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# Learning from Ill-Structured Cases

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## Learning from Good vs. Poor Quality Cases

Cases and examples are known to play an important role for novices at the initial stage of problem solving. Novices tend to retrieve prior cases from their long-term memories to solve a novel problem. Consistent with analogical transfer research, instructors often provide students with a few good cases that may demonstrate correct problem solving and outputs. Students are then expected to acquire lessons from the best cases, which may in turn lead to successful problem solving with analogous problems.

Like good cases where learners may learn what they should do, poor cases could play an important role. Failures and errors in poor cases tend to be self-evident, providing students with lessons about what they should not do. This feature of poor cases might be more beneficial when novices solve complex or ill-structured tasks such as writing, experimental design, and programming.

While good cases are a well-tuned system it is hard to extract what makes good cases good, while poor design is relatively easy to find why poor cases are poor. Thus students may learn from errors and reviewing others' errors can facilitate analogical transfer (Gick & McGarry, 1992). From reviewing poor cases, students may learn what they should not do, why the solution has errors, and how they could be fixed. Therefore, it could be expected that poor cases may support novices' problem solving as do good cases. Consistently, Siegler (2002) found that explaining correct reasoning and incorrect reasoning together are more effective than explaining correct reasoning only.

Therefore, the goal of this research was to examine the role of good and poor cases in learning. We examined this issue within a reciprocal peer reviewing of writing context where peer reviewers were asked to review classmates' writing. This research seems important in that there are few studies about the effect of case quality on ill-structured problem solving skill improvement.

## Method

Initially, undergraduates in an intro physics course at a research 1 university participated in this study as part of their course requirements. Forty four students among initial 89 students were selected for further data analyses after controlling the floor and ceiling effect of writing improvement, and the quality of feedback that the students received on their initial writing from peers.

The participants wrote the first draft, reviewed four peer papers allocated randomly by SWoRD, a web-based

reciprocal peer review system (Cho & Schunn, 2007). The reviewers read four peer drafts, generated written feedback, and scored them based on a 7-point rating scale. After receiving feedback from peers, authors revised their first draft and gave the helpfulness scores of the feedback to the reviewers. The process was repeated for the revised draft.

## Results & Discussion

Based on the average case quality of the papers they reviewed, the reviewers were categorized into either the high-quality case group ( $n=22$ ,  $M=5.82$ ,  $SD=.16$ ) or the low-quality case group ( $n=22$ ,  $M=5.18$ ,  $SD=.26$ ). A one-way analysis of covariance with initial writing quality as a covariate and the case quality (High vs. Low Quality) as a between-subject variable was carried out on the revised writing quality when the initial writing scores were controlled. The covariate was significant,  $F(1, 41)=5.32$ ,  $MSE=.13$ ,  $p=.026$ . It was found that the revised writing quality was significantly different between the high-quality and the low-quality case groups,  $F(1, 41)=4.95$ ,  $MSE=.13$ ,  $p=.032$ , as shown in Figure 1. This result clearly supports that poor cases may play an important role in facilitating the improvement of ill-structured problem solving skills more than good cases.

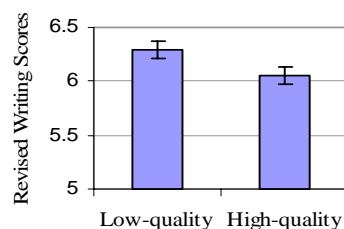


Figure 1: Adjusted revised writing quality and standard error bars

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