The Behavior Analyst 2005, 28, 73–76 No. 1 (Spring)

In Response

The Relations Among Fluency, Rate Building, and Practice: A Response to Doughty, Chase, and O'Shields (2004)

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As reports and experimental investigations of fluency increase in the general educational literature (e.g., National Reading Panel, 2000), so too has research on fluency grown in behavioral education. Doughty, Chase, and O'Shields (2004) reviewed the precision teaching and behavioral education literature to examine how frequency, or rate building, influences fluency and its associated outcomes. In Doughty et al., some of the definitions used to identify fluency's outcomes deviated from conventional precision teaching usage. In addition, the relation of rate building to practice offered by Doughty et al. requires review when viewed through the lens of a precision teacher.

Definitions and classifications. Under the section "Defining and Clarifying Terms and Methods," Doughty et al. provide examples of two different sets of outcomes associated with fluency: retention, endurance, application, performance standards (REAPS; Binder, 1996; Haughton, 1980) and retention, endurance, stability, application, adduction (RESAA; Johnson & Layng, 1996; Weiss, 2001). Doughty et al. chose to examine the literature based on RESAA. As mentioned by Binder (2004) in a previous response, a number of concerns arise from their definitions. Doughty et al.'s classifications regarding fluency merit additional commentary because how one defines the critical learning outcomes associated with fluency influences basic and applied research.

Doughty et al. define *application* as synonymous with generalization. In the precision teaching literature, however, application does not refer to generalization, but rather to the process of fluent component or element behaviors combining and affecting a composite or compound behavior (Barrett, 1979; Berens, Boyce, Berens, Doney, & Kenzer, 2003; Binder, 1996; Haughton, 1972, 1973, 1980; Johnson & Layng, 1996; Kubina, Young, & Kilwein, 2004; Lin & Kubina, in press; Smyth & Keenan, 2002). Doughty et al. categorized some studies that explicitly examined the effects of fluency on generalization as representative of application (or their term, *extension*) (e.g., Ashbaugh & McLaughlin, 1997; Young, West, Howard, & Whitney, 1986). In contrast, a recent applied study from Kubina et al. illustrates application in the precision teaching sense. In this study, students with learning disabilities learned and then practiced to fluency two component skills of spelling. Once the students became fluent with both component skills, all students spelled the targeted words with 100% accuracy. The students never received direct instruction on how to spell the words; instead, when the component behaviors reached fluency, application occurred with the formation of the composite behavior (i.e., spelling words).

In addition, Doughty et al. also re-

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viewed studies that have purportedly shown endurance. Endurance characterizes the trajectory of performance over increasing intervals of time (Binder, 1996). If a student lacks endurance, his or her rate of performance will decrease as the timing interval lengthens. Doughty et al. classified a study by Miller, Hall, and Heward (1995) as representative of endurance. Miller et al. did not use the term *endurance* but instead identified their dependent variables as correct rate, accuracy, and on-task behavior. The study compared two conditions against a baseline of 10-min of math-fact completion. The first condition consisted of seven 1-min time trials with 20-s periods of rest delivered periodically. The second condition contained two 1-min timings with the addition of self-correction procedures and teacher-directed feedback. Although Miller et al. studied fluency, they did not design their study to examine the effects of endurance.

Using technical terms incorrectly and misrepresenting and misclassifying some studies as illustrative of fluency outcomes create a number of problems. Technical terms in an academic discipline serve as the mechanism by which professionals communicate to each other (Cuvo, 2003). The precision inherent in technical terms allows researchers not only to begin to understand and theorize about a subject matter of interest but also to design experiments and directly and systematically replicate other studies. Inappropriate uses of technical terms "create ambiguity in meaning and confusion in understanding," as well as fostering false attributions and claims regarding variables of interest (Cuvo, p. 78). Precision teaching, part of the behavioral education literature, does have distinct terms with clear denotations. *Application* and *endurance* have well-defined meanings that are dissimilar to the classifications used by Doughty et al.

A second concern from Doughty et al.'s definitions section comes from the absence of the major component for fluency outcomes, performance standards (Binder, 1996; Haughton, 1980), what Johnson and Layng (1996) describe as the linchpin of RESAA. A performance standard specifies the quality and quantity criteria for fluency. Without a performance standard, one may question whether the reviewed research used arbitrary determinations of rate criteria as a fluency aim. In other words, a researcher could set an aim for writing answers to basic math facts at 40 digits per minute and then test for application. The researcher may then fail to find application because the performance standard for basic math facts exceeds 40 digits per minute and occurs at 80 to 120 digits per minute (Beck, Conrad, & Anderson, 1996; Haughton, 1973).

The rigorous study of performance standards can first serve the purpose of providing an empirical marker for when someone has entered the fluency range. The range of skills available for study covers the span of human behavior. Academic behavior such as decoding words, showing inferential comprehension, and using complex mathematical algorithms all have performance standards. Any behavior that can reach fluency has performance standards. Indeed, many of the problems of competence or proficiency in educational settings would change significantly if researchers discovered true performance standards. For example, if a preschool teacher knew the performance standard for gross motor imitation, he or she would have a clear aim or goal for the student. By comparing the student's performance frequency against the performance standard frequency range, the teacher would know exactly how much the student needed to progress. Further, the teacher could quickly determine that, in the absence of the requisite behavioral frequency for gross motor imitation, the student would likely show problems with the critical learning outcomes associated with fluency (e.g., long-term retention, endurance, application).

Analysis. Doughty et al. indicate that

the literature does not support rate building and obtaining higher rates of responding as the variables responsible for the learning outcomes associated with fluency. In their words, "rate-building procedures may be confounded with number of exposures (i.e., practice)" (p. 10), and "separating the effects of practice and rate building is important because a large body of research indicates that practice facilitates the acquisition and maintenance of skills" (p. 18). Doughty et al.'s assertions polarize the relation between rate building and practice. An alternative view suggests that rate-building procedures warrant investigation as a form or subset of practice. Setting rate building in opposition to practice trials creates a false dichotomy.

Precision teachers have long used rate criteria to assess the effects of previous practice activities (Haughton, 1971, 1972; Lindsley, 1971). An early discovery showed that instead of having students practice for long periods of time, shorter intervals of 1 to 3 min provided highly accurate information regarding learning outcomes such as application (Haughton, 1971). How rate building occurred and the conditions that contributed to meeting rate criteria varied and did not conform to a standard protocol. Rate-building techniques could have the following characteristics: (a) daily or intermittent practice trials, (b) single or multiple trials per session, (c) trials with or without feedback, (d) practice trials following each other contiguously or spread across the session or day, (e) practice trials including or excluding cumulative features, and (f) the presence of extrinsic or intrinsic reinforcers. Even though the majority of the research reviewed by Doughty et al. did not report the number of practice trials or other elements previously stated, rate building falls under the category of practice.

Because practice minimally consists of repeating behaviors in time with the goal of improvement, almost any practice activity can qualify as rate building. All behaviors occur in time and, as a consequence, all behaviors have a rate. Therefore, precision teachers use units of measurement that show behavior over time. By making use of one of Skinner's greatest contributions, rate of response, and displaying the data on a standard celeration chart (Lindsley, 1991), the resulting observations demonstrated that when behaviors reached a particular frequency or rate range called a fluency aim or performance standard, learning outcomes like retention, endurance, and application appeared (Binder, 1996). Obtaining the fluency aim did not represent the sole cause of fluency and the associated outcomes but served as an indicator of a skilled, well-practiced performance. Johnson and Layng (1996) suggest that eight other variables play a critical role in promoting fluency.

Based on their literature review and subsequent analysis, Doughty et al. submit that "it is premature to conclude that fluency is the result of precision teaching or any of its component procedures—rate building, for example" (p. 17). Doughty et al. dichotomized the relation between rate building and practice trials, misrepresented and misclassified some of the fluency outcome studies, and failed to include performance standards in their review of the fluency literature. Their conclusions regarding the relations among rate building, fluency, and practice require reexamination. Fluency comes about as a result of practice, and precision teachers have used rate building as an efficient method for practice. Doughty et al. did ask a profitable question regarding fluency, and this author agrees with their concluding statement: "More controlled research may increase the acceptance of precision teaching among behavior-analytic investigators and, regardless of the outcome, benefit education as a whole by yielding more efficient and effective techniques" (p. 20).

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