Chang, M. et al. (Eds.) (2019). Proceedings of the 27th International Conference on Computers in Education. Taiwan: Asia-Pacific Society for Computers in Education

The Effects of a Crowd-sourced Approach to Feedback-provision for Online Drill & Practice Activities

Fu-Yun YU [a*] & Chiao-Yi Chen [b]
[a] *Institute of Education, National Cheng Kung University, Taiwan*
[b] *Tainan Municipal Daciao Elementary School, Taiwan*
* fuyun.ncku@gmail.com

Abstract: The main purpose of this study was to investigate the effects of a crowd-sourced approach to feedback-provision for online drill & practice (D&P) activities. As compared to traditional teacher-designed feedback to online D&P activities, the effects of student-created feedback on academic achievement and attitudes toward the studied subject matter were the focus of this study. A non-equivalent pretest-posttest quasi-experimental research design was adopted. A total of 104 six-graders from four primary school classes participated in a weekly 20-minute online D&P exercise for six weeks. The results of the analysis of covariance indicated no statistically significant between-group differences in terms of academic achievement. However, students exposed to the student-created feedback for the online D&P activities condition exhibited a better attitude toward the subject matter as compared to the teacher-designed feedback group.

Keywords: Crowdsourcing, drill-and-practice, experts and novices, feedback, learning effects, online learning activity

1. Introduction

Engaging students in practice aligned with learning objectives and followed by timely feedback has been suggested as powerful instructional elements to facilitate learning (Dick, Carey, & Carey, 2005). Despite its well-recognized pedagogical values, questions in practice and feedback to student performance mostly come from teachers. Under the maker movement and crowdsourcing model, the idea of delegating question-generation to the larger student community is becoming increasingly popular. More recently, generating corresponding feedback to student-generated questions has been a topic of experimentation. While students have been found to benefit from the act of generating questions and feedback (Yu, Wu, & Huang, 2018), the question as to whether learners can benefit from utilizing the produced work, specifically, student-created feedback to responses to posed questions, awaits investigation.

In view of the literature on experts and novices, feedback messages created by students and teachers may lead to different learning effects. Experts and novices have been found to be distinctly different in terms of structures, types, and amount of knowledge, as well as skill level (Chi, Feltovich, & Glaser, 1981; LeFrance, 1989; Rumelhart, 1980; Voss & Post, 1988). Specifically, experts have more systematic knowledge, procedural knowledge, and a larger prior knowledge base as well as relevant experience in a specific field or domain, whereas the knowledge of novices tends to be fragmented, insufficient, and declarative in nature (Rumelhart, 1980; Voss & Post, 1988). With these distinct differences, the messages created by teachers (i.e., considered as experts in the study) and students (i.e., considered as novices in the study) to be used as feedback to questions may engender different effects on the part of student users.

To summarize, the research question of this study is to examine any differential learning effects of student-created feedback as compared to teacher-designed feedback on academic achievement and attitudes toward the subject matter.

2. Methods

For the purpose of this study, a non-equivalent pretest-posttest quasi-experimental research method was adopted. Two treatment groups were devised: Group A (the teacher-designed feedback group) and Group B (the student-created feedback group). Four sixth-grade participating classes (n = 104; males: 53, females: 51) from a single elementary school in Tainan City, Taiwan were randomly assigned to the two treatment groups (Group A, n = 49 and Group B, n = 55) for this 6-week study. For the teacher-designed feedback group, the feedback was designed by the implementing teacher herself. As for the student-created feedback group, the feedback was created by a selected group of 20 students (called the collaborating students) from five other non-participating sixth-grade classes in the same school. To equip the collaborating students with essential knowledge on feedback message design, a training session was arranged. For the duration of this study, the collaborating students were directed to create feedback to accompany each of the four options of the two multiple-choice questions assigned by the implementing teacher in the 30-minute morning session before their inclusion in the adopted online system for the use of Group B. Informed consent was secured from all participating and collaborative students prior to the study.

An online learning system was adopted to support the activity (Yu & Liu, 2016), and the online activity integrated was introduced to support the teaching and learning of science. Once in the D&P space, a set of multiple-choice questions was displayed individually (Figure 1), and feedback to the chosen option of the focal question was displayed right afterwards, which could be textual and media forms (Figure 2).

Figure 1. The Online D&P Space

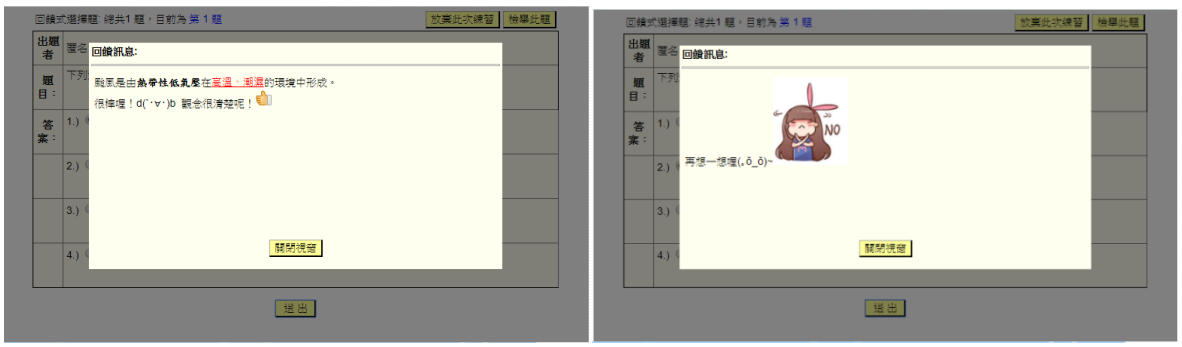

Figure 2. Feedback to Student Responses to the Posed Questions in the Textual Form (left) and Media Form (right)

Prior to the study, data on student science academic achievement on the mid-term exam administered school-wide and attitudes toward the sciences (14-item, 5-point Likert scale, Cronbach α = .93) were collected and used as covariates for later data analyses. In addition, a brief training session on accessing the D&P and learner portfolio spaces in the system was arranged. Routinely during the study, after receiving 100 minutes of teacher-led instruction and science lab activities, the participants

engaged in the 20-minute online D&P activity on the science topic covered in the previous week in the participating school computer lab. After the study, data on student academic achievement on the science content covered during the study and attitudes toward science were collected again.

3. Results and Discussion

The results of the analysis of covariance (ANCOVA) revealed that there were significant between-group differences in attitudes toward the sciences, F (1, 100) = 13.674, $p < .05$. However, no significant between-group differences were found in academic achievement, F (1, 100) = 0.019, $p > .05$. In view of the findings of this study, instructors are suggested to consider adopting a crowdsourcing approach to feedback-provision for online D&P activities as a change. As confirmed, student-created feedback to D&P questions led to improved attitudes toward the subject matter studied without sacrificing academic performance. Moreover, with the crowdsourcing approach, students at large are involved in the learning process, and participatory education are thus promoted. Furthermore, with students serving an integral part of the classroom environment and given opportunities to contribute to peers' learning, the proposed crowdsourcing model aligns well with contemporary educational paradigm.

This study examined if teacher-designed feedback and student-created feedback differed in promoting learning. As a next step, the issue regarding how and why teacher-designed feedback and student-created feedback differ can be examined. By content-analysis of feedback message designed by teachers and students, in what ways teacher-designed feedback and student-created feedback differ can be compared on multiple dimensions (e.g., style, forms, content and so on) and better understood. By in-depth interviews with a purposively selective group of participants, the activated learning process and student subjective views toward the two different approaches can be tapped on. Insights obtained can lead to the strengthening of theoretical bases and empirical evidence on student-generated content as well as expert and novice research.

Acknowledgement

This study was supported by the Ministry of Science and Technology, Taiwan. Project number: MOST 105-2511-S-006-005-MY3.

References

Chi, M., Feltovich, P. J., & Glaser, R. (1981). Categorization and representation of physics problems by experts and novices. *Cognitive Science, 5*(2), 121-152.

Dick, W., Carey, L., & Carey, J. O. (2009). *The systematic design of instruction* (7th ed.). Upper Saddle River, NJ: Pearson/Merrill Publishers.

LeFrance, M. (1989). The quality of expertise: Implications of expert-novice differences for knowledge acquisition. *ACM SIGART Newsletter, 108*, 6-14.

Rumelhart, D. E. (1980). Schemata: The building blocks of cognition. In R. J. Spiro, B. C. Bruce, & W. F. Brewer (Eds.), *Theoretical issues in reading comprehension* (pp. 33-58). Hillsdale, NJ: Lawrence Erlbaum Associates.

Voss, J. F. & Post, T. A. (1988). On the solving of ill-structured problems In M. T. H. Chi, R. Glaser & M. J. Farr (Eds.). *The Nature of Expertise*. Hillsdale, NJ: Erlbaum

Yu, F. Y. & Liu, Y. H. (2016). Development and evaluation of student-generated feedback in an online student-generated multiple-choice questions learning space. *Workshop Proceedings of the 24th International Conference on Computers in Education* (pp. 413~418). IIT Bombay, Mumbai, India, November 28-December 2.

Yu, F. Y., Wu. W. S., & Huang, H. C. (2018). Promoting middle school students' learning motivation and academic emotions via online student-created feedback for student-created multiple-choice questions. *Asia-Pacific Education Researcher, 27*(5), 395-408.