

Development of a Mobile-Friendly Classroom Support System to Improve Students' Presentation Skills

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Abstract—Work in Progress: Communication skills are indispensable for becoming successful in the global engineering community. Among various communication skills, presentation skills are regarded as one of the greatest career enhancers for engineers. Nevertheless, it is the weakest skill of most Japanese engineering students. To overcome this inadequacy, we offered a presentation skills course for sophomore Science, Technology, Engineering, and Mathematics (STEM) students by integrating video streaming and numerical peer evaluation using IT technology. This paper examines the feasibility and the students' acceptability of the newly developed IT peer evaluation system. In implementing the system, three research questions were posed: 1. Does the new system facilitate classroom management? 2. Is the new system more accepted than the existing paper-based method by the students? 3. Does the new system promote the overall improvement of students' presentation skills? The preliminary results showed that the new system facilitated classroom management, and that it was accepted by the students primarily due to its functional requirement such as utility and non-functional requirement such as promptness. Furthermore, the students' average numerical peer evaluation scores of physical messages and audience interaction mostly improved.

Keywords—*classroom support system; presentation skills; peer evaluation*

I. INTRODUCTION

A great variety of skills and professional expertise are required of engineers for success in the modern global world. The "Criteria for Accrediting Engineering Programs" [1] by the Accreditation Board for Engineering and Technology (ABET) designates communication skills as one of the 11 key learning outcomes required of undergraduate engineering programs. In the case of Japan, the need for engineering design education is highlighted by the participation of the Japan Accreditation Board for Engineering Education (JABEE) to the Washington Accord [2]. Among various communication skills, presentation skills are considered as one of the greatest qualities that increase engineering students' employability [3], [4]. Although much attention has been paid to the importance of presentation skills as a career booster by

both academia and industry, it is the weakest skill for most Japanese engineering students who are not used to expressing themselves because of the Japanese mindset [5]. To overcome this inadequacy, many Japanese universities are offering courses to develop the presentation skills of STEM students.

In order to make a persuasive presentation, we need to structure the story and use visuals with impressive body language. Considering that STEM students may eventually need to present their research findings and ideas at academic, professional conferences and business meetings, they should realize the crucial role of body language in making effective presentations. We therefore combined videotaping with a peer evaluation method using a rating scale to raise students' awareness about the importance of body language and to strengthen their overall presentation skills.

Videotaping has been widely used in presentation classes as a powerful aid for evaluation as well as instruction [6]. The results of our study show that videotaping is a practical tool that allows students to engage in self-analysis that leads to the improvement of their body language such as eye contact, posture, and voice [7].

Peer assessment is a valuable technique to promote students' self-reflection and to engage them in active learning [8-11]. Based on this idea, we adopted a peer evaluation method in 2008 for providing students with opportunities to examine other students' performance and become self-reflective by receiving feedback from peers. The initial paper-based peer evaluation form devised in 2008 contained three written questionnaires on the following themes: "What did you learn from the presentation?", "What do you like about the presentation?", and "What advice can you give to the presenter to make the presentation better?" In 2010, a numerical peer evaluation criterion that enabled students to confirm their progress quantitatively was added to the initial form.

The existing paper-based peer evaluation method was effective in promoting students' self-reflection and peer observation [7]. However, it had significant limitations in terms of promptness, accuracy, and utility due to the complex paperwork procedure. To overcome these limitations, a

mobile-friendly classroom support system named Presentation Education Assistance System (PEAS) that collects, summarizes, and discloses students' in-class peer evaluation using PC and mobile devices was developed.

II. COURSE DESCRIPTION

The "Presentation Skills" course, which was launched in 2008, is an elective course primarily for sophomore engineering students of the Department of Engineering and Design at Hosei University. This course aims to teach students the skills required to become a competent presenter who understands the importance of "audience first" and delivers structured presentations. Since the students of this course will present their findings and ideas in various professional and academic settings, they need to be aware of the crucial role of body language in making convincing presentations. For this reason, peer evaluation and videotaping have been integrated into the course since 2009 to raise students' awareness about the significance of body language and to enhance their overall presentation skills.

The fifteen-week course consists of instructor's lectures and presentation sessions by the students. After learning how to structure presentation and to use visuals with powerful body language, each student is assigned the task of making three presentations during the semester. In each presentation session, about ten students deliver their presentations, and other students assess their performance. In addition, students' presentations are videotaped so that the presenters can view their own performances afterwards while consulting the peer evaluation results. After checking the videotape and the peer evaluation results, the presenters write a self-reflection report in order to improve their presentation skills. During the semester, students are required to write one reflection report per presentation and one final reflection at the end of the course.

When providing feedback to the presenters, the paper-based numerical peer-evaluation method was used, as mentioned in the Introduction section, to ensure better objectivity in the assessment. Students were therefore able to evaluate the improvement in their presentation skills by comparing the numerical results of the first and the second presentations. Based on the ideas in "Speaking of Speech"[12] and the instructor's teaching experiences at this "Presentation Skills" course, the existing paper-based numerical peer evaluation form as shown in Fig.1 was designed in 2013.

The paper-based numerical peer evaluation method, however, was inefficient in terms of utility, promptness, and accuracy. Steps (1) to (8) in Fig. 2 briefly outline the handling procedure of the paper-based peer evaluation: (1) Instructor copies 300 peer evaluation forms (30 enrollees x 10 presenters) per class prior to a presentation session and distribute them to the students. (2) Instructor collects and scans the completed peer evaluation forms. (3) Presenters check their recorded presentation videos. (4) Instructor emails the scanned data to teaching assistants (TAs) who calculate the data manually. The calculation takes about four days. (5)

A Peer Evaluation Sheet for an Informative Speech (Reporter)					
Presenter's name	Theme :				
1. In the beginning, did the speaker explain the theme and the outline of the speech?	Yes	1	No	0	Story Message /3pts
2. Based on the outline, did the speaker explain the main points in sequence in the body part?	Yes	1	No	0	
3. In the end, did the speaker review the main points and made a good conclusion?	Yes	1	No	0	
4. Did the speaker prepare effective visuals with much graphics and less text?	Yes	1	No	0	Visual Message /2pts
5. Did the speaker show an "Overview" slide in the beginning and a "Summary" slide at the end?	Yes	1	No	0	
6. Did the speaker talk in an appropriate voice volume and speed?	Yes	1	No	0	Physical Message /4pts
7. Did the speaker maintain consistent eye contact with the audience?	Yes	1	No	0	
8. Did the speaker look confident by maintaining good posture?	Yes	1	No	0	
9. Did the speaker use movements and gestures which attracts' audience attention?	Yes	1	No	0	Interaction /1pts
10. Did the speaker interact with the audience by asking questions?	Yes	1	No	0	
Total points				/10	
©What I learned from the presentation was...					
©What I liked about the presentation was...					
©One suggestion to make your presentation better is...					
<Average points>					
Story Message	Visual Message	Physical Message	Interaction	Total	

Fig. 1. Paper-based Numerical Peer Evaluation Form.

Instructor receives the calculated results from the TAs. (6) Instructor fills the calculated results in the original forms and returns them to the presenters in the next class the following week. (7) After viewing their recorded videos and confirming the peer evaluation results, students write a self-reflection report. (8) Students submit the report to the instructor. If the presenter misses the next class, staff members from the Academic Affairs Office of the department return the form with the peer evaluation results to the presenter on behalf of the instructor.

In order to eliminate the limitations of the paper-based peer evaluation method, a mobile-friendly classroom support system, PEAS was developed to simplify the procedure and

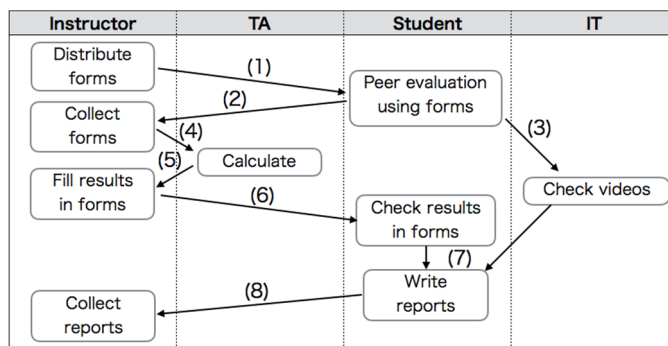


Fig. 2. Handling procedure of the paper-based peer evaluation form.

promote students' active learning. We conducted a series of experiments in the "Presentation Skills" course to examine the feasibility of PEAS in facilitating classroom management, the degree of acceptance by students, and the improvement of students' overall presentation skills.

III. MATERIALS AND METHOD

PEAS collects, summarizes, and discloses students' in-class peer evaluation using PC and mobile devices. To develop the system, we adopted several latest Web technologies such as RESTful Web services, single page application, and responsive web design to maintain affordance in order to enable students to understand how to use PEAS intuitively without reading manuals.

The instructor and students take the following steps in peer evaluation: (1) Instructor launches PEAS and students log in. (2) Instructor chooses the name of the presenter. (3) As shown in Fig. 3(a), the presenter's name and input screen appear on students' smart phone displays. (4) Students watch the presenter's performance and answer yes-no questions by clicking on the radio buttons. (5) Students also answer written questions by entering characters on their smart phones. (6) After one minute of evaluation time, the instructor discloses the presenter's peer evaluation result as shown in Fig. 3(b). (7) Instructor chooses the next presenter. Fig. 3 describes the input screen and peer evaluation results displayed on smart phones. Since the same images are displayed on the PC screen, here we use smart phone screens as examples.

As the above-mentioned procedure illustrates, PEAS allows for character entry as well. This is quite different from existing interactive responsive devices such as clickers that only allow data entry.

IV. PRESENT STUDY

The study posed three research questions: 1. Does the new system facilitate classroom management for the instructor, TAs, and the staff of the Academic Affairs Office? 2. Is the new system PEAS more accepted than the existing paper-based method by the students? 3. Does PEAS promote the overall improvement of students' presentation skills?

The present study was administered between October 2015 and January 2016 in the Department of Engineering and Design at Hosei University. Fifty-eight sophomore engineering students enrolled in the "Presentation Skills" course and two master's course TAs participated in ten experimental sessions. During the sessions, each presenter made a five-minute presentation followed by a one-minute peer evaluation period using PEAS. In the ninth and tenth experimental sessions, comparative experiments using PEAS and the paper-based numerical peer evaluation form were conducted. Following the sessions, subjects were asked to write their comments about PEAS and the paper-based form in their reflection reports.

The paper-based peer evaluation form shown in Fig.1 consists of ten yes-no questions and three written

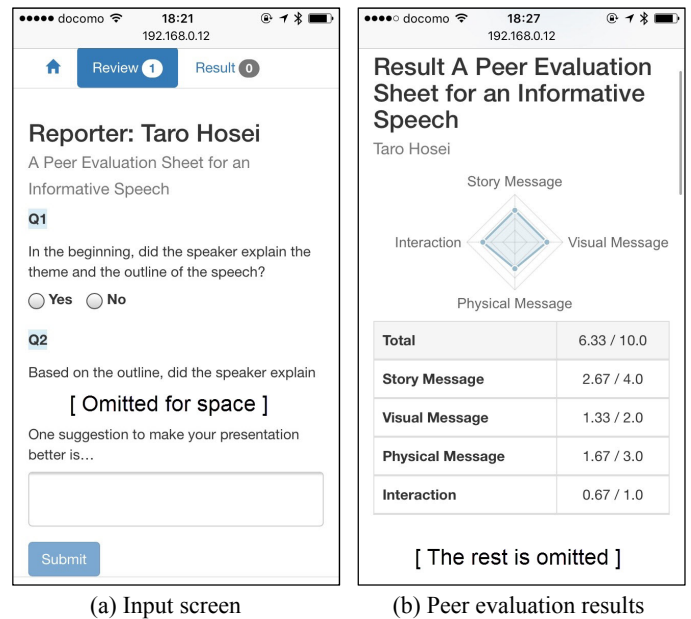


Fig. 3. Examples of smartphone screens.

questionnaires. Out of the ten yes-no questions, three questions deal with story message, two with visual message, four with physical messages, and one with audience interaction. Fig. 3 shows how these questions and aggregate results appear on smart phone screens.

V. PRELIMINARY RESULTS

A. Result of Research Question 1

The introduction of PEAS significantly reduced the workloads of the instructor, TAs, and the staff of the Academic Affairs Office. Fig. 4. shows how peer evaluation procedure was simplified by the implementation of PEAS. Steps (1) to (5) in Fig. 4 outline the procedure of using PEAS: (1) Instructor launches PEAS. (2) Students log into PEAS and input their evaluation using a PC or a smart phone. (3) Presenters confirm the results through PEAS on the spot immediately after their presentations. (4) Presenters write self-reflection reports. (5) Presenters submit the report to the instructor. PEAS reduces the time taken by the instructor for copying, scanning, processing, and returning the paper-based form from three hours to one hour for each presentation session. Additionally, TAs do not have to aggregate data

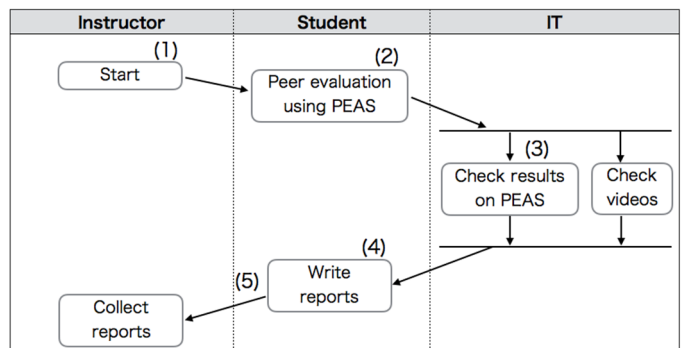


Fig. 4. Procedure of peer evaluation by PEAS.

manually, as computational calculations are performed. PEAS thus ensures the timeliness and accuracy of the numerical peer evaluation results. Furthermore, the staff of the Academic Affairs Office do not have to handle the paper-based form.

B. Result of Research Question 2

Overall, the students welcomed PEAS, particularly for its utility and promptness. Fig. 5 shows the distribution of students' feedback about PEAS.

In the final reflection, we asked fifty-five students to comment on the differences in peer evaluation using PEAS and the existing paper-based method (multiple answers were allowed). Out of the 75 comments, 56 were about the usability of PEAS and 19 were about how PEAS affected students' motivation for learning. There were 43 comments that favored the usability of PEAS. Examples of some common comments are as follows: (1) "Answering using a keyboard is faster and easier than writing by hand." (2) "PEAS enables me to check peer evaluation results and comments at a glance." (3) "I can instantaneously identify my strengths and weakness using the PEAS graph." On the other hand, there were 13 comments that disfavored the usability of PEAS. An example of a negative comment about PEAS is "I had to answer the question hastily because of the time limit."

The motivational effects of PEAS were appreciated in 12 comments. Examples of some common comments are as follows: (1) "I stayed focused on watching the presentation because I could input my comments using my touch typing skill." (2) "I used to worry about the errors I made while writing by hand. Using PEAS, I can get rid of errors, and my intention will be accurately conveyed to the presenter. I think that is great!" On the other hand, there were seven comments that depreciated the motivational effects of PEAS. Examples of some common comments are as follows: (1) "I think I tend to be more casual when I answer the questions using PEAS." (2) "When I wrote my comments by hand, I felt I was thinking more deeply."

C. Result of Research Question 3

The average numerical peer evaluation scores of physical messages and the interaction of the two presentations using PEAS are listed in Table I. The subjects were divided into two classes (X, Y) according to their student ID numbers. Each

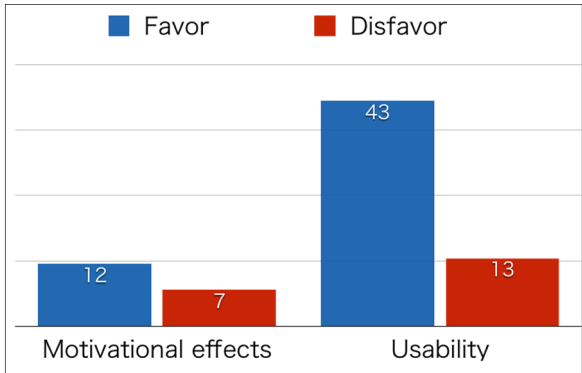


Fig. 5. Student feedback about PEAS.

TABLE I. 2015 AVERAGE NUMERICAL PEER EVALUATION SCORES USING PEAS

	Presentation	Voice	Eye contact	Posture	Gesture	Inter-action
Y class	2 nd (n=26)	0.74	0.54	0.69	0.33	0.53
	1 st (n=29)	0.72	0.50	0.62	0.31	0.40
X class	2 nd (n=29)	0.81	0.58	0.81	0.29	0.86
	1 st (n=29)	0.77	0.60	0.71	0.44	0.57

average score of physical messages and interaction in Table I is calculated by the dichotomous scale previously shown in Fig.1. A full score on each item is 1.0. Given the limited time for peer evaluation, we chose easy-to-answer yes-no questions for the convenience of the students.

As can be observed from the results, the average points of the second presentation are generally higher than those of the first ones. For example, all the points of physical messages and interaction in Y class increased in the second presentation compared to the first one. In X class, the average points of voice, posture, and interaction were higher in the second presentation than in the first one. These results can be used to conclude that PEAS together with videotaping has positively influenced the development of students' physical messages and interaction with the audiences. For further study, we need to test the system in various contexts to verify its effectiveness in enhancing students' presentation skills.

VI.CONCLUSION

We conclude that PEAS significantly improves promptness, accuracy, and utility of classroom management for the instructor, TAs, and the staff of the Academic Affairs Office. We are confident that PEAS will eventually achieve faculty buy-in because of its remarkable contribution to classroom management. In addition, PEAS reduces the additional effort required of students by the paper-based evaluation method. Moreover, we confirm that PEAS is accepted by most students due to its usefulness and timeliness. The rise in the average points of the students' physical messages and interaction shows that PEAS with videotaping is a supportive setting to improve students' presentation skills.

Nevertheless, considering the several comments that appreciated the value of writing comments by hand and favored paper-based peer evaluation, we should next explore how to use PEAS more effectively in motivating and supporting students' active learning. For example, we can integrate PEAS into another IT device that allows for writing by hand in order to gain the strengths of both writing by hand and key board input. Furthermore, we will test PEAS system in other classes to confirm its efficacy by increasing the number of academic disciplines. In implementing this, we will utilize IT technology and form "PEAS Socials" to share data and data analysis with other users in the community for refining the PEAS system using feedback and collaboration.

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