs and formatively evaluates a social networking service (SNS) platform and a management method to foster interaction among students and between students and experts who participated in the Electric Vehicles Super Micro Mobility Design Contest. Results indicate that the students learned about design from the meta perspective, including the importance of the relation between electric vehicles and urban transport. This learning was fostered by interaction among students and between students and experts on the SNS. Further, we found that the level of interaction on the SNS may be influenced by each stage in the design and by the characteristics of the contest.

Introduction

Recent research has found many learning effects associated with using social networking sites. For example, Brady, Holcom, and Smith (2010) reveal that SNSs foster student communication, reflection on discussion, and sharing ideas. In particular, SNSs can establish a cooperative learning environment (Selwyn 2009). Also, Yamauchi et al. (2012) used Facebook to implement a unique learning environment where high school students could learn about the realities of careers by being connected to many working adults.

In engineering education, globalization is increasing the need for problem-based learning and collaborative design (Richard et al. 2007; Stuart & Wayne 2011). This means that there is a need in engineering education for the design of SNS platforms and management methods through which students can share ideas about design amongst themselves and with experts, identifying mutual advantages and learning from each other's viewpoints. However, there is little research about the role of SNS in connecting various types of people in the learning environment. The use of an SNS platform in education may involve dividing students by field (such as engineering, design, and urban transport), which results in little interaction among students or between students and experts in various fields.

In this study, we focus on a design contest as a form of problem-based learning and design an SNS platform and management of the contest to foster interaction amongst students and between students and experts. Moreover, we evaluate this project formatively to obtain knowledge for improving next year's contest and for preparing future questionnaires.

About the Project

In this project, we implemented the Electric Vehicles (EV) Super Micro Mobility Design Contest, and collected 3D designs considered the body and the way to use in relation to society, city, people in the region, and culture through Web site. The Association for the Promotion of Electric Vehicles hosted the contest and Dassault Systèmes provided the software for 3D design and for a closed SNS platform, "SwYm." The contest

was also supported by the University of Tokyo.

We consider the following three points to be the prerequisites of fostering interaction among participants in this contest (both among students and between students and experts).

Platform design corresponding to the activity

Online platforms need to be divided into pages corresponding to functions composing the activity (Colison et al. 2000). Additionally, we needed to provide limited access pages in view of the nature of the contest. Consequently, we arranged SwYm's structure and set rules for the use of each page: general blog pages where students could post design progression for everyone and receive comments, closed blog pages where they could post design progression for particular people, and the Q & A blog pages where they could post only technical and administrative questions.

Visualization of the whole activity

Because there was a lot of interaction in this design contest, students and experts using SwYm might have felt overburdened if they had been required to monitor all posts. Therefore, facilitators worked to visualize the whole activity involved in this contest, including posting to the blog summarizing each team's progression every week. We also worked to show them the statistics of blog access and the list of participants to keep their motivation even if participants only read posts.

Design of the activity cycle

Participants might have felt burdened by having to access SwYm if they were active online for an extended period of time (Colison et al. 2000). Consequently, we set the activation cycle to a one-week period; the student teams posted on the blog about the week's progression each Saturday, the students and experts checked the blog posts and commented on them on Sundays, the facilitators posted summaries of each team's progression and interaction on the blog on Mondays, and the student teams made progress with their designs on weekdays in response to the suggestions received.

Implementation

Participants signed up for the contest between January 1, 2013 and May 8, 2013. Each team was required to have at least 2 members, who had to be over 18 years old, and any nationality was eligible. Moreover, participants were informed that not only their car design but also the sharing of their progression and interaction through SwYm would be evaluated. In total, 31 teams (115 individuals) entered the contest.

The contest was composed of two rounds of assessment. The first round started on May 13 and continued for 48 days (6 one-week cycles), during which students had to create an idea sketch, a concept design, and a rough sketch including detailed parts. These had to be submitted by June 28. After each team's design was examined by who did not participate in SwYm, 27 teams (98 individuals) advanced to the final round. The final round started on July 22 and continued for 72 days (10 one-week cycles), during which students had to create a 3D sketch using CATIA 3D design software that was used to create a 3D natural sketch. Students had to submit these elements by September 27. Each team advancing to the second stage of the contest was sent the CATIA software, a pen tablet, and a notebook PC by July. At the end of the process, 5 teams were awarded. Figure 1 shows two award-winning designs.

Formative Evaluation

Questionnaire

Through an open-ended questionnaire administered to the students after the contest, we explored responses to the following questions: (A) What did you learn about electric vehicles through this contest?, (B) What did you learn about urban transportation?, (C) In what ways was communication via SNS helpful during your design process in first round?, and (D) In what ways was communication via SNS helpful during your design process in final round? The purpose of the questionnaire was to improve next year's contest. The questionnaire was delivered to 98 people who advanced to the final round, and we received 67 responses. We then analyzed each response and categorized them by certain characteristics. Table 1 displays the results of this categorization.

Responses to questions (A) and (B) show that students learned not only technical knowledge, such as information about the inner structure of EV and about current urban transportation, but also gained understanding of the meta view such as problems in EV and current urban transportation, the relation to social components, and the importance of designing a whole system. This result suggests an increase in theoretical learning, which is essential to modern engineering design.

Figure 1: Two award-winning designs

Responses to questions (C) and (D) show that interaction through SwYm allowed students to acquire stimulation from other teams' ideas and to broaden their own ideas using advice from the experts. Additionally, SwYm increased the students' motivation by allowing them to see other teams' progression and check for overlaps between own designs and those of other teams.

(A) What did you learn about electric vehicles through this contest?	N
Possibility of EV	25
Problem in EV	21
Inner structure of EV	21
Relation to social components	7
Recent trend about EV	5
(B) What did you learn about urban transportation?	N
Importance of designing a whole system	19
Information about current urban transportation	18
Problem in current urban transportation	18
Various needs in each region	8
Possibility of application of EV to urban transportation	4
(C) In what ways was communication via SNS helpful during your design process in first round?	N
Stimulation from other teams' ideas	24
Increasing motivation by seeing other teams' progressions	17
Obtaining advice from experts	11
Keeping own progression by facilitator	6
Check if own design overlaps that of others	4
(D) In what ways was communication via SNS helpful during your design process in final round?	N
Stimulation from other teams' ideas	14
Learning how to use 3D design software	13
Obtaining advice from experts	10
Increasing motivation by seeing other teams' progressions	6
Check whether own design overlaps that of others	4

Table 1: Result of categorizing the questionnaire data (N = 67)

Access, posting, and comment counts

By analyzing the use of SwYm throughout the contest period, we learned that the access count was 42494 (average of 354 per day), and there were 275 blog posts and 805 comments. Figures 2, 3, and 4 show the distributions of these variables in each period. It is clear that there were higher counts of SwYm access, posting, and commenting in the first round than in the final round. Potential causes of this result include students' reluctance to share their own designs openly because of the competitive nature of the contest, few chances for students to interact during the design completion step, and university vacations overlapping with the final round of the contest.

Conclusion

In summary, this contest can help students to learn about the importance of designing from the meta view because of the interaction among students and between students and experts. Moreover, our results suggest that students were limited in these interactions because of differences in the design step, the time period chosen, and the competitive nature of the contest towards the end of the contest period. We will revise the management method by which students can interact throughout the entire contest by adding functions such as manage the right to make others read more flexibly in each period in next year.

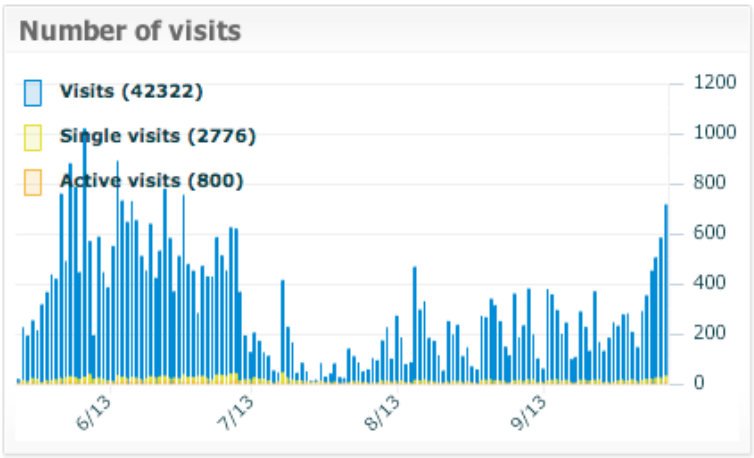

Figure 2: Distribution of SwYm access counts in each period

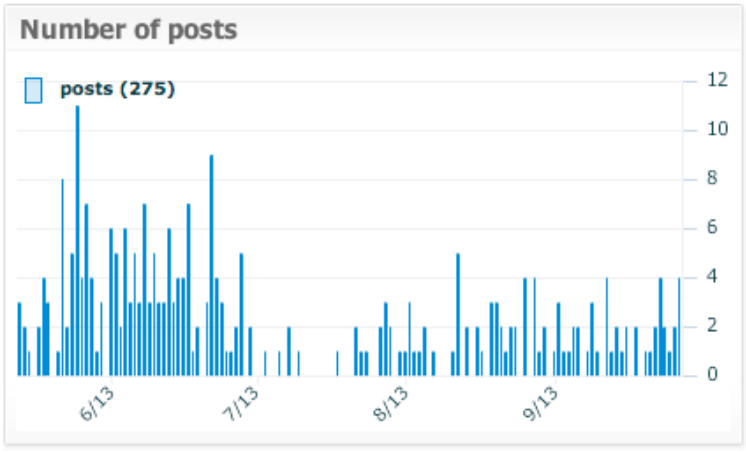

Figure 3: Distribution of SwYm post counts in each period

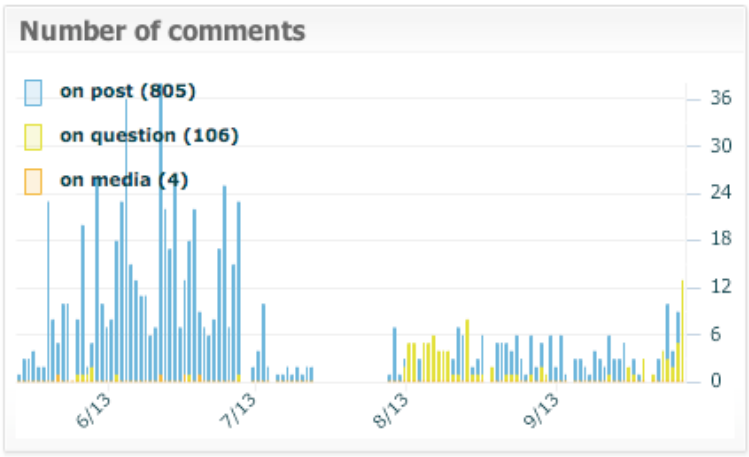

Figure 4: Distribution of SwYm comment counts in each period

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