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Differential Facilitation of Learning Outcomes: What Does It Tell Us About Learning Disabilities and Instructional Programming?[1]

Thomas E. Scruggs
George Mason University, Virginia, USA

Abstract

Differential facilitation refers to interventions that influence sample subgroups in different ways. This article discusses the concept of differential facilitation in special education and how it has influenced our characterizations of learning disabilities, from the historical search for disordinal aptitude treatment interactions to the present day. I will review a number of recent investigations undertaken by myself and colleagues involving students with learning disabilities in inclusive classrooms, and re-examine the evidence for differential facilitation of academic outcomes. I will argue that specific psycho-educational treatments, at least in some cases, differentially promote learning for students with learning disabilities. Further, the results of these treatments offer information on the characteristics of learning disabilities, and provide opportunities as well as challenges for inclusive education.

[1]This article is based on the William Cruickshank Memorial Lecture presented at the Bo Palace, University of Padua, Italy, at the annual meeting of the International Academy for Research in Learning Disabilities, June, 2012. The author dedicates his presentation, and this article, to the memory of Marjorie Montague, a great teacher, researcher, and friend; and strong international advocate for students with learning disabilities.

The field of learning disabilities has had a rich and varied history, led and developed in part by researchers and clinicians such as Hinshelwood, Orton, Cruickshank, Gillingham, Fernald, Strauss, Kirk, and Kephart (see Hallahan & Mercer, 2002). Although these earlier efforts, including perceptual and motor training, multi-sensory instruction, and psycholinguistic training, failed to consistently produce reliable learning gains, many of these advocates agreed that intensive, systematic, individualized instruction was an important component for learning success. Hinshelwood (1917, p. 99), for example, maintained, “The first condition of successful instruction in such cases…is that the child must have personal instruction and be taught alone.” Individualized instruction appears sensible for this population, and appears to lead to increased learning; it nevertheless may strongly contrast with later efforts for students with disabilities, including learning disabilities, to receive their instruction in more inclusive settings.

What Type of Instruction is Effective for Students with Learning Disabilities?

The varied approaches that have been taken over the years to improve outcomes for students with learning disabilities have provided considerable evidence for the relative effectiveness of these approaches, and provide insights into the nature of learning disabilities. Forness (2001) reviewed a number of “meta-analyses” (quantitative research summaries) of special education treatments that have been conducted over the years. Considering the meta-analyses of most direct interest to learning disabilities, his analysis of the findings is interesting, revealing the following “effect sizes” (standardized experimental-control mean differences):

- Perceptual motor training = .08
- Diet modifications = .12
- Modality training = .14
- Direct instruction = .84
- Reading comprehension strategies = .94
- Mnemonic (memory-enhancing) instruction = 1.16

As can be seen from Forness’ summary, interventions that were oriented toward general constitutional functioning of students with learning disabilities (i.e., perceptual-motor, diet, modality training) were associated with modest effect sizes; on the other hand, interventions that were directed toward specific skill or strategy deficits were associated with very substantial effect sizes. These conclusions suggest that learning disabilities can be more profitably characterized by one or more relative deficits (e.g., verbal memory, reading comprehension) responsive to specific skill or strategy training, than as a deficit in one or more generalized processes (e.g., perceptual-motor skills) less responsive to general training

Content Area Learning and Learning Disabilities

Over much of my career, I (along with my colleague Margo Mastropieri) have been interested in facilitating the content area learning (particularly, science and social studies) of students with learning disabilities, and have implemented a number of different interventions to promote learning of academic content. Content area learning including such topics as science, history, geography, citizenship, literature, and humanities—is of interest simply because it comprises such a significant component of schooling; however, it is also of interest for other reasons. Much school content requires verbal learning paradigms, and allows researchers to use what we know about verbal learning in planning interventions. Learning in these domains largely requires declarative, purposeful, deliberative processing, rather than skill development requiring automaticity, as in much skill acquisition. Intervention research in these areas also may offer insights into the characteristics of learning disabilities, addressing such questions as, "What types of interventions are effective in this area?" and, "What do outcomes of content area learning research tell us about the nature of learning disabilities?"

Recently, we (Scruggs, Mastropieri, Berkeley, & Graetz, 2010) conducted a meta-analysis of content area instruction of students with special needs. We identified 68 investigations, including a total of 2,514 students, 80% of whom had learning disabilities. We identified a number of effective treatments for students with learning disabilities. Effect sizes for these treatments ranged from .48 to 1.68; this also represents substantial variability, but all effects were in the moderate (e.g., .40 - .70) to high (e.g., > .80) range:

- Peer mediated learning = .48
- Hands-on learning = .58
- Computer-assisted instruction = .62
- Spatial learning strategies, using tables and charts = .83
- Study aids, such as highlighting, framed outlines, guided notes = .94
- Learning strategy instruction, including study skills and note-taking skills = 1.09
- Mnemonic instruction, including the use of keywords, pegwords, and letter strategies to facilitate memory = 1.39
- Systematic, explicit instruction in specific contexts = 1.68

Similar to the positive outcomes in the Forness (2001) summary, substantial positive effects in this meta-analysis were associated with enhancing skills and cognitive processes associated with specific learning tasks, and were focused directly on outcome measures. Collectively, these interventions could be said to help students with learning disabilities *attend more carefully* or *think more systematically* about the content to be learned. These strategies serve to reduce demands on purposive information processing, increase capacity for working memory, and provide direct links and retrieval routes to the target information. At the same time, all have sought to maximize academic engagement.

The outcomes of these interventions provide us with some insights on the nature of learning disabilities, in that they interact with both relative strengths and relative weaknesses of students with learning disabilities. Relative strengths which supported these interventions include general intelligence and capacity for understanding, memory for pictures, and memory for relevant activities (or enactments, see Cohen, 1989). Relative weaknesses addressed directly in these interventions include limitations in areas such as attention and focus, semantic memory, organizational skill, purposive information processing, and spontaneous strategy use (see Lerner & Johns, 2012). Such an analysis provides important insights into learning disabilities, and allows us to predict interventions that are likely to be effective in other domains.

Interactions in Special Education Research: Is "Effective" Good Enough?

Research to date has identified a number of important treatments that have been successful in substantially increasing learning of students with learning disabilities. But is this sufficient to justify the existence of a sometimes controversial category (see Scruggs & Mastropieri, 2002), as well as specialized treatment programs? Many, if not most, of the treatments identified by Scruggs, Mastropieri, Berkeley, & Graetz (2010) could conceivably be of benefit to general education students. In the earlier days of the development of special education, much thinking was influenced by contemporaneous investigations into "aptitude-treatment interactions," that is, the search for differential outcomes based upon alternate treatments and personological variables (Aptitude-treatment interaction, 2002).

Ysseldyke (1973) expressed the orientation of many researchers of the time when he argued: "The very existence of 'special' education is literally dependent on the identification of specific disordinal interactions between learning characteristics (specific personological variables) and the relative educational payoff of differential educational curricula or approaches" (p. 1). In other words, educational treatments cannot be said to be "special" unless they differentially facilitate learning. In this case, as with aptitude treatment interaction research in general, a disordinal interaction was considered to be necessary to validate a different educational treatment system. To illustrate, Figure 1 demonstrates three types of "interactions." Figure 1a represents a disordinal interaction, where Treatment A improves learning for one group, and inhibits learning for another group; Treatment B is associated with the opposite effect. In Figure 1b, the lines are parallel, indicating no group x treatment interaction has occurred. This suggests treatments outcomes are similar, although one group uniformly performs less well than the other. Even in this case, however, the treatment may be of significance, for example if the treatment raised both groups above an established criterion for mastery. Finally, Figure 1c indicates an ordinal interaction, in this case benefiting both groups, but benefiting the lower functioning group differentially. This example of differential facilitation could also be said to represent significant "special" treatments, in that students with learning disabilities perform similar to the level of general education students after treatment. Such an interaction may be of even greater benefit, because it could conceivably lead to greater success of students with learning disabilities in inclusive classrooms. Disordinal interactions, on the other hand, if they were commonly observed, would provide substantial evidence that instruction of students with learning disabilities should be generally taught in separate instructional settings. For better or worse, disordinal interactions have been observed only rarely over the years (Aptitude- treatment interaction, 2002)

Content Area Learning in Inclusive Settings

Content area learning refers to learning academic subjects such as English literature, citizenship, geography, history, and science. Content learning can be of particular importance to inclusion efforts, for number of reasons. Special education teachers, especially at the secondary level, may not be well prepared to teach these subjects; instructional programming may in these cases be best accomplished in inclusive classrooms. Secondary schooling is mostly concerned with content area learning, so it seems appropriate for much of this to take place in inclusive settings. In addition to providing support for content learning, special education teachers can also focus on basic literacy and math skills, as well as organizational and learning strategies.

Earlier research in content area learning in inclusive settings focused on curriculum adaptations, such as study guides, computerized tutorials, and graphic organizers. Much of this research was conducted by Tom Lovitt, Steve Horton and colleagues, and focused on adaptations that provided means to assist poor readers to abstract main ideas from textual material, reduce the readability level, and help organize and streamline the enormous amount of detail often found in secondary textbooks (e.g., Horton & Lovitt, 1989; Horton, Lovitt, & Bergerud, 1990; Lovitt, Rudsit, Jenkins, Pious, & Benedetti, 1985). These curriculum modifications were generally helpful in improving content learning of students with learning disabilities, and other students, in general education content area classes. More recently, research has employed peer-mediated instruction in inclusive content area classes (Mastropieri, Scruggs, Guckert, Thompson, & Weiss, in press).

Inclusive content learning may also be of interest in studying possible differential learning effects. While students are learning academic skills such as reading, they develop cumulative skills over a period of time; students must develop automaticity in applying these skills to higher level learning. Content area learning, on the other hand, requires purposeful, deliberative processing of declarative—generally of verbally-based—information. Studying content acquisition of specific domains of knowledge in inclusive classes can provide us with important information about the relative effects of specific instructional treatments, and any possible differential effects on students with learning disabilities vs. general education students.

Over the past several years, Margo Mastropieri and I, along with other colleagues, have investigated differential learning gains of content information in inclusive classrooms. These studies have included a number of investigations that can be combined under what we referred to as "Differentiated Curriculum Enhancements." In this model, all students in a.

b.

c.

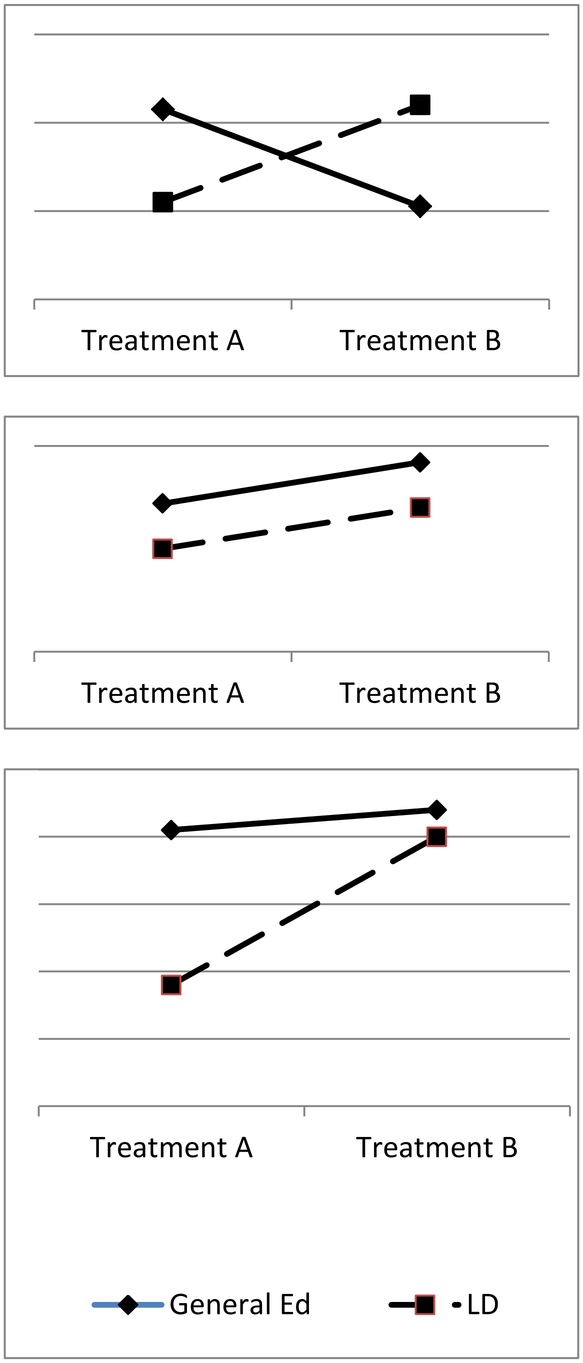

Figure 1. Examples of disordinal interaction (a), no interaction (b), and ordinal interaction (c).

inclusive classrooms receive the same instructional practices and materials. This was done to meet learner preferences not to be singled out, and to reduce the possible stigma associated with modified (or, "dumbed-down" in the minds of some students) curriculum materials (see

Fuchs & Fuchs, 1994). We nevertheless considered these examples of differentiated instruction, because they were presented in a manner that allowed for individualized instruction to occur. In addition to the Differentiated Curriculum Enhancements studies, I also included in this analysis two teacher implementation studies in inclusive classrooms, and one study by Bulgren, Schumaker and Deshler (1994), which is similar in design and implementation. These studies represent a significant number of very similar interventions conducted in inclusive content area classes, for which separate effects could be calculated for students with and without special needs (including very substantial numbers of students with learning disabilities). Although not exhaustive of inclusive content area investigations, they nonetheless comprise a consistent and coherent subset of available research literature in this area. I will describe these studies, and then describe my summary analyses of the possible differential effects of these particular interventions on students with and without special academic needs.

Research on Differentiated Curriculum Enhancements

We designed the Differentiated Curriculum Enhancements studies in three different ways. One type, which we referred to as "tiered activities," employed activities we developed on several levels of difficulty, intended to be completed by students in small groups. All groups were expected to complete all levels of activities in turn, and they were provided with materials and training in progress recording techniques, to be certain all students had mastered each level before moving on to the next level. Student groups, then, each moved through the different activity levels at their own pace. In a second type of Differentiated Curriculum Enhancements, which we referred to as "classwide peer tutoring" (see, e.g., Greenwood, 1997), students in tutoring pairs took turns tutoring each other using "fact sheets" of important content, at their own pace, and pairs evaluated their progress using self-monitoring sheets. In a third type, we employed tutoring pairs with fact sheets, but also provided mnemonic (memory-enhancing) strategies when needed. All of these studies were implemented generally over periods of 8-18 weeks. Each type of intervention is described in turn (see also Mastropieri et al., in press).

Tiered activities. Mastropieri et al. (2006) developed materials, and employed small group activities, on three levels or tiers to enhance learning of a middle school unit on scientific methods (e.g., charting and graphing, measurement, variables used in experimental research, qualitative and qualitative research questions). We developed eight activities using game-like activities, such as "Jeopardy," "Concentration," and "hangman," as well as specific charting and measurement activities, to increase motivation. Each one of these activities was presented at three difficulty levels. On level one, students were asked to identify correct answers to relevant questions or problems from an array. On level two, students were presented with similar questions, but now were expected to produce correct answers, with prompting when needed. Level three required students to provide answers without prompting. This investigation was applied in 13 inclusive eighth grade science classes, randomly assigned to experimental or control condition, over a period of 12 weeks.

The participants included 213 students, of whom 44 were students with disabilities (37 with LD and 7 with emotional/behavioral disabilities). Results supported the effectiveness of the experimental condition using these peer-mediated, tiered learning activities on relevant unit tests, as well as on the yearly high stakes test. We believe the unit-long intervention facilitated outcomes on the yearly test because the unit selected, scientific method, promoted understandings that carried over to other science units.

Simpkins, Mastropieri, and Scruggs (2009) applied a similar treatment, in this case using two levels of difficulty, to study the effectiveness of tiered learning activities in three fifth grade classes, using a crossover design in which all students received both experimental and comparison treatments. This sample included sixty-one fifth grade students (43 general education, 15 at risk, and 3 with learning disabilities) who were taught two 5-week science units (light/sound, and earth/space science) via experimental or control conditions. Again, students with and without special needs scored higher when in the experimental condition.

Classwide peer tutoring with self-monitoring. The tiered activities were found to be effective; however, they involved a level of materials development that we thought might discourage some teachers. Using teacher feedback for materials that were simple to develop and implement, Mastropieri, Scruggs, and Marshak (2008) employed a classwide peer tutoring procedure with partner monitoring to enhance learning in inclusive middle school U.S. history classes studying World War I. Students tutored each other, using "fact sheets" that had been identified by teachers as representing the most important declarative content for the units (e.g., neutrality, Zimmerman telegram, Lusitania). Students tutored for specific periods of time, alternated the role of tutor and tutee, and pairs recorded progress on supplied self-monitoring sheets. In this way, students proceeded to new content only after they had demonstrated that they had mastered the previous fact sheets. Mastropieri et al. employed a crossover design, and reported that students scored higher on posttests when in the experimental condition than in the traditional condition. Scruggs, Mastropieri, and Marshak (2012) conducted a follow-up study using similar methods and involving 10 classrooms (N = 133 general education students, 21 students with learning disabilities, and 3 students with emotional/behavioral disabilities), randomly assigned to condition. This investigation covered seven units of U.S. history covering the period from the end of the Civil War to the beginning of World War II, and was implemented over a period of 18 weeks. Results indicated that students in experimental classrooms scored higher on tutored content, as well as on related content that had not been specifically tutored. This suggested that tutoring benefits may go beyond the actual material being tutoring and may more generally enhance content learning.

In a third classwide peer tutoring study, McDuffie, Mastropieri, and Scruggs (2009) investigated its effect on learning a unit on genetics (e.g., nitrogenous bases, protein, DNA). This investigation included 141 general education students, and 62 students with special needs, of whom 77% had learning disabilities, in 8 classrooms. Similar to the applications in social studies, students using classwide peer tutoring intervention outperformed students receiving traditional instruction.

Mnemonic strategies. The third type of inclusive intervention was developed to maintain the classwide peer tutoring format, but also to provide additional strategic support for students who had difficulty remembering specific content information. Mastropieri, Scruggs, and Graetz (2005) developed mnemonic strategies (see Scruggs, Mastropieri, Berkeley, & Marshak, 2010) in high school chemistry classes containing students with learning disabilities. Classwide peer tutoring was used as in the previous investigations, and in this case students took turns questioning, using materials that contained chemistry content as identified by teachers (e.g., molarity, core and valence electrons, exothermic reactions, nonpolar covalent bonding). Tutors were trained to provide mnemonic pictures, and corresponding strategies, to facilitate retrieval when students did not immediately retrieve the target content. For example, if partners demonstrated difficulty remembering that a *mole* is the atomic weight in grams of an element or compound, tutors showed partners a drawing of a "mole" (the burrowing animal) sitting on a metric scale reading its weight in grams. In this investigation, students also questioned each other on comprehension of the content, by asking partners to provide additional information and examples ("What is an example of a mole?", "What else can you tell me about moles?"). At the end of the instructional unit, tests indicated that students with and without learning disabilities in the mnemonic tutoring condition outperformed students who received more traditional instruction.

Mnemonic strategies were also employed by Marshak, Mastropieri, and Scruggs (2011) to improve learning of important information in inclusive middle school American history classes. If students had difficulty remembering, for example, that John D. Rockefeller controlled much of the oil industry in the early 20th century, tutors presented a mnemonic picture of a *rock* ("keyword" for Rockefeller, see Scruggs, Mastropieri, Berkeley, & Marshak, 2010) with oil on it (for oil industry). In this investigation, 8 classrooms were randomly assigned to tutoring and traditional conditions, including 144 general education students, 21 students with learning disabilities, and 21 students with other special needs. As with other research in this series, students in the mnemonic tutoring condition outperformed students in the traditional instruction condition.

Other Related Investigations

I also included two teacher implementation studies in this review and synthesis. In one implementation study, Mastropieri, Sweda and Scruggs (2000) used mnemonic strategies in an inclusive fourth grade history classroom to help students learn about the European discovery and colonization of America, while in another implementation, Uberti, Scruggs, and Mastropieri (2003) employed mnemonic strategies to improve learning of reading vocabulary in three inclusive third grade classrooms (e.g., for *jettison* = throw overboard, students were shown a picture of a *jet*, the keyword for jettison, throwing something overboard). In both implementation studies, students scored higher on recall tests when using mnemonic strategies.

Finally, Bulgren et al. (1994) implemented a "Recall Enhancement Routine", which was very similar in substance to the previously described investigations. These researchers employed mnemonic strategies to improve learning in social studies, for 41 seventh and eighth grade students, 18 of whom had learning disabilities. Students in both conditions received a teacher presentation on the history of journalism. In the control condition, students received the presentation followed by a standard review. In the experimental condition, students received the same presentation, but mnemonic strategies (including acronyms, images, and keywords) were embedded within the review portion of the lesson. For example, to help students remember that Copperheads were members of a political group that supported the Confederacy during the American Civil War, students were asked to remember a mental image of a shiny copper statue of a soldier waving a Confederate flag. Students with and without learning disabilities benefited more from the experimental condition procedures.

Summary of Effects for Students With and Without Learning Disabilities

Overall, these 10 selected investigations of content learning in inclusive classrooms involved 1128 students, including 283 with special needs. Of the students with special needs, 80% were characterized as having learning disabilities. For each of these studies, I calculated standardized effect sizes separately for students with and without special needs, as shown in Table 1. As can be seen in the table, across a number of different subject areas (children's literature, American history, world history, genetics, scientific method, earth/space science, science of light and sound, chemistry), and grade levels 3-10, the mean overall effect size was .63 for general education students, and 1.40 for students with disabilities. These effect sizes are in the moderate to high range. The effects are greater, in each case, for students with special needs, and these differences overall were statistically significant, according to a Wilcoxon Matched-Pairs, Signed Ranks test (p = .005). It is interesting to note that the smallest advantage for students with special needs, (.36 vs. .43), was observed in the Simpkins et al. (2009) investigation, which was the only one to include a minority of students with learning disabilities in the special needs group (the majority were considered "at risk"). These data can be presented graphically in an interaction chart, as they are in Figure 2. By setting general education control group performance at a standard score of "0", it can be shown that the corresponding control condition performance of students with special needs relative to general education students is 1.03 standard deviations lower, or at about the 15th percentile of the general education scores. After treatment, students with special needs (again, the great majority of whom had learning disabilities) had scored .26 standard deviations below general education students, placing them at about the 40th percentile of the general education scores, and at about the 64th percentile of general education students in the control conditions.

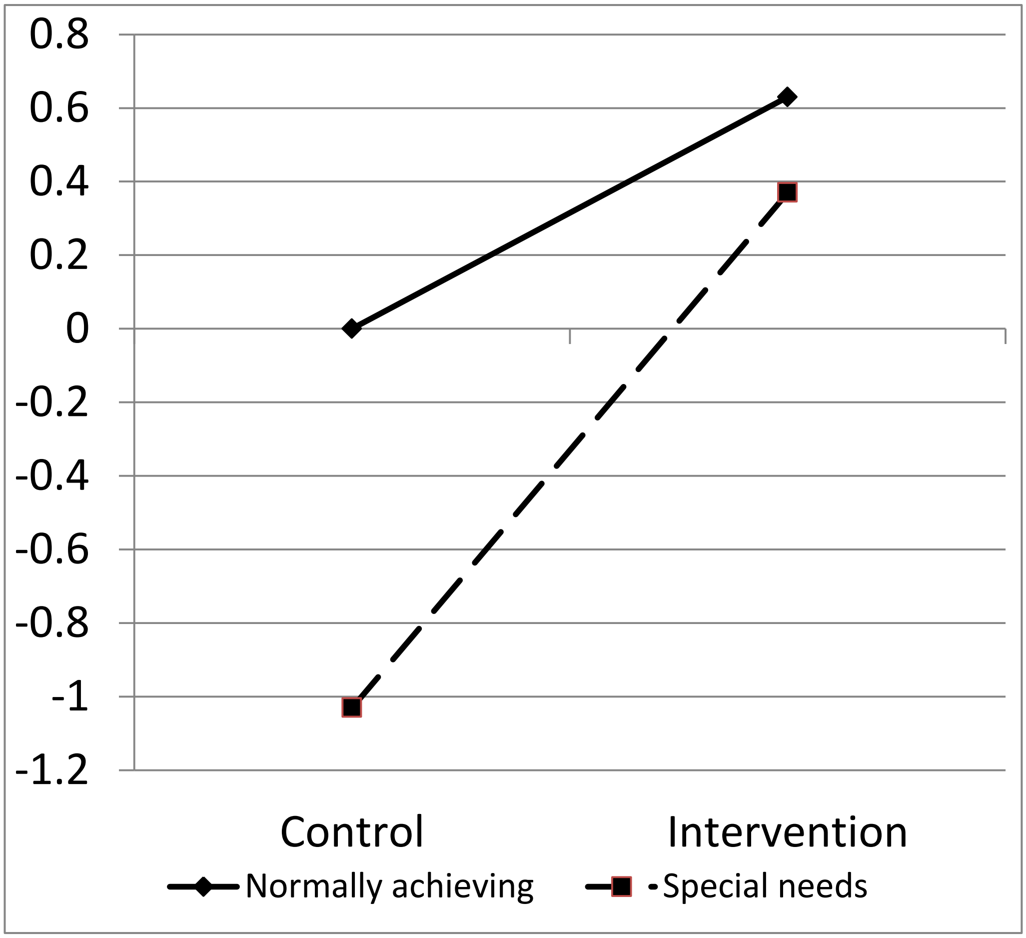

Figure 2. Ordinal interaction representing differential treatment effects from the 10 investigations.

The extent of the difference of learning gain can also be demonstrated with respect to percent increase over control. In this case, gains for students with and without disabilities were calculated as a function of control group performance. These treatments overall have improved functioning of general education students by 16.9% over control students; however, students with special needs gained 63.5% over controls. This difference is also statistically significant (p = .005), according to a Wilcoxon test.

Table 1

Summary of Effect Sizes: 10 investigations, 1128 students, 283 with special needs (80% LD)

Authors	**Effect size**		
	General Education		Special Education
Mastropieri et al. (2008)	.15	>	.41
Scruggs et al. (2012)	.28	>	1.04
Mastropieri et al. (2009)	.35	>	2.39
Simpkins et al. (2009)	.36	>	.43
McDuffie et al. (2009)	.47	>	.63
Uberti et al. (2002)	.76	>	3.33
Mastropieri et al. (2005)	.78	>	.93
Mastropieri et al. (2006)	.79	>	1.15
Marshak et al. (2011)	1.09	>	1.90
Bulgren et al. (1994)	1.29	>	1.82
Mean	**.63**	>	**1.40**

Wilcoxon $z = 2.803$, $p = .005$

Interestingly, these differential effects, which appear so clearly when outcomes are summarized, resulted in statistically significant interactions in only a few of these investigations (e.g., Mastropieri et al., 2008). I believe that the lack of observed significant effect in the other investigations are in fact Type II errors, and are the consequence of the fact that, in these inclusive classrooms, the number of students with special needs was too small to possess sufficient statistical power to yield statistically significant interaction results in individual cases, even when the overall number of classrooms was large. The magnitude and consistency of the differential effects, when these studies are viewed collectively, provides another dimension to the analysis.

These results provide cause for great optimism, as well as cause for some concern, for students with learning disabilities in inclusive content area classrooms. The positive conclusions are that research has revealed several effective strategies for inclusive learning of students with learning disabilities; these strategies appear to have differentially facilitated learning outcomes, so that, after intervention, students with and without disabilities scored very similarly. In some cases (Marshak et al., 2011; Scruggs et al., 2012; Uberti et al., 2003) students with learning disabilities, after training, scored on the same level as, or on an even higher level than general education students. At least in some cases, then, students with learning disabilities and other special needs can benefit very substantially from appropriate inclusive instruction.

In spite of these positive findings, and the apparent differential facilitation of learning outcomes, there remains cause for concern. Although great learning improvements were observed for students with special needs, the effects on other students (the great majority of the students in these investigations) were substantially more modest in most cases. For this reason, teachers may be reluctant to devote the time and resources needed to plan and execute inclusive strategies that are particularly effective for only a smaller proportion of students in general education classrooms. So there is some reason to believe, given these data, that general implementation of appropriate inclusive strategies may be problematic.

In fact, data from some recent research syntheses suggest implementation may indeed be a problem. Scruggs and Mastropieri (1996) and more recently, Scruggs, Mastropieri, and Leins (2011) summarized research from 68 surveys of teacher attitude toward inclusion reported between 1958 and 2011. These surveys, which included 18,926 respondents, indicated that attitudes may have changed but little over these decades: most teachers did support the general idea of inclusion (although fewer than half supported full time inclusion), but a much smaller proportion of teachers agreed that they had sufficient time (< 30%), training (< 40%), or support (< 30%) to include students with disabilities effectively.

In more recent decades, “co-teaching” has been implemented to provide additional supports to general education teachers (Mastropieri et al., 2005). However, this does not appear to have led to improved instructional strategies. Scruggs, Mastropieri, and McDuffie (2007) completed a “meta-synthesis” of 32 qualitative studies of the use of co-teaching in inclusive classrooms, which generally included students with learning disabilities. These studies investigated in depth the activities and perspectives of 453 co-teachers, 142 students, and 42 administrators. Although most teachers commented favorably on co-teaching, instructionally, the practice was more limited. Collectively, the dominant model of co-teaching was “one teach, one assist” (see, e.g., Friend & Cook, 2010), in which the special education teacher provided assistance to the general education teacher in what was often a subordinate role. Zigmond and Matta (2004), for example, studied a number of secondary inclusive classrooms, and represented the conclusions of many other co-teaching researchers when they stated,

> …none of what we saw would make it more likely that the students with disabilities in the class would master the material. . . We did not hear the [special education teacher] chime in with carefully worded elaborative explanations. We virtually never saw the special education teacher provide explicit strategic instruction to facilitate learning or memory of the content material. (Zigmond & Matta, 2004, p. 73)

Scruggs et al. (2007) concluded,

> practices known to be effective and frequently recommended —such as peer mediation, strategy instruction, mnemonics, study skills training, organizational skills training, hands-on curriculum materials, test-taking skills training, comprehension training, self-advocacy skills training, self-monitoring, or even general principles of effective instruction …were only rarely observed. (p. 412)

Findings such as these provide a less optimistic picture of effective inclusion for students with learning disabilities. Combined with the positive results of intervention research, however, it seems very possible that, with increased teacher time, training, and support, more positive outcomes can be realized for students with learning disabilities in inclusive classrooms. These supports should include an increased emphasis on the importance of improving achievement for students with learning disabilities, and the importance of improving learning of general education students, even if to a more modest extent.

Conclusion

The field of learning disabilities has been characterized by multiple and varied changes in theory and practice throughout its history. Researchers have identified a number of important instructional interventions of importance to students with learning disabilities; these interventions provide tools for practitioners and also provide important information about the characterizations of learning disabilities. Some intervention research, conducted in inclusive settings, appears to suggest that interventions that help students attend more carefully, and think more systematically, about academic content may result in differential academic learning gains for students with learning disabilities. These interventions may succeed by serving to help maximize the relative strengths of students with learning disabilities in general intellectual ability, memory of pictures and activities, and ability to benefit from provided academic strategies. At the same time, they directly address and help minimize relative weaknesses in attention and focus, semantic memory, organizational skill, purposive information processing, and spontaneous strategy use. Such characterizations can lead to more general understanding of the instructional needs of students with learning disabilities. That these learning strategies can be presented successfully in inclusive classrooms provides optimism that the general education classroom can be an effective environment for content learning.

Identification of effective intervention strategies is of little practical use if they are not generally implemented in general education classrooms. Summaries of research have suggested that successful inclusive learning may require additional efforts to maximize teacher time, training, and administrative and personnel support. These efforts can ultimately be employed to maximize academic learning for all students, including those with learning disabilities.

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