Process and Product Explanations for What Works for LD and Why

Sid T. Womack is professor of secondary education, Department of Curriculum and Instruction, Arkansas Tech University, Russellville, Arkansas

Shellie L. Hanna is assistant professor of health and physical education, Department of Health and Physical Education, Arkansas Tech University, Russellville, Arkansas

Peggy Woodall is assistant professor of special education, Henderson State University, Arkadelphia, Arkansas

Rebecca Callaway is assistant professor of curriculum and instruction, Arkansas Tech University, Russellville, Arkansas

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Abstract: In the history of learning disabilities education, practitioners and researchers alike have been mired in controversies about product and process approaches. This review of literature attempts to identify the most useful research about product and process approaches and to suggest situations in which each may be most appropriate. Some literature suggests that there may be a process/product break between the elementary and secondary grades. The article also uses the four basic Gestalt laws (principles) to illustrate how students with learning disabilities apprehend content.

The field of learning disabilities education for decades has been divided between two categories of approaches: process (or ability) approaches and product (skill) approaches. Process approaches tend to view learning disabilities as intrinsic to the learner (Kirk & Gallagher, 1979), while product approaches tend to view learning disabilities in terms of performance deficits (what the child does not know). In this paper, we seek to clarify both approaches in light of the existing literature, illustrate classroom applications of each, and provide reasons why the applications would be likely to work with students who have learning disabilities.

Definitions

The definition of learning disabilities from the federal law IDEA-2004 is:

> The term "specific learning disability" means a disorder in one or more of the basic psychological processes involved in understanding or in using language spoken or written, which disorder may manifest itself in imperfect ability to listen, think, speak, read, write, spell, or to do mathematical calculations. Such term includes such conditions as perceptual disabilities, brain injury, minimal brain dysfunction, dyslexia, and developmental aphasia. Such term does not include a learning problem that is primarily the result of visual, hearing, or motor disabilities; of mental retardation; of emotional disturbance; or of environmental, cultural, or economic disadvantage.

The definition has four criteria that must be considered when identifying students with learning disabilities:

1. *Academic difficulties*. "The child with learning disabilities has difficulty learning

how to read, write, spell, organize thoughts, or do mathematical calculations, compared with other children of the same age" (Kirk, Gallagher, & Anastasiow, 2003).

2. *Discrepancy between potential and achievement*. "The child with learning disabilities experiences a serious discrepancy between intellectual ability and achievement in school; this is known as an aptitude-achievement discrepancy" (Kirk et al., 2003).

3. *Exclusion of other factors*. "A person may not be classified as having learning disabilities if the learning problem is caused by visual or hearing impairments, mental retardation, motor disabilities, emotional disturbance, or environmental factors" (Kirk et al.).

4. *Neuropsychological disorder*. "Basic learning disabilities are the result of some type of neuropsychological disorder ("Kirk et al").

For the purposes of this article, process learning will be defined as how a student acquires information through the modalities of auditory, visual, and tactile-kinesthetic. Process learning is closely related to methods and strategies of learning. Contrarily, product learning as discussed in this article will be defined as the transfer of learning to an end result through the modalities. Product learning is closely related to content. Product learning has been used synonymously with skill learning. The process versus product controversy has not been limited to special education. Richardson and Morgan (2000) describe reading primarily as a process although the act of reading may produce products. Few would argue that reading should not be taught simply because it is heavily process-oriented.

Although admittedly there are five senses, the primary modalities of learning for school settings are visual, auditory, and tactile-kinesthetic. Visual learners, for instance, in university settings take notes in class and look at their material until they have it encoded into memory. Auditory learners take notes in class and later read those notes subvocally or aloud in order to

recapitulate the auditory experience, i. e. to "hear" the lecture again. Tactile-kinesthetic learners write the notes in order to re-copy later. By re-copying their notes, they encode the information. All three types of learners take notes, yet for three distinctly different reasons. A difference in modality preference reaches the point of a learning disability when the learner cannot learn or must learn only with great difficulty through one of these modalities. Pisha and Coyne (2001) supplied a similar explanation of the role of modalities while in reviewing the first of Vygotsky's three conditions for learning: the *recognition system*, the strategic system, and the engagement system.

> "The recognition system receives and interprets sensory data. As some individuals, such as those who are blind or vision-impaired, are not able to recognize patterns, visual and auditory presentation would support diverse learners' efforts to access meaning. The strategic system enables learners to plan action and act on information. The engagement system strives to accommodate learners' preferences. (Pisha & Coyne, 2001.)

The recognition system of the student with a learning disability does not accept information reliably through the modality that has the disability. The student with LD does not encode information visually, auditorally, or tactually/kinesthetically as fluently as his non-disabled peers.

Studies on Process Approaches

Definitive studies by Kavale and Forness (2000) and by Johnson et. al. (2010) indicate that there are process variables which influence learning. Auditory and visual perceptual skills can successfully increase the accuracy of predicting reading achievement (Kavale and Forness,

1995). In a meta-analysis of 267 quantitative studies, auditory and visual perception were said to account for approximately 19% of the variance in reading achievement. Statistically significant correlations from .371 to .402 were found between general reading ability and auditory discrimination, auditory blending, auditory memory, and auditory comprehension. Higher correlations from .251 to .472 were found between general reading ability and figure-ground discrimination, visual spatial relation, visual motor integration, visual association, visual discrimination, visual closure, and visual memory, with visual memory being the most predictive. Kavale and Forness advocated the use of the Binomial Effect Size Display, which indicates the change in predictive accuracy attributable to the relationship in question. The same data in BESD analysis indicated that all of the process variables were contributors to the total variance accounted for and should be considered in analyzing the association between reading and perception. Processes measured in the 267 studies of the meta-analysis included, but were not limited to: auditory discrimination, sound discrimination, auditory blending, visual-motor Gestalt, eye-motor coordination, and figure ground perception. The names of the tests utilized to assess the above process variables would be familiar to many special educators. In the Kavale & Forness (2000) study, when IQ was introduced into the regression analysis, it became the first variable in explaining the variance in general reading ability, accounting for 45 to 58% of the variance. There are arguments for and against whether IQ tests should be considered process tests or achievement (product) tests. If IQ tests are process tests, 45 to 58 percent of the variance is considerable. If IQ tests are product tests, the remaining 19% of variance accounted for would represent two letter grades in most school districts, still too much to ignore.

Both the deficits in processes and the influence of IQ impact the speed at which the LD student information. Some of the delays in processing occur in a fashion parallel to that of

translation from a second language: A learner with Ld might meta-cognate "'Bog' could be 'dog,' that is a word that sometimes tricks me, I have to go back to check the context to see which one it is." While he is considering the possibility of a reversal, and checking the context to see whether the word in question is *bog* or *dog*, his classmates never had to resolve the issue during their silent reading, and by now have finished the "bog-dog" paragraph and are on the next page. Ambiguities of the perceptual processes slow the learner with LD by causing him to re-check and verify cognitive processes that typically-developing learners never have to. For these and other reasons, students with LD have been described as easily fatigued, slow to finish, careless and inaccurate, and having a poor tolerance for frustration (Wiig & Semel, 1984). Johnson *et. al* (2010) in a meta-analysis of 32 studies found moderate to large differences in the cognitive processing abilities of students with specific learning disabilities (SLD) compared to typically achieving students. Students with reading disabilities had reading achievement levels nearly two standard deviations below those of typically achieving students. Students with reading disabilities had the largest deficits in phonological processing (Effect Size or ES of -1.276, a slower processing speed (ES=-.947), and less verbal working memory (ES=-.920). These findings support a definition of learning disabilities as "a learning problem intrinsic to the child." In studies that had used a discrepancy formula to identify students with SLD, difference in intelligence between students with and without reading disabilities was small (ES= - .253).

Process approaches in the historical development of the LD field

The term *learning disabilities* was coined by Dr. Samuel Kirk in 1963 in speaking to a group of concerned parents. Their children had experienced significant difficulties in learning while in school, but IQ tests usually showed that they had average or above average intelligence. "Learning disabilities" was used to describe an uneven pattern of growth, particularly among

psychological processes. The field of learning disabilities came of age during a search for process-oriented explanations of why some children could identify letters but not read, recite number facts but not calculate, or who seemed very bright, but could not spell.

Early writings by Fernald (1943), Gillingham and Stillman (1960), Frostig, Lefever, and Whittessey (1964), and Getman (1965) attributed learning difficulties to disorders in perceptual and motor processes, or difficulties in written language. Gestalt perceptual theory was used to explain the perceptual confusion those students experienced. The word *Gestalt* refers to the ability to grasp the wholeness of an experience (Lerner, 1997). Gestalt theory declares that humans tend to group or to associate phenomena, including written communications, based upon four laws or principles:

1. *Closure*. Humans desire good closure. We do not like answers to mathematical problems, for instance, if those answers are not reduced to lowest terms.
2. *Proximity*. We tend to group things that are close to each other.
3. *Similarity*. We tend to associate things that have common characteristics.
4. *Continuity*. Continuity is the basis for the camouflage that the military uses.

According to Lerner and Johns (2009), tests used to assess visual Gestalt dysfunctions include the Bender-Gestalt Test, in which the individual is asked to copy nine geometric forms, and the Goodenough-Harris Drawing Test, which requires the individual to draw a picture of a human figure. Seasoned teachers of students with LD have been overheard to say "His Gestalt is off," meaning that one or more of these Gestalt principles is not working properly and therefore the student with LD is misperceiving the symbols in his world. If the individuals' perceptual processes are not interpreting information correctly, customary presentations of content may be of limited usefulness since the student will be attempting to process information that his brain is

receiving incorrectly—*b*s for *d*s, *p*s for *q*s, ns for *h*s, *3*s for *8*s, *6*s for *9*s. Sometimes words are reversed, such as *was* for *saw*. Such distortions have been referred to as *strephosymbolia* or twisted symbols (Kirk and Gallagher, 1979). If a student is going to habitually misperceive the information that has been placed in front of him, it is little wonder that homework for students with LD is not just unproductive, but counter-productive. Unless there is someone to help him get past his *strephosymbolia*, all he or she will be doing is practicing mistakes and reinforcing errors (Dieker, 2009).

Early attempts to characterize the difficulties of the student with LD lacked a clear connection between the process treatment and the process outcome. An early approach to process training was the perceptual motor training program by Doman and Delacato (Kerschner & Bower, 1966). The case histories of a sample of sixth grade boys with dyslexia showed that they had a lack of successful motor experiences during their early childhoods. They had, as infants, rolled over unassisted later than their age-mates. They had taken their first un-assisted steps later, learned to walk later, and learned to skip later. The Doman-Delacato approach attempted to re-capitulate those missing or un-successful motor learnings. The creeping and crawling exercises of the Doman-Delacato approach (Kerschner & Bower, 1966) were not been demonstrated to have causal effects on reading performance, or on most other kinds of performance, except perhaps for creeping and crawling. Hoopes (1973(D077171) described a swimming intervention that was intended to increase raise reading scores. While effusive, the case study did not offer data to substantiate improvements in reading comprehension because of swimming. Process interventions that are more nearly related to the process outcome have been shown to be successful.

Neufeld & Takacs (2006) discussed the stasis in the theoretical definition of learning

disabilities and in particular the assumption of neurological dysfunction as it related to the construct of LDs in school contexts. The authors reviewed the development of the definition of learning disabilities between 1962 and 1975 when the original emphasis on LD as an educational label was more concerned with etiology than teaching and learning. An emphasis grew on differentiating children with "real" learning disabilities from others who struggled in school.

Seidel and Shavelson (2007) conducted a meta-analysis of studies on teaching effectiveness. Among the issues studied were process and product. Their findings revealed the effectiveness of cooperative learning, feedback, reinforcement, and differentiation/adaptive instruction, processes identical to those utilized by regular education students, for students with learning disabilities. They found that the highest effect sizes were found for the execution of domain-specific activities (processes). This finding is congruent with earlier studies that report no significant improvements in cognitive tasks such as reading with non-domain specific intervention such as crawling, climbing, walking balance beams, or swimming. The list of academic subjects reviewed in their meta-analysis indicated that students from both elementary and secondary grade levels were represented. Seidel and Shavelson reported smaller effect sizes for most teaching components such as goal setting and orientation, social context, and basic processing for secondary grade levels than for elementary. In the Fraser, Walberg, Welch, and Hattie meta-analysis of 1987, effect sizes for process variables were greater for teaching components characteristic of elementary school such as reading training, reading experiments, personalized instruction, and individualized science than for most product components characteristic of secondary schools such as sequenced lessons, advanced organizers, inquiry biology, and the use of homogeneous groups.

Lerner (2009) devoted a chapter of her most recent book on the integration of modern

brain research with the neuropsychological theories of the past. Brain research of the past ten years has re-affirmed the validity of many of the earlier principles such as localization, lateralization, and the significance of "soft' neurological signs (pp, 319-337). The specific brain research techniques employed to test these hypotheses have been (1) postmortem anatomical studies, (2) genetics studies, (3) computer tomography, (4) positron-emission tomography, and functional magnetic resonance imaging {fMRI}. Learning disabilities have been linked to abnormalities in specific portions of the brain. Neurocognitive research has contributed evidence that both the developing and the mature brain are structurally altered during learning. For example, the weight and thickness of the cerebral cortex of rats is altered when they have direct contact with a stimulating physical environment and an interactive social group. The structure of the nerve cells themselves is correspondingly altered: under some conditions, both the cells that provide support to the neurons and the capillaries that supply blood to the nerve cells may be altered as well. Learning specific tasks appears to alter the specific regions of the brain appropriate to the task. In humans, brain reorganization has been demonstrated in the language functions of deaf individuals, in rehabilitated stroke patients, and in the visual cortex of people who are blind from birth. These findings suggest that the brain is a dynamic organ, shaped to a great extent by experience and by what a living being does.

Studies on Product Approaches

Product approaches historically have denied or minimized the presence of a deficit intrinsic to the child. Instead they argue a poor quality of instruction or insufficient instruction. Product approaches diagnose the student in terms of what he does not know, not in terms of the processes he may not have (Kirk & Gallagher, 1979, pp. 317-318). Product advocates favor criterion-referenced tests such as the *Benchmark* and the *Brigance Inventories* over process tests.

In the 1980s, they favored programmed instruction such as the Science Research Aprroach kits and the use of drill sheets. The product approach has given both special and regular education the following useful methodologies:

(1) precise definitions of skills to be taught (Klein, Paasch, & Frew, 1979. Pp. 88, 89)

(2) task analysis (Lerner, 2009, p. 117)

(3) direct instruction (Algozzine, 1991; Rosenshine, 1986; Rosenshine and Stevens, 1986)

(4) direct feedback and reinforcement for student performance, and

(5) direct, frequent measurement (Kirk & Gallagher, 1979, 315-318)

The above ideas are not only plausible instructional ideas for students with learning disabilities—they are good practice for regular education as well. The collaborative arrangement of the above five elements is *precision teaching.* Precision teaching is a critical need of students with learning disabilities (Bender, 2008). Precision teaching involves the specification of exact objectives, in the most learnable order, with mastery learning of each objective before the student is allowed to proceed further. Precision teaching was pioneered in the education of students with disabilities, but has been applied to general education populations since its inception in the 1970s.

"Finally," said Darrow (2008), "understanding the function of task analysis is the key to instruction in the inclusive classroom. Task analyzing involves breaking down a musical behavior into smaller components. Understanding where a student can succeed along the behavioral continuum is the key to adapting instruction. Any musical behavior is a composite of prerequisite skills. For example, to play a note on the staff, a student must first be able to distinguish between a line or space note, then count up or down to determine which line or space

the note is on, and finally be able to name the line or space. In the classroom, students may be at different skill levels. One student may be only stating whether a note is a line or space note, another student is identifying which line or space the note is on, another student is naming the note, and still another student is actually playing the note. One student may be able to clap and count a particular rhythm; another student may only be able to clap the steady beat--a prerequisite skill to any rhythmic task. All of these students are participating successfully at some point on the musical continuum and hopefully moving along the continuum to more complex skills. Regardless of where students start at the beginning of the school year, they should have the opportunity to be 9 months better by the end of the school year."

Age Appropriateness for Each Approach

The Goldberg and Schiffman study of 1972, as depicted in Table 1 below, was replicated in 1994 by Fletcher & Forman (p. 187) in reference to dyslexia with essentially the same results. If diagnosis and treatment are accomplished before the end of second grade, more than 80 percent of previously reading-deficient learners can be brought up to grade level. The Goldberg and Schiffman data (Table 1) indicate that if remediation is delayed past fourth grade, the chances of students overcoming those difficulties falls to around ten percent and does not appreciably improve thereafter.

Insert Table 1 about here

Process-Product Break

These data suggest a break-point at grade five with regard to implications for process approaches and product approaches. Because of the higher incidence of process-oriented teaching at the elementary level than in the secondary grades, the greater remediation of reading/learning disabilities occurred at the elementary grades. It is perhaps at this point the plasticity of youth has diminished and process approaches may be ineffective. Certainly, if the treatment is unrelated to the process that is attempting to be remediated, the treatment is unlikely to be successful. Some of the more passionate advocates of product approaches over process come from the ranks of secondary educators such as Grumbine and Alden (2006), biology educators. The Fraser, Walberg, Welch, & Hattie (1987) meta-analysis which included studies from both elementary and secondary education showed large effect sizes for process approaches at the elementary level and steeply declining effect sizes associated with process-oriented secondary learning environments.

Yet, as Lerner and Johns (2009) note, the majority of students are not identified until ages 9 through 14, with the peak age of identification of 12. This may be past the time when process approaches are most likely to have worked. Another possible explanation may be that by age 12, most of the process teaching has ceased.

What Works, and Why

Vaughn, Bos, & Schumm (2003) pled for a balance of content (product) and process. Pressure to cover content causes teachers to move steadily through material, even though some students have not learned it. Readance *et. al.* said

> "One critical issue in content-area instruction is to strive for balance between content coverage (subject-centered) and process (student-centered). Process

> includes teacher-directed instructional activities that help students understand material. For example, by teaching key vocabulary before reading, you can help student zero in on key ideas while they read. Process also includes student-implemented study skills." (1992).

Vacca and Vacca (1989, p.9) said "Teachers who are wedded to a discipline walk a tightrope between content and process. It's a balancing act every time the attempt is made to influence *what* is learned (content) and *how* it should be learned (process)."

Some processes that work well for students with SLD work well with typically developing students also. Swanson (1999) after a meta-analysis of 272 studies found that "the most effective form of teaching children with learning disabilities combined components of direct instruction (teacher –directed lecture, discussion and learning from books) with components of strategy instruction (teaching ways to learn such as memorization techniques and study skills." The main instructional components of the Swanson combined model include

1. Sequencing (breaking down the task, prociding step-by-step prompts), a product intervention
2. Drill-repetition-practice (e. g. daily testing, repeated practice, sequence review), a product intervention
3. Segmentation (breaking down sills tino parts and then synthesizing the parts into a whole), a product intervention
4. Directed questioning and responses (e. g., teacher asks process onr content questions of students), a process intervention
5. Control of task difficulty, a product approach
6. Use of technology, a process approach
7. Teacher-modeled problem solving (process)
8. Small-group instruction (process0
9. Strategy cues (e. g., reminders to use strategies, think-aloud models). (Swanson, 1999)

There are several noteworthy studies on the role of process approaches in teaching writing. Gerard and Junkala (1980) in a study involving 190 learning disabled (LD) children ages 7 to 13

years and 38 of their teachers found that product and process teaching are complimentary strategies, that a framework exists to assist teachers in determining if the process components of a task are related to pupil failure, and that the entire approach was validated.

Self Regulated Strategies Development (SRSD) is a process approach designed to improve students' strategic behavior, knowledge, self-efficacy, and motivation. Students learn to carry out specific writing strategies and self-regulation strategies (Graham and Harris, 2005; Harris and Graham, 1996). Research (De La Paz & Graham, 2002; Graham & Harris, 1989; Harris Graham & Mason, 2006; Reid & Lienemann, 2006) shows SRSD improves students' attitudes about writing, amount of time spent planning, and length of written compositions for students with learning disabilities, attention deficit hyperactivity disorder (ADHD), struggling writers without an identified disability, and regularly achieving writers.

De La Paz (1999) suggests that eighth grade students with learning disabilities may be less effective and not consistent in their use of previously learned strategies as they attempt to shorten or simplify the steps of the strategy. Thus, the process approach may begin to be difficult at apply to upper grades due to the students' unwillingness to follow the prescribed procedure. De La Paz stated that the process approach in writing may help students make connections between written communication and specific writing skills such as spelling, grammar and punctuation.

Wojasinski and Smith (2002) found that of process writing approaches, free writing approaches, or informal writing approaches, although students with learning disabilities prefer free writing, they actually learn how to write using the process writing approach.

The Guided Reading Approach, also known as the Directed Reading Approach, is a

process approach that provides scaffolding for readers before they begin a period of silent reading (Richardson & Morgan, 2000) . The noted psycholinguist Frank Smith (1971), drawing from his study of communication systems, argued for a definition of reading comprehension as "the reduction of uncertainty" (p. 17). In GRA/DRA, before the students begin to read, the teacher leads them in a clarification of key concepts about the reading. The teacher assesses the students' background knowledge. The structure of the passage or book is pointed out. If certain parts of the chapter or passage are not important or are less important, that is pointed out to them. The students then read silently. A de-briefing procedure is used to help them recall and interpret significant facts. They examine the story for inconsistencies and to determine if further information on the topic is needed (Richardson & Morgan, 2000, pp.163-165). The reasons that the Directed or Guided Approach works is that it (a) provides scaffolding for the silent reading that is about to occur, reducing disabled and typically-developing students' attention to unlikely possibilities (b) it establishes a context that enables students with LD to rule out *strephosymbolia* unlikely to fit the context (3) thereby reducing the number and type of regressions during reading. With fewer regressions—occasions when students have to re-check and reconfirm what had already been read—LD and typical students are able to use chunking strategies more. Their saccadic eye sweeps are able to span more syllables or more words at a time instead of engaging in laborious, letter-by-letter or syllable-by-syllable reading. As the pace of word attack is able to increase, comprehension increases. The scaffolding given by DRA/GRA enables students to spend less time paying attention to the process of reading as an entity of its own and more time engaging the content of the book or passage. In Gestalt terms, use of the Directed Reading Approach has enabled students to have *better closure* with the words in the text.

Multimedia design with implications for Gestalt psychology

Greater adherence to the principles of universal design in the development of instructional materials may not be the answer to all of our problems in regular and special education, but they have much to offer. The following seven principles of multimedia design (Mayer, 2006) speak to the requirements of Gestalt perception:

1. Students learn better from words and pictures than from words alone. (Good closure).

2. Students learn better when corresponding words and pictures are presented near rather than far from each other on the page or screen (spatial contiguity or proximity principle).

3. Students learn better when corresponding words and pictures are presented simultaneously rather than successively (temporal contiguity principle).

4. Students learn better when extraneous words, pictures, and sounds are excluded rather than included. (Gestalt principle of closure).

5. Students learn better from animation and narration than from animation and on-screen text; that is, students learn better when words in a multimedia message are presented as spoken text rather than printed text (Gestalt continuity principle).

6. Students learn better from animation and narration than from animation, narration, and on-screen text. (Continuity principle, overloading of visual modality).

7. Design effects are stronger for low-knowledge learners than for high-knowledge learners and for high-spatial learners rather than for low-spatial learners (proximity, similarity).

Customary product adaptations

Product approaches are designed more for the purpose of enabling a student to deal with content on a day-to-day basis than to improve underlying processes that may be deficient. One product approach is the practice of putting a word bank at the top of a page of fill-in-the-blank

questions. The word bank assists students with spellings as long as they have a close idea of which answer should go in the blank. Another product intervention is that of limiting the number of distracters on multiple-choice tests to one or two instead of the customary two or three. This product intervention should be used sparingly, however, to avoid the effect of "watering down" the content. Quite possibly, if the multiple-choice items were written more carefully when the test was designed, eliminating one or two distracters might not be necessary.

In mathematics, a number of product interventions can help the person with LD experience a minimum impact of his disability upon his everyday life. In Canada, the 6s on street signs are underlined (6) to minimize confusion with 9s. In Europe, 7s on signs have a line through the middle to minimize the possibility of confusion with 1s or 9s. Such accommodations are not likely to help people with LD overcome their perception difficulties, but they may at least prevent them from making wrong turns on highways or dialing incorrect numbers on their telephones. When elementary students are doing drill and practice on basic number facts, all of the addition problems should be on one page, all of the subtraction on another, all of the multiplication on another, and all division on another. The + sign is very easily mistaken for a x (times) sign for the student with a visual integration disability. Such a student could easily produce systematically incorrect answers because he was reading the operation sign incorrectly. His grade would reflect the effects of his disability, not the effects of his efforts in learning his times tables. The traditional division sign ÷ is easily misread as a minus for subtract, so the expression "six divided by two could better be written as 6/2 or

$2\overline{)6}$ to avoid confusion. Having all of one kind of problems on one page could help avoid the perseverative effects associated with bad continuity (Gestalt).

Some product approaches have helped in the conservation and effective utilization of

classroom time. Of all students, those who test below grade level are the last ones who need to be allowed to waste classroom time. Yet they can be the ones to abuse or over-use opportunities to waste time through excessive break time, passing out/picking up books, bookkeeping and related administrative diversions, broken pencil leads, and getting books and materials in and out of desks or lockers (Womack, 1988). In alternative school environments, token economies combined with individualized instruction and contracts can motivate students to forego such time-wasters in the interest of earning more tokens through completing more class assignments (Womack, 1983; Womack & Womack, 1983; Womack, 1988) to an acceptable mastery level. One small but carefully monitored and controlled study in Oklahoma showed achievement gains of over three grade levels with emotionally disturbed and learning disabled secondary students (Womack, 1988) when a combination of individualized instruction, contracts, and a token economy was utilized. All of these arrangements help to minimize the impact of a student's disability upon his achievement in school.

Recommendations

Studies need to be done which more clearly show the relationship of process learning approaches and product learning approaches to clearly defined age groups. It may be the case that process approaches work more effectively through the fifth grade, and that product approaches work either from either approximately the fifth grade upward or from birth upward. The possibility that process approaches can be effective from P-12 should not be dismissed without more definitive evidence. Even until now, questions about these issues affect the definition of learning disabilities (Tummer, & Greaney, 2010). Until these questions have been answered, daily practice should include both process and product approaches, especially in the elementary grades.

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Table 1

Percent of Learning Disabilities Remediated Successfully When Diagnosed at Various Grade Levels

Learning Disability Diagnosed In	**Successful Remediation**
Grade 2	**82%**
Grade 3	**46%**
Grade 4	**42%**
Grade 5	**15%**
Grade 6	**8%**
Grade 7	**10%**
Grade 8	**11%**
Grade 9	**6%**

Source: H.K. Goldberg and G.B. Schiffman. *Dyslexia: Problems of Reading Disabilities* (New York : Grunes Stratton. 1972). p.26.