What Does Deliberate Practice Have to Offer Mathematics?
Lyle Paukner, Professor Chris Hlas  Mathematics  University of Wisconsin-Eau Claire

Abstract

Deliberate practice is a form of practice that consists of focused, repetitive practice of above-average difficulty. The subject continuously monitors his or her performance, and subsequently corrects, experiments, and reacts to immediate and constant feedback, with the aim of steady and consistent improvement.

In our study we attempted to discover practice techniques that encourage students to deliberately practice algebraic skills. We identified two techniques we believed fit into the model of deliberate practice.

Students from UW-Eau Claire who volunteered for the study were given a pretest to identify specific algebraic skills they struggled with, assigned to one of the two practice types, and given help.

Following the practice, volunteers were given a post-test to measure improvement, and the results were recorded.

All groups showed improvement (though the difference between the groups is not statistically significant).

Study Design

Participants were given a diagnostic test of their abilities in algebraic concepts. They were given practice problems, and the following improvements were tested:

- Slowed Practice: One group was asked to perform each step in every problem.
- Scaffolded Practice: The other was given smaller individual problems and build toward more complex problems.

Participants' pretests were scored to discover which concept needed most improvement.

Participants were then split into two groups, asked to work through sets of practice problems while being provided with "expert" feedback.

Results

- Each volunteer showed improvement from the pretest to post-test.
- Each volunteer also took more time to complete the post-test.
- Instances of both practice types showed up in practice with each volunteer.
- For example, some students attempting the "scaffolded" practice needed to take more steps, similar to the "slowed" practice.
- Some students could not proceed with "slowed" practice without seeing simple examples of a concept.
- The "slowed" practice showed greater improvement of scores.
- The difference is not statistically significant, however, likely due to the small number of participants.

Conclusions

- The practice proved effective
- This may be due to many factors: time, feedback, the specific technique, etc.
- Differences between the techniques was not statistically significant.
- The two identified practice techniques cannot be entirely separated.
- New concepts must be explained with simple examples first.
- Slowing down increases comprehension greatly.

Limitations

- Small sample size
- Due to the voluntary nature, subject matter
- Inconsistent "expert" feedback
- Students were promised specific help
- Each had different questions and levels of understanding, which required different explanations.

Works Cited


Music - Mostly case studies examining the habits of top athletes (e.g. Tiger Woods, Peyton Manning, Roger Federer). In each case, the athletes put in long hours, receiving feedback from personal coaches.

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Chess - Many different studies on chess have been done. For example, subjects are asked to select best possible move. The score is compared to moves of chess experts in similar situations.

The girls achieved high levels of success through intense and organized practice. Judit, the one who achieved the most (becoming a grand master at age 15), was also the one who practiced the most.

Background

Studying deliberate practice began with examining expertise. Research has shown that experts practice more than their counterparts, and in increasingly large amounts to improve their performance.

Beyond being incredibly motivated, what do these individuals have going for them? How do they improve?

Deliberate Practice!

Deliberate practice presents a task which an individual can’t yet reliably perform.

Incremental steps allow for steady improvement toward peak performance.

Studies of deliberate practice have shown up in many different fields.

Music: Perform a piece of music, then repeat performance exactly.

Sports: Mostly case studies examining the habits of top athletes (e.g. Tiger Woods, Peyton Manning, Roger Federer). In each case, the athletes put in long hours, receiving feedback from personal coaches.

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