Quantitative Research Synthesis:
Meta-Analysis of Research on
Meeting Special Educational Needs

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Introduction

Since the passage of landmark federal law (now IDEA) in 1975, special education has witnessed significant change but not necessarily real progress. The consequences are found in attitudes that oscillate between optimism and pessimism about the prospects for special education (see Zigler & Hodapp, 1986). For example, there is optimism about the law’s success in providing access to special education but pessimism about whether or not the appropriate education provision is achieving the desired outcomes (Finn, Rotherham & Hakanson, 2001). Such pessimism is not new; the innovative program developed by Jean-Marc-Gaspard Itard for Victor, the “wild boy of Aveyron” (Itard, 1806/1962) was perceived as a “failure” (e.g., Kirk & Johnson, 1951) because of Victor’s modest attainments. In reality, the gains were meaningful and demonstrated the potential of special education (Gaynor, 1973).

Questions about the efficacy of special education are thus long-standing (e.g., Milofsky, 1974) and typically take the form of asking: Is special education special? Answers may become confounded because the special in special education possesses two meanings: a) teaching special students, and b) using special instruction. Too often, however, the desire to enhance education experiences for special students means that teaching may be based on uncritical decisions about the efficacy of techniques used for special instruction. The fact that the most effective teaching is predicated on scientific ground may be ignored when a teacher is faced with the challenge of teaching special students (see Gage, 1978). Without a scientific foundation for practice, special education is likely to become a variable enterprise that may be effective or not effective.

To determine whether methods for special instruction are effective (i.e., Do they work?), special education how long-endorsed the scientific method where decisions about efficacy are based on empirical evidence (Kauffman, 1987). The empirical evidence is available but too often
remains isolated when individual study findings do not agree. Which findings are to be believed? Differences among studies are not a problem if individual findings are combined to produce “usable knowledge” (Lindblom & Cohen, 1979) that may be used to judge the efficacy of special instruction.

Traditional methods for combining individual study findings (e.g., narrative review) are too subjective and may produce biased findings (see Jackson, 1980). In an effort to reduce the subjectivity associated with traditional methods of reviewing research findings (see Cooper & Rosenthal, 1980), quantitative methods, usually termed “meta-analysis” (Glass, 1976), have become an accepted means of combining empirical findings. Meta-analysis is the application of statistical procedures to collections of empirical findings from individual studies for the purpose of integrating, synthesizing, and making sense of them (Glass, McGaw, & Smith, 1981).

As a research methodology, meta-analysis uses rigorous and systematic procedures that parallel primary research activities including: 1) problem formulation (Is intervention X effective?), 2) sampling (a comprehensive and representative set of studies from the domain under investigation), 3) study classification (organizing and coding study information), 4) data analysis (calculation of the “effect size” (ES) statistic that permits quantification and standardization of individual study findings), and 5) ES interpretation (Kavale, 2001b).

An ES is most often interpreted as a z-score indicating level of improvement on an outcome assessment for students initially at the 50th percentile. To gain greater insight, two additional ES interpretations are provided. The “common language effect size” (CLES) (McGraw & Wong, 1992) converts ES into a probability that a score sampled from one distribution will be greater than a score sampled from another. For example, in a sample of studies investigating the use of intervention Y with a CLES of .83, 83 out of 100 would show
that a subject using intervention Y would improve when compared to subjects not using intervention Y. The “binomial effect size display” (BESD) (Rosenthal & Rubin, 1982) addresses the question: What is the percentage increase in the number of successful responses when using a new instructional practice? Based on converting an ES to r, the BESD for the use of intervention Z (ES = 1.16, for example) would show an increase in success rate from 25% to 75%. The 50-percentage-point spread between treatment (75%) and comparison (25%) success rate shows that the use of intervention Z possesses, not only statistical significance, but also practical significance. Finally, Cohen (1988), based on notions of statistical power, offered “rules of thumb” for classifying ES as small (.20), medium (.50), or large (.80). Thus, the ES metric imparts a clarity and explicitness to empirical findings that make synthesized evidence more objective and verifiable (Kavale, 1984).

This chapter reviews meta-analyses investigating the effectiveness of special education in order to make decisions about “what works” (see Kavale, 2001a).

The Nature of Special Education

The definition of special education as “specially designed instruction…to meet the unique needs of a child with a disability (U.S. Department of Education, 1999, p. 12425) emphasizes individualized instruction but does not stipulate the nature of the special instruction to be delivered. Special education, in an effort to differentiate itself from general education, has historically opted for developing unique and exclusive methods. Although “special” methods provided a distinct identity, they also introduced a separateness from general education that produced a skepticism about their benefits on the part of general education. Because of its higher costs, special education was being held increasingly accountable: Could special education substantiate its benefits?
Special education has historically assumed a goal of correcting or reversing the altered learning functions of students. Beginning with Itard, special education has focused on enhancing cognitive processes so students in special education may then be able to learn in the same way as general education students. Consequently, process training has long been a primary form of special education (see Mann, 1979). Although intuitively appealing, does research support the theoretical assumption that training processes enhances learning ability?

A large body of empirical research has investigated the efficacy of process training but difficulties arise in deciding “what the research says” as was illustrated in the case of psycholinguistic training, a prominent form of process training during the 1960s and 1970s. Psycholinguistic training was developed by Samuel A. Kirk and embodied in the Illinois Test of Psycholinguistic Abilities (ITPA). The model was based on the assumption that psycholinguistic ability is comprised of discrete components and that these components can be improved with training. By the mid 1970s, empirical research summaries revealed very different interpretations about the efficacy of psycholinguistic training.

A review of 39 studies by Hammill and Larsen (1974) concluded that, “the idea that psycholinguistic constructs, as measured by the ITPA, can, in fact, be trained by existing techniques remains nonvalidated” (p. 11). In response, Minskoff (1975) offered a more positive evaluation and concluded that psycholinguistic deficits can be remediated. The Minskoff review was immediately challenged by Newcomer, Larsen, and Hammill (1975) who concluded that, “the reported literature raises doubts regarding the efficacy of presently available Kirk-Osgood psycholinguistic training programs” (p. 147). The divergent interpretations made it increasingly difficult to determine “what the research says” about the efficacy of psycholinguistic training.
Several years later, Lund, Foster, and McCall-Perez (1978) re-evaluated the original 39 studies, and concluded that, “It is, therefore, not logical to conclude either that all studies in psycholinguistic training are effective or that all studies in psycholinguistic training are not effective” (p. 319). Hammill and Larsen (1978) contested the Lund et al. analysis and concluded that, “the cumulative results…failed to demonstrate that psycholinguistic training has value” (p. 413). Although polemics abounded, a primary question remained unanswered: What is really known about the efficacy of psycholinguistic training?

Meta-analysis and the Efficacy of Special Education

**Psycholinguistic Training**

The traditional methods of research integration used to evaluate psycholinguistic training failed to accumulate knowledge in an objective manner. To provide verifiable and replicable conclusions, Kavale (1981) conducted a meta-analysis on 34 studies that yielded an average ES of .39. In a statistical sense, an ES shows outcomes in standard deviation (SD) units that can be interpreted in terms overlapping distributions (treatment vs. control). The ES of .39 indicates that the average treated subject would gain 15 percentile ranks on the ITPA and would be better off than 65% of control (no treatment) subjects. Using Cohen’s (1988) rules of thumb, an ES of .39 approaches a “medium” level but does not represent an unequivocal endorsement of psycholinguistic training.

To gain insight, ES data were aggregated by ITPA subtest and five of nine ITPA subtests revealed “small,” albeit positive, effects. Such a modest response suggests that training would not be warranted in these five cases. For four subtests (Auditory and Visual Association, Verbal and Manual Expression), however, training improves performance from 15 to 24 percentile ranks
and makes the average trained subject better off than approximately 63% to 74% of untrained subjects.

The findings regarding the Associative and Expressive constructs appear to belie the conclusion of Hammill and Larsen (1974) that, “neither the ITPA subtests nor their theoretical constructs are particularly ameliorative” (p. 12). The meta-analytic findings should not, however, be interpreted as approval for psycholinguistic training. In the case of Auditory Association, for example, there are difficulties in defining the skill: What is Auditory Association? Additionally, it is important to determine whether improvement in Auditory Association provides enhanced functioning in other than that discrete ability. In contrast, the case for Expressive constructs particularly Verbal Expression presents a different scenario because it represents the tangible process of productive language behavior whose improvement is critical for school success. In fact, the Verbal Expression ES (.63) exceeds what would be expected from six months of general education language instruction (ES=.50). Thus, the Kavale (1981) meta-analysis showed where psycholinguistic training might be effective and might be initiated when deemed an appropriate part of an intervention program.

Process Training

Mann (1979) suggested that, “process training is, in fact, one of the oldest forms of education and that, despite periodic discontinuities in its practice, it has continued unabated into our own day” (p. 537). Table 1 reveals that popular forms of process training demonstrate limited efficacy. (The reported ES were obtained from the meta-analyses listed in Appendix A and represent either the ES reported in a single meta-analysis investigating a particular intervention or a weighted mean ES from meta-analyses investigating the same intervention.) For example, perceptual-motor training, the embodiment of 1960s special education had practically
no effect on improving educational performance; famous programs such as those developed by Kephart (ES=.06) and Frostig (ES=.10) revealed very modest effectiveness. The limited efficacy of process training may be related to difficulties in attempting to ameliorate unobservable (hypothetical) constructs. The outcomes of training (products) are the only observable component while the means by which those products were achieved (process) are not observable. Although these difficulties are evident for constructs like perception, the same problems can be identified for, as an example, social skills training where the actual skills represent products that are presumed related to the hypothetical construct of social competence.

Although attacks on process training have been vigorous (e.g., Mann, 1971), its historical, clinical, and philosophical foundation creates a resistance to accepting negative evidence (e.g., Hallahan & Cruickshank, 1973) because, “the tension between belief and reality provides a continuing sense of justification for process training” (Kavale & Forness, 1999, p. 35). The failure to change beliefs about efficacy was found for modality-matched instruction (ES=.14) which has received a number of previous negative evaluations (e.g., Arter & Jenkins, 1979; Larrivee, 1981; Tarver & Dawson, 1978). The negative evidence is resisted because teachers have maintained a strong belief that students learn best when instruction is modified to match individual modality patterns (Kavale & Reese, 1991). The beliefs, however, must be modulated by the empirical evidence indicating that interventions developed to define the uniqueness of special education (e.g., process training methods not likely to be used in general education) are not effective. Such evidence needs to be heeded because, “schools must view the time, money, and other resources devoted to [process training] as wasteful [and] as an obstruction to provision of appropriate services (Council for Learning Disabilities, 1986, p. 247).

Creating Effective Special Education
The long dominant tradition of process training in special education reflected a pathology model; academic problems were regarded as a “disease” and interventions were aimed at “curing” the disease (i.e., removing the pathology) (Kauffman & Hallahan, 1974). By about 1975, the realization that process training was not producing desired outcomes shifted attention to an “instructional imbalance” model where school failure was viewed as the result of a mismatch between instructional methods and student developmental level (Hagin, 1973). The “effective schools” research (see Bickel & Bickel, 1986) was a major influence that stressed, for example, the importance of teachers believing that all students can achieve, that basic skill instruction should be emphasized, and that clear instructional objectives should be used to monitor student performance.

At the same time, a “learning process” model emerged that viewed teaching within a “process-product” paradigm where variables depicting what occurs during teaching are correlated with products (i.e., student outcomes) (Needels & Gage, 1991). Research revealed the importance of a number of principles like, for example, encouraging student’s active engagement in learning, exploring innovative approaches to grouping and organizing classroom instruction, and making learning meaningful by keeping it enjoyable, interesting, student-centered, and goal-oriented (see Brophy & Good, 1986). These principles became “best practice” and were interpreted for special education (e.g., Christenson, Ysseldyke, & Thurlow, 1989; Reith & Evertson, 1988; Reynolds, Wang, & Walberg, 1992).

**Effective Special Educational Practice**

Research investigating the teaching-learning process has identified a number of effective instructional practices. Table 2 shows a sample of effective instructional practices and reveals
that substantial positive influence on learning are possible by modifying the way instruction is delivered.

The use of effective instructional practices moves special education toward the general education teaching-learning model and away from a reliance on “special” interventions (e.g., process training). For example, mnemonic instruction (MI) is a strategy that transforms difficult-to-remember facts into a more memorable form through recoding, relating, and retrieving information (Mastropieri & Scruggs, 1991). A student receiving MI would be better off than 95% of students not receiving MI and would show a 45 percentile rank gain on an outcome assessment. In a sample of studies investigating MI, 87 out of 100 would show that students receiving MI would demonstrate improvement when compared to students in the control condition (CLES=.87). The BESD shows a 64% increase in success rate which indicates substantial practical significance. Compare the success rate of MI to, for example, perceptual-motor training (ES=.08) where the modest 4% increase in success rate indicates a negligible statistical effect and almost no practical significance.

Effective Special Education Instruction

The ultimate purpose of implementing effective instruction is to enhance academic performance. Achievement outcomes are shown in Table 3 and indicate the potential for substantial gains across subject areas. All achievement domains show “large” ES with gains ranging from 29 to 41 percentile ranks on academic achievement measures. On average, almost eight out of ten investigations of effective special education instruction will likely show improvement (CLES=.77). The success rate increases from 27% to 73% indicating an average 46% improvement for students showing a positive response to instruction.
The example of reading comprehension demonstrates how meta-analysis can be useful for judging the magnitude of “real” effects. Two meta-analyses contributed almost all ES measurements and produced ESs of 1.13 and .98, a modest three percentile rank difference in outcomes (87 vs. 84). When specific methods for improving reading comprehension are compared, the two meta-analyses revealed a similar pattern of findings. The largest effects (ES=1.60 and 1.33) were found for metacognitive techniques (e.g., self-questioning, self-monitoring). Text enhancement procedures (e.g., advanced organizers, mnemonics) produced ES of 1.09 and .92. The least powerful (but nevertheless effective) techniques involved skill training procedures (e.g., vocabulary, repeated reading) with ES of .79 and .62. The consistency of findings across these two meta-analyses provides confidence in concluding that it is possible to enhance reading comprehension.

The meta-analytic evidence suggests that, on average, the “real” effect of reading comprehension instruction is 1.05, a level comparable to one year’s worth of reading comprehension instruction in general education (ES=1.00). Thus, methods adapted for the purposes of special education produced the same effect as 1 year of general education instruction but did so in approximately 20 hours. Clearly, special education students can significantly improve their ability to better understand what they read.

Effective Special Education Related Services

A hallmark of special education is the provision for related services to be provided when deemed appropriate in augmenting the instruction program. Table 4 shows a sample of adjunct activities and most demonstrate, at least, “medium” ES. On average (ES=.65), related services produced a 24 percentile rank gain on an outcome assessment. In 68 out of 100 cases, a positive
response to the related service was achieved (CLES=.68). Thus, related services appear to be useful supplements to the instructional program.

Placement has often been viewed as having a positive influence on student performance (see Kavale & Forness, 2000). The ES magnitude (.12) negates such a view and indicates that the success rate associated with placement increases only 6% from 47% to 53% (BESD). The “small” ES suggests that “what” (i.e., nature of the instruction) is a more important influence on student outcomes than “where” (i.e., placement). In contrast, prereferral activities revealed significant positive effects. The CLES (.78) indicates that in 78 of 100 cases prereferral activities produce positive outcomes. Prereferral “works” because it is predicated in modification of instructional activities, and its 48% success rate means that almost half of students given preferential activities will not need to enter special education.

Drug treatment is often an integral part of the treatment regimen for some students in special education. Stimulant medication (usually Ritalin) is the most popular and produces significance positive changes in behavior. In 2 out of 3 cases (CLES=.67), positive outcomes were found in gains averaging 23 percentile ranks on behavior ratings and checklists. The ES (.62) was obtained primarily from a meta-analysis done in 1982 (ES=.58) and a replication completed in 1997 (ES=.64). The consistency of the obtained ES (i.e., .58 and .64) provides confirmation for the positive influence of stimulant medication. Special education, however, has long criticized the use of stimulant medication and has sought more natural and unobtrusive treatments. One such alternative, popularized during the 1970s, was the Feingold diet designed to eliminate all foods containing artificial additives from the diet. The ES (.12) obtained for the Feingold diet (see Table 1) clearly indicates that it has limited influence on modifying behavior. A comparison of the two treatments shows stimulant medication to be better than five times
more effective than the Feingold diet; the debate about the efficacy of stimulant medication appears unequivocal.

Evaluating Special Education

Special education has demonstrated increased efficacy that may be attributable to a change in instructional emphasis. Until about 25 years ago, special education emphasized its “special” nature by developing singular and different methods not found in general education. The goal was to enhance hypothetical constructs (e.g., “processes”) that were presumed to be the cause of learning deficits. Basic skill instruction was a secondary consideration until processes were remediated and learning became more efficient. When intervention activities emphasize, for example, process training and basic skill instruction is subordinate, the nature of special education can be conceptualized as SPECIAL education, with a focus on unique and exclusive “special” interventions. The limited efficacy of SPECIAL education (see Table 1) suggest that process deficits are difficult to “fix” and such an intervention focus produces little benefit.

The recognition that “special” interventions did not produce desired outcomes moved special education to emphasize “education” in an effort to enhance academic outcomes. When intervention activities emphasize alternative instructional techniques, the nature of special education can be conceptualized as special EDUCATION. Such instructional techniques usually originate in general education and are adapted to assist students with disabilities in acquiring and assimilating new knowledge; special EDUCATION demonstrates significant success (see Table 2) and produces improved achievement outcomes (see Table 3).

The difference between the two forms of special education are seen in the mega ES (mean of means) for “special” (.15) versus “education” (.89) techniques. The comparison reveals special EDUCATION to be six times more effective than SPECIAL education; it produces
achievement outcomes (mega ES=1.04) that exceed one year’s worth of general education instruction (ES=1.00). On average, SPECIAL education provides only a 6% advantage meaning that the students in special education receiving primarily “special” interventions exceeds only about 56% of the group not receiving such interventions; this level of improvement is only slightly above chance (50%). Additionally, across meta-analyses investigating SPECIAL education, about 25% of the calculated ES were negative indicating that in one out of four cases the student not receiving the “special” intervention performed better. Clearly, there is little reason to include SPECIAL education in most intervention programs.

In contrast, the methods associated with special EDUCATION provide an efficacious foundation for designing an academic instructional program. The use of effective techniques is likely to move the average student in special education from the 50th to the 81st percentile. The 31-percentile-rank gain is better than 5 times the gain found with the use of “special” interventions, and indicates students are better off than 81% of those not receiving the preferred special EDUCATION. For example, Direct Instruction (DI), a behaviorally oriented teaching procedure based on an explicit step-by-step strategy (ES=.93) is 6 ½ times more effective than the intuitively appealing modality-matched instruction that attempts to enhance learning by capitalizing on learning style differences (ES=.14). Students in special education taught with DI would be better off than 87% of students not receiving DI and would gain over 11 months credit on an achievement measure compared to about one month for modality-matched instruction. With its grounding in effective instructional methodology, special EDUCATION can sometimes be up to 20 times more effective than SPECIAL education.

Effective Special Education
The meta-analyses synthesized provide insight into the indications and contra-indications of special education interventions (Lipsey & Wilson, 2001). The interventions associated with special \textit{EDUCATION} may be considered a form of “evidenced-based practice” (EBP) (Odom, Brantlinger, Gersten, Horner, Thompson, & Harris, 2005) where intervention decisions are based on empirical findings demonstrating that the actions produce efficacious and beneficial outcomes. The use of EBP promotes \textit{instructional validity} where changes can be attributed to the specific activities and can be used to produce similar results with other students in special education (generalization).

Although EBP is desirable, the implementation of EBP is often limited by extraneous factors. For example, tradition (“We have always used it”) and history (“It has worked before”) are powerful barriers. Additionally, the \textit{bandwagon effect}, where an intervention suddenly becomes popular and gains momentum rapidly, may have a significant influence. As pointed out by Mostert (1999-2000), “Bandwagons are used to champion a cause, engage in sweeping yet attractive rhetoric, and generally to promise far more than they ever have hope of delivering” (p. 124). Finally, belief, a strong conviction about the truth, although a legitimate consideration in making intervention decisions, is only appropriate when the belief is grounded in empirical evidence.

The negative influence of these extraneous factors is one reason why research findings in special education “are embraced by some, ignored by others, and modified to suit the routines and preferences of still others” (Gersten, Vaughn, Deshler, & Schiller, 1997, p. 466). Regardless of how exciting teachers may find new proven techniques, they often resist implementing them in favor of more comfortable existing practices (Swanson, 1984). Heward (2003) identified ten faulty notions that may hinder the effective delivery of special education. All told, the obstacles
that interfere with making sound instructional decisions are a primary reason why there is a continuing research-to-practice gap in special education (Greenwood & Abbott, 2001). The failure to use EBP is a major contributor to the problem of *sustainability*, the maintained use of an instructional practice supported by evidence of improved outcomes for students in special education (Gersten, Vaughn, & Kim, 2004).

Because students in special education, by definition, possess unique learning needs, instructional decisions are critically important in the design of *individualized* programs. The complexities surrounding the instructional decision making introduces a degree of “uncertainty” (i.e., the program may not work) (Glass, 1979). Besides uncertainty, there is also the possibility of “risk” (i.e., negative outcomes) that can be described in meta-analysis by the standard deviation (SD), a measure of dispersion around the mean ES that represents an index of variability. Taken together, the ES and SD provide a theoretical expectation about intervention efficacy (i.e., ES ± SD). For example, psycholinguistic training (.39 ± .54) spans a theoretical range (-.15 to .93) from negative ES to “large” ES; the difficulty is the inability to predict the outcome (i.e., ES) for a particular student. The mega ES for *SPECIAL education* (.15) is associated with a larger mega SD (.48) making “special” interventions actually more variable than effective (.15 ± .48). The theoretical range for *SPECIAL education* (-.33 to .63), although possibly producing “medium” effects, also includes significant risk (i.e., a negative ES indicating that those not receiving the intervention perform better). In contrast, *special EDUCATION* (.89 ± .87) reveals itself to be more effective than variable and, although the theoretical range shows that it may not “work” in some cases (ES=.02), there also exists the theoretical possibility of being almost twice as effective (ES=1.76).
Although the use of *special EDUCATION* can reduce risk (i.e., no negative ES), the special education teaching-learning process remains a capricious enterprise (i.e., variable, unpredictable, and indeterminate). To create more certainty, instructional decisions should not be prescriptive (i.e., do A in circumstance X or Y, and do B in circumstance Z) but rather based on an assortment of effective options (i.e., practices with large ES). This means that teachers are central characters in the special education decision making process who must replace dogmatic beliefs with rational choices about “what works.” Instructional decisions thus include elements of science (theoretical and empirical knowledge) and art (interpretation necessary to initiate action (see Gage, 1978). The teacher’s goal is to narrow the gap between the state of the art (what has been demonstrated to be possible) and the state of practice (current ways of providing instruction). Consequently, the actions of special education practitioners will need to go beyond the scientific basis of their work … and must be mediated through the teacher’s own creative rendering of best practice … because quality education for special education students will always be based on the artful application of science (Kavale & Forness, 1999, p. 93).
Table 1

*Effectiveness of Process Training*

<table>
<thead>
<tr>
<th>Method</th>
<th>Mean Effect Size</th>
<th>Percentile Rank Equivalent</th>
<th>Power Rating</th>
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</thead>
<tbody>
<tr>
<td>Irlen Lenses</td>
<td>-.02</td>
<td>49</td>
<td>Negative</td>
</tr>
<tr>
<td>(34)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perceptual-Motor Training</td>
<td>.08</td>
<td>53</td>
<td>Negligible</td>
</tr>
<tr>
<td>(33)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diet Modification (Feingold)</td>
<td>.12</td>
<td>55</td>
<td>Small</td>
</tr>
<tr>
<td>(31)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Modality-Matched Instruction</td>
<td>.14</td>
<td>56</td>
<td>Small</td>
</tr>
<tr>
<td>(32)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social Skills Training</td>
<td>.36</td>
<td>64</td>
<td>Small</td>
</tr>
<tr>
<td>(17, 42, 44)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Psycholinguistic Training</td>
<td>.39</td>
<td>65</td>
<td>Small-Medium</td>
</tr>
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<td>(27, 29)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Frostig Visual Perceptual Training</td>
<td>.10</td>
<td>54</td>
<td>Negligible-Small</td>
</tr>
<tr>
<td>(30)</td>
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( ) = ES source listed in Appendix A
Table 2

*Effective Instructional Practices*

<table>
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<tr>
<th>Practice</th>
<th>Mean Effect Size</th>
<th>Common Language Effect Size</th>
<th>Binomial Effect Size</th>
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</thead>
<tbody>
<tr>
<td>Mnemonic Instruction</td>
<td>1.62</td>
<td>.87</td>
<td>18</td>
</tr>
<tr>
<td>(39)</td>
<td></td>
<td></td>
<td>82</td>
</tr>
<tr>
<td>Self-Monitoring</td>
<td>1.36</td>
<td>.83</td>
<td>22</td>
</tr>
<tr>
<td>(55, 58, 59)</td>
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<td></td>
<td>78</td>
</tr>
<tr>
<td>Reinforcement</td>
<td>1.17</td>
<td>.80</td>
<td>25</td>
</tr>
<tr>
<td>(58, 59, 64)</td>
<td></td>
<td></td>
<td>75</td>
</tr>
<tr>
<td>Self-Questioning</td>
<td>1.16</td>
<td>.79</td>
<td>25</td>
</tr>
<tr>
<td>(55, 57)</td>
<td></td>
<td></td>
<td>75</td>
</tr>
<tr>
<td>Drill &amp; Practice</td>
<td>.99</td>
<td>.76</td>
<td>28</td>
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<td>(4, 58, 64)</td>
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<td></td>
<td>72</td>
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<tr>
<td>Strategy Instruction</td>
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<td>.75</td>
<td>28</td>
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<tr>
<td>(55, 56, 57, 58)</td>
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<td></td>
<td>72</td>
</tr>
<tr>
<td>Feedback</td>
<td>.97</td>
<td>.75</td>
<td>28</td>
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<td>(58, 59, 64)</td>
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<td></td>
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<tr>
<td>Direct Instruction</td>
<td>.93</td>
<td>.75</td>
<td>29</td>
</tr>
<tr>
<td>(1, 2, 65)</td>
<td></td>
<td></td>
<td>71</td>
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<tr>
<td>Visual Displays</td>
<td>.90</td>
<td>.74</td>
<td>29</td>
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<tr>
<td>(58)</td>
<td></td>
<td></td>
<td>71</td>
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<tr>
<td>Computer-Assisted Instruction</td>
<td>.87</td>
<td>.73</td>
<td>30</td>
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<tr>
<td>(47, 58)</td>
<td></td>
<td></td>
<td>70</td>
</tr>
<tr>
<td>Repeated Reading</td>
<td>.76</td>
<td>.71</td>
<td>32</td>
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<tr>
<td>(59, 61)</td>
<td></td>
<td></td>
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<td>Error Correction</td>
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<td>.70</td>
<td>33</td>
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<tr>
<td>(58, 64)</td>
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Table 2 (continued)

*Effective Instructional Practices*

<table>
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<tr>
<th>Practice</th>
<th>Mean Effect Size</th>
<th>Common Language Effect Size</th>
<th>Binomial Effect Size Display</th>
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<td>Success Rate Increase</td>
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<td>Early Intervention</td>
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<tr>
<td>(8, 23, 24, 49, 50, 51, 65)</td>
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<td>Formative Evaluation</td>
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<td>(58, 59)</td>
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<td>(10, 41, 59)</td>
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<td>(13, 14, 48)</td>
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<td>Increased Time</td>
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( ) = ES source listed in Appendix A
Table 3

Effective Special Education Instruction

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<th>Subject Area</th>
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<th>Percentile Rank Equivalent</th>
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<td>Handwriting</td>
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( ) = ES source listed in Appendix A
<table>
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<th>Service</th>
<th>Mean Effect Size</th>
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<th>Binomial Effect Size</th>
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<tr>
<td>Memory Training (16, 58)</td>
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<td>Prereferral (5)</td>
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<td>Cognitive Behavior Modification (12, 46)</td>
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<td>Placement (6, 57, 63)</td>
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( ) = ES source listed in Appendix A
References


Appendix A

Reported Effect Size were obtained from the following sources:


