

Autochthonous Change: Self-renewal Through Open Software Design

Charles Hedbring
Program STEPPE, New York, New York

In all likelihood, currently employed therapists and teachers grew up with computer technology. Part of their computer culture included programming computers for entertainment using popular consumer software like Microsoft Basic. Within this social-educational milieu, the *FACTS*⁺ curriculum represents one long-term project covering the past twenty years to combine computer programming and public school instruction. This article describes the scope, sequence, and content of the effort and most importantly, offers educators access to the source code. With access to the actual software source code, perhaps more youthful and creative programming-competent therapists and teachers can improve and tailor the *FACTS*⁺ curriculum to better meet pressing legal mandates and local instructional demands.

Keywords: computer technology, computer-based instruction, curriculum design, *FACTS*⁺ software, computer programming, behavioral cusps, generalization, Visual Basic, home schooling, reading comprehension, match to sample, autism, mental retardation, language, developmental disorder, communication, transfer of stimulus control, multiple handicaps

We behavior therapists and teachers know our consequences. We know that one consequence of nearly fifty years of behavioral research is the central importance of generalization training to long-term therapy outcomes. We teachers and behavior therapists understand that generalization skills are needed for effective community integration. Whether in therapy, during compliance training, employment preparation, or community living adjustment, we have learned that generalization is the sine qua non of effective instruction.

We practitioners have also learned that generalization must be trained – with intense and systematic rigor (Baer & Baer, 1999; Baer & Stokes, 1977; Haring, 1989; Kazdin, 1982; Miltenberger, 2001; Sundel & Sundel, 2004). We know that the pressing challenge these days is to ensure that newly acquired skills endure over time and circumstance. Regardless of language cues, cultural accents, ambient distractors, physical setting or even level of verbal prompting, behaviors must be predictable and reliable in the long run. It is a vital skill indeed to learn in structured group therapy the self-control required to avoid physically assaulting a stranger who hurls gratuitous insults. It is quite another skill to extend that learned composure beyond the therapy session to school hallways stalked by confrontational verbal abusers. It is one skill to complete an important task in a workshop training setting. It is quite another skill – a generalized skill – to complete similar tasks in unsupervised settings such as a group home, convenience store, or fast food establishment. Without question, newly acquired skills must extend to contexts beyond the training program itself. Otherwise, the results of therapy or classroom instruction remain at best limited. In today's vernacular, learning must be 24/7 rather than episodic. Learning must generalize.

Enter the 21st century behaviorist. Thanks to a daunting legacy of definitive behavioral research (e.g., Axelrod & Hall, 1998; Goldfried & Davison, 1994; Kazdin, 1978, 2001; Michael, 1993), protocols for teaching community-based, socially appropriate behavior are readily available, widely taught, and effectively used. Moreover, a well-organized literature supports teachers and therapists committed to promoting systematic generalization of the acquired skills as well (Alberto, & Troutman, 1999; Cooper, Heron & Heward, 1987; Fantuzzo & Atkins, 1992; Kohlenberg, Tsai & Kohlenberg, 1996; Martin & Pear, 1996; Thorpe & Olson, 1997; Walker &

Shea, 1999; Wallace, Doney et al., 2004). Without question, applied research has done its job in informing (and influencing) much of our current school-based instructional practice.

Enter the 21st century teacher and therapist. These educators know computers. Indeed, legions of classroom teachers and behavior therapists are entering classrooms and clinics equipped with one of the decade's most important instructional skills: basic computer software programming. These young educators grew up using, abusing, and experimenting with all facets of computer technology. They know full well how to design bad things (untoward websites), evil things (self-replicating viruses), and good things (individually-tailored instructional programs). Without question these young practitioners can provide exciting new dimensions to and applications of Skinner's early work with programmed instruction (e.g., Skinner, 1963). The key is to motivate, channel and focus this youthful wealth of computer expertise toward helping school aged children in need of specialized instruction.

Thanks again to a legacy of enabling research (e.g., Boutquin et al, 2000; Milheim, 1993; Schrock, 1995; Thomas & Bostow, 1991), educators who grew up with computers and software programming can now reap the unparalleled rewards of the ubiquitous technology. Fortunately, we are again supported by a rich literature aimed at tech-savvy educators wanting to integrate computers into daily lesson plans (Alessi & Trollip, 2000; Kulik & Kulik, 1991; Morrison & Lowther, 2005; Newby, Stepich et al., 2000; Smaldino, Russell et al., 2005; Tudor & Bostow, 1991; Woodward & Rieth, 1997). Programming for generalization is clearly taking on new meaning, given the advent and rapid ascent of software design. The 21st century educator is in a unique position to apply well-developed computer programming skills to the critically important challenge of promoting community-based generalization. The functional integration of computer technology has never been closer at hand.

These days, creating instructional software can be downright trivial. For someone who is sixty years old, who has worked with young teachers from the inner city of New York to the calm cafes of Singapore, to small town homes around Australia, to university offices in many countries, my wonder at youthful computer ingenuity is never ending. The computer-savvy educators I have met over the past fifteen years with few exceptions approach even seemingly complex computer software problems as "do-able". Programming requests are mere trifles. Any coding flaw is but a glitch, never a setback, never a failure. A cell phone call, email exchanges, instant message dialogues and soon most any coding challenge has been met. It is all quite staggering to us old-timers who learned to wait patiently in line for a few moments with a computer science major to query a Fortran IV bug. Regardless, within this twenty-year context the *FACTS*⁺ curriculum for learning handicapped individuals evolved. Creating instructional software was never easier. It was soon to get easier still.

***FACTS*⁺: Four goals**

FACTS⁺ was the result of a single vision – to help teachers and therapists "get the job done" more efficiently (Hedbring, 1985). From that vision in 1984 emerged a "no-nonsense, no excuse" curriculum with four specific goals faithful to pedagogically correct instruction (Gagne, Briggs & Wager, 1988).

Goal 1: To provide a curriculum that offered teachers and therapists one program with a common command set. When *FACTS*⁺ began in 1984, we educators had to purchase several separate and very expensive software programs to teach each separate basic skill. Worse, each program had its own set of commands we had to memorize before incorporating the content into our classroom

lesson plans. Then we discovered that low functioning students simply would not sit still, stay calm, and remain docile while the early Apple IIe programs booted or crashed, or while we swapped disks. We needed software that was reliable, easy to use, booted quickly and did not require frequent disk-swapping.

We began building *FACTS*⁺ accordingly. Written in AppleBASIC and using an early AppleBasic compiler from Microsoft (quite a story in itself), hundreds upon hundreds of hours of testing and code changes gradually morphed the software from a double-chuckle into a useful instructional tool. By mid-1985, *FACTS*⁺ was helping teachers and therapists at public school PS77K in Brooklyn, New York use their newly acquired Apple II computers productively.

By 1987 we began work on a “DOS” version, using Microsoft Quick BASIC. In 1990 the DOS version of *FACTS*⁺ won a national award for “software excellence”. In 1996 work began on a “Windows” version, this time using Visual Basic (VB), a programming language fast becoming popular among teenagers and young adults. With each incremental version of *FACTS*⁺, dozens of teacher suggestions were implemented and the software became more stable, faster, feature-rich and practical for daily classroom use (cf. Okolo, Bahr & Rieth, 1993).

Goal 2: To integrate into *FACTS*⁺ at least a portion of the behavioral research that has taught us about how and why we behave as we do (Becker, 1988; Bryson, 1997; Chen & Bernard-Opitz, 1993; Haynes & O’Brien, 1990; Kazdin, 1995, 2003; O’Donohue, Hayes & Fisher, 2003). Some applications of the empirical research to the design of *FACTS*⁺ include:

- No single-key exit capability: Multiple exit commands solved potential Piagetian ‘cause-effect’ keyplay behavior that can often lead to premature and abrupt task or program termination.
- All unnecessary keys disabled: Piagetian ‘cause-effect’ keyplay can become ritualized if reinforced.
- Separate and distinct task and reward screens: This ensures easy visual discrimination between task and consequence.
- Distractor-free, uncluttered task-only task screens: Thus, user attention is not distracted from the task at hand.
- No visible cursor unless necessary: A cursor can become a stimulus that some students might lock onto visually rather than attending to the task.
- Multiple levels and branching to maximize task individualization.
- ‘Alt-key’ keyboard alternatives to mouse/touchpad/trackball commands.
- Brief, multiple eye-catching, attention-grabbing reward screens (color, sound, animation).
- Reward screens targeted to the degree of difficulty of the task screen: For example, with very basic tasks (letter, number, word matching), high definition reward screens help cue low-functioning students that the recorded response was correct. However, with the more developmentally advanced tasks (memory training tasks, word processing), eye-catching reward screens can actually interfere with the task (as with memory training exercises). Students sufficiently skilled to use word processing, reading, or data-entry software do not require glitz-and-glitter reward screens to indicate correct responses. A simple yes or no, right or wrong cue will suffice.
- ‘One ‘wrong-answer’ screen: The key is to present a brief cue that the response was incorrect, but not to make the cue so distinctive that the student repeats errors in order to ‘enjoy’ the wrong-answer cue screen content.

- Content protected against profanity: *FACTS*⁺ offers a dirty-word option switch that disallows some forty hard-coded “inappropriate” words.
- Auto-branching levels of task difficulty: Depending upon response, some classroom program modules move back and forth, easier to harder to easier levels of task difficulty.
- Flexible content: As much as possible, content is alterable. Where appropriate, the teacher or therapist can determine content in order to meet the varied instructional needs of students.
- Options galore: Features such as 'yes/no' switches, large/small display, on/off sound, identical (sample remains on-screen) or delayed (sample disappears) matching, and any other options that allow maximum individualization so the learning needs of all students are met.

Goal 3: To make the *FACTS*⁺ curriculum available at minimal cost to colleagues, teachers, graduate students, and educators competent in VB programming. Accordingly, we offer five practical levels of use: (a) *FACTS*⁺ can be accessed 25 times without ‘nag screens’. (b) We enlist donations of \$25 after the curriculum has been used 25 times. (c) Educators who wish to continue to use the software without helping us defray even a portion of our costs are asked to contact us by email and a follow up phone call. If we are convinced of their plight, we provide a special password. That password allows *FACTS*⁺ to be accessed 100 additional times. (d) Those who register with a donation are given a code that allows unlimited use of the curriculum. (e) The *FACTS*⁺ source code is available to registered users who also are licensed classroom teachers or certified therapists in full-time employment and who demonstrate a working competence in VB programming to our satisfaction.

Goal 4: To provide a secure instructional scaffold for therapists and teachers eager to apply their programming prowess to modify the source code. With its open source code, *FACTS*⁺ provides a firm foundation computer-literate educators can build on. The source code is available to educators who work full-time with the learning handicapped and who demonstrate competence in VB programming. For these young therapists and teachers, modifying already existing source code, following the logic and code used to generate screen displays, and avoiding having to re-invent the design, scope, logic, and sequence of a comprehensive software curriculum saves many hundreds of hours of time, effort, and frustration. Such was the goal from the onset of the *FACTS*⁺ project – to help educators get the job done more efficiently.

Visual Basic is powerful and flexible, thanks to the efforts of Microsoft. Simply put, “Visual Basic provides the tools to make your life far easier because all the real hard code is already written.” (Tustanowski & Starks, 1996). Young educators crowding public school computer labs around the western world “speak” and write VB nearly as well as their native language. Should educators need assistance, high school computer clubs, university computer science majors, scores of books on VB (e.g., Wright, 1998), “VB for Dummies”-type manuals, training CDs, uncommonly helpful VB-oriented websites (e.g., www.vbwm.com/; <http://visualbasic.about.com/c/ec/1.htm>), and even VB tomes for the helping professions (e.g., Dixon & MacLin, 2003). These resources combine to offer a truly in-exhaustive source of information for helping us grapple with even the most challenging VB problems. These are exciting times for education in general and the learning handicapped in particular. The *FACTS*⁺ Curriculum can join the fun by handing over the source code to other “VB-educators” to improve, expand, and tailor to their own needs.

FACTS⁺: Brief description

The *FACTS*⁺ Curriculum consists of five distinct, though tightly interrelated components:

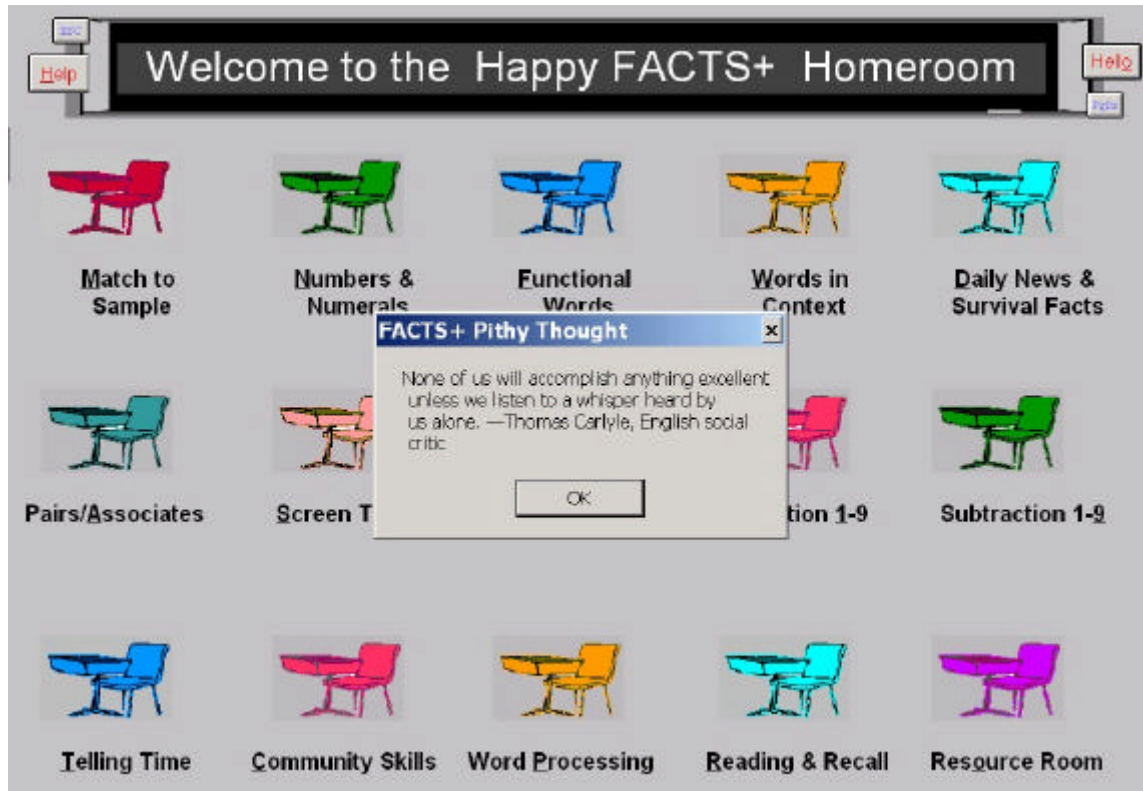


Figure 1: FACTS⁺ “Homeroom” displaying fifteen “Classroom” modules, along with one of more than five hundred classic quotations.

Component 1: Instructional Modules. The *FACTS*⁺ Curriculum includes a large constellation of skill areas organized into fifteen instructional modules called *FACTS*⁺ Classrooms (see Figure 1). Embedded within the fifteen areas are tasks that include: (a) cause/ effect (press spacebar, a five-second animated colorful, screen is displayed, with sound); (b) number and letter identification, matching and discrimination; (c) word recognition, replication and context-sensitive use; (d) training critical survival information (home phone number, local school number, police and fire dept numbers; correct spelling of surnames); (e) several levels of reading comprehension, both literal and inferential; (f) single digit addition and subtraction; (g) and elementary word processing.

Years ago a colleague calculated that all *FACTS*⁺ options (in the DOS version) added together offered students a total of nearly 350 instructional exercises. The more recent Windows version adds even more options. For example, many of the pull-down Help menu sub-topics are written as Microsoft Word .rtf (rich text format) text files. As a result, computer-savvy educators with no programming interest can nevertheless easily substitute their own helpful .rtf files for the .rtf files included with *FACTS*⁺. Similarly, the audio files can be readily replaced as well. As long as the directory locations and filenames are not altered, the imaginative teacher or therapist can modify these important components of the curriculum -- the actual curriculum program text and audio files.

Component 2: Resource Modules. The *FACTS*⁺ Curriculum includes a second screen, the Resource Room. The Resource Room offers teachers and therapists several modules designed with PL 94-142 and later, IDEA in mind. There is a module for collecting and monitoring student and client information. There is also a module for recording behavior using frequency, duration, interval and anecdotal coding forms.

Component 3: Supplemental Modules. The *FACTS*⁺ Curriculum includes a “Top Freeware/Shareware Room”. This screen offers therapists and teachers access to fifteen outstanding freeware and shareware programs they might find useful in their classroom or therapy instruction.

Component 4: Information Modules. The *FACTS*⁺ Curriculum also includes several pull-down informational files intended to give educators ready access to such information as:

- 14 empirically supported Principles of Teaching
- 17 empirically supported Rules of Instruction
- Law and Education: List of several classic articles published in law journals since the 1970s (e.g., Candelora, 1995; Dimond, 1973; Kirp, Buss, & Kuriloff, 1974)
- Behavior modification and the Law: List of several classic articles that discusses behavior modification in education (e.g., Ayllon, 1975; Rebell, 1981; Wexler, 1973)
- In an era of quiet publishing, a list of some of the more controversial articles published over the years is provided in order to initiate some original discussion rolling among today’s youth about controversial issues (e.g., Burton & Hirshoren, 1979).
- Time on task, quality of instruction, and learning: List of some classic articles on the subject (Bloom, 1976; Rosenshine, 1979).
- *FACTS*⁺ includes additional practical information educators will find instructive. Each classroom module is accompanied by a sample annual goal, behavioral objective, task analysis, and set of research readings relevant to the module.

Component 5: Teaching Tips. Finally, the *FACTS*⁺ Curriculum includes a flat file database of more than five hundred teacher tips, therapy suggestions, definition of terms, and suggested readings. Each time *FACTS*⁺ is started, a small message box is displayed that contains such information (see Figure 1). A second database is also built into the software. After the first message box is closed, one of nearly five hundred historical quotes from Socrates, Disraeli, Twain, Tolstoy, Aeschylus and hundreds of others is displayed. Therapists and teachers on the front lines of grass roots change are often too busy or too tired to read much literature. The “pithy teacher tips” component of *FACTS*⁺ attempts to fill this important pedagogical need.

***FACTS*⁺: Source code**

Times have changed. The clinical challenges facing teachers and therapists alike have intensified. The expectations of evolving Federal and state mandates now influence much of instructional methodology. Classroom disruptions, school hallway confrontations, and playground chaos clash inexorably thwart well-intentioned efforts at so-called “full inclusion” in many city and suburban school districts. Educators more harried now more than ever need practical assistance now more than ever (e.g., Carr & Wilder, 2004; Gatto, 2002). The novel availability of open source code of well reasoned instructional software is a helpful step in the struggle to teach amid chaos. Open source code can help ease the strain and reduce the burdens that are severely testing meaningful instructional practice.

VB-competent educators can expand, modify and improve the content of *FACTS*⁺ modules. They easily can point the curriculum toward local interpretations of educational mandates (e.g. Rebell, 1981). Therapists can alter the various activities to meet their client goals. The entire assessment and performance data modules are designed to allow nearly unrestricted student-specific tailoring (Sugai & Horner, 2000). Whatever the curriculum area, *FACTS*⁺ modules are structured for quickly and easily individualizing therapy and lesson plans (re: Chen & Bernard-Opitz, 1993; Connell & Witt, 2004).

Self-renewal is the centerpost of the *FACTS*⁺ open code approach to curriculum and instruction. Much historical literature supports the argument that educators feel empowered and sense of ownership and loyalty heightened when involved in the curriculum building process (e.g., Berman & McLaughlin, 1976; Farrar, DeSanctis & Cohen, 1980; Fullan & Pomfret, 1977; Mann, 1976, 1978; McLaughlin, 1976; McLaughlin & Marsh, 1978). *FACTS*⁺ gives young adult teachers and therapists truly unlimited opportunity to re-invigorate their approach to instruction. They have the basic code upon which to build individually tailored tasks, activities, and lesson plans. The VB-competent educator sees a need for content change and can make the change in seconds, or certainly during teacher lunchtime or a prep period. The software is then back on-line and in use an hour later. Immediacy of reward is a powerful motivator.

Potential behavioral cusps. Skinner (1963) defined programming as “the construction of carefully arranged sequences of contingencies leading to the terminal performances which is the object of education” (p. 183). Educator-created instructional software is a programming “cusp” (Bosch & Fuqua, 2001; Rosales-Ruiz & Baer 1997). With significant consequences beyond software design itself. Some examples of behavioral cusps arising from VP program modifications include:

- The .jpeg picture format used in *FACTS*⁺ offers a match to sample and oddity training model for designing more advanced fine grain visual discrimination tasks. The classic Sidman and Stoddard (1963, 1966) errorless learning format provides a fine model for creative VB-clever educators to build on. Moreover, any .jpeg picture database is ultimately context-specific. The set of digital photographs used in instruction or therapy will vary from inner city to suburb, from any city to rural settings, from climate to climate, and indeed, country to country. The open source code of *FACTS*⁺ makes the task of changing picture sets used in the curriculum a nearly trivial exercise.
- *FACTS*⁺ makes limited use of audio files. VB-competent therapists and teachers can use the model source code to design several levels of auditory training and discrimination activities based in part, for example, on the *FACTS*⁺ “Functional Words” classroom module. Spoken-word samples can be recorded in the voice of the therapist or teacher, making the natural communities of reinforcement.
- *FACTS*⁺ includes many .rft text files. For VB-enthusiasts, those text files can easily be replaced with content more appropriate to higher functioning clients and students. Existing text files may be supplanted with instructions, directions, homework assignments, or multiple choice test questions. The options are limited only by the creativity, motivation, and perseverance of the VB-competent educator.
- A shortcoming of *FACTS*⁺ is the limited input options. The software would be markedly enhanced with the addition of touchscreen capability or operation via voice commands. The “input challenge” would present clever programmers with an exciting design challenge.
- *FACTS*⁺ of course uses American spelling tradition. VB-competent educators in Britain and Australia and so on can easily use global replace commands to change “behavior to

“behaviour”, sidewalk to footpath, gas to petrol, flashlight to torch, cookie to biscuit, nickel to five cent piece, two weeks to fortnight, guy to bloke, jail to gaol, license to licence, friend to mate and on and on. Translating the entire *FACTS*⁺ Curriculum into any local vernacular with location-specific spelling and grammar is a thirty minute activity for most competent VB programmers.

- The two *FACTS*⁺ flatfile databases can easily be modified. High functioning students could then use the files to practice a variety of data entry skills. Further, with minor changes the files could serve as a searchable repository for short stories, personal diaries, daily tasks, and homework assignments (perhaps involving deductive answers to teacher generated inferential questions). Personal privacy is easily accomplished using the password protection routines already coded into the software.
- *FACTS*⁺ presently runs under Windows and the venerable DOS. Some enterprising young VB-competent educator is invited to contact this developer about porting their modified version of our curriculum to the Macintosh.

***FACTS*⁺: Promoting community-based generalization**

Again, generalization is the sine qua non of effective teaching and therapy. Notebook size computers are fast transforming the elusive goal of generalization into a practical reality. Small, lightweight, durable, and inexpensive, notebook size laptop computers offer a number of exciting instructional features:

- Practice, practice, practice – repetition leads to improvement. The legacy research is firm on this point (e.g., Bloom, 1976; Rosenshine, 1979)
- Distributed practice – brief yet frequent episodes of practice leads to improved long-term memory.
- Peaceful, disruption free learning. The student can work on classroom assignments and practice needed skills in the quiet of the bedroom, out back on the veranda, in the study room of the private boarding school, or even in the serenity of the local library.
- Computer savvy educators know that computers can help teach beginning reading skills (e.g., Heimann, Nelson, Tjus & Gillberg, 1995; Stromer, Mackay, Howell, McVay, & Flusser, 1996). Far from the madding crowd called public schooling, students can sit quietly with their laptop computer and work on improving their reading skills, and answering direct and inferential questions.
- Self-selection – away from the structured class, the student can select what to practice, when to practice it, and for how long.
- Leisure-time computer play – tic-tac-toe, word games, checkers, Pac-man, free-flow writing, drawing programs, music software, even (closely monitored) Internet use are computer activities students can enjoy on their laptops after school at their quiet leisure.
- Intentional learning – the learning handicapped student can work on curriculum areas where improvement is necessary, such as spelling, word recognition, essay-based self expression, and so on. Away from the classroom the students can practice and complete assignments free from chaotic distractions.
- Incidental learning – one of the wonders of learning is the kind of skills we develop “without knowing it.” For example, playing computer games does wonders for reaction time, eye-hand coordination, decision-making, visual tracking, prolonged on-task attention. Using their laptop computer as a drawing easel allows students to freely express themselves drawing creative figures, cartoons, or even simple circles and straight lines. Fortunately, freeware or inexpensive shareware keeps the cost of incidental learning to a minimum. At low cost, parents can acquire a text editor (e.g., textpad.com),

picture editor (e.g., irfanview.com), database (e.g., mydatabase.com), arcade games (e.g., realarcade.com), music software (e.g., shitalshah.com/vmusic/ – VB source code included), card games (solitaire, blackjack) and on and on. A vast and diverse array of free software is available from such download websites as download.com and Tucows.com. In summary, so much “invisible learning” occurs when the learning handicapped students is alone, at peace, secure, safe, self-paced, and calm. The laptop computer provides just such a learning aid for training these incidental, “pivotal responses” (Koegel, Koegel, & Brookman, 2003).

- Self-selecting computer activities in a quiet and safe and secure setting encourages on-task attention for prolonged periods of time. Focused attention to freely selected computer activities certainly decreases inappropriate behavior. Self-injury, hand-mouthing, ticks, pica behavior, tantrums, eye poking, hand flapping, genital play are incompatible with keyboarding (Hanley, Iwata & McCord, 2003). Keep them busy to keep them good! Laptops are great tutors indeed.
- Home-based schooling offers a plethora of opportunities for both parents and their children (Holt & Farenga, 2003; Whelchel & Ferris, 2003). Safe, secure, loving, danger-free, familiar environment; individualized instruction; sibling-centered peer-teaching; self-pacing; natural environment rewards and reinforcement; well-established contingencies; soft background music and pets complete an enviable setting event; multiple training and practice settings (kitchen, den, backyard, balcony, nearby park). Laptop computers used in a home schooling environment seems almost instructionally idyllic, whether in a large city or small rural town.
- Perhaps “full inclusion” can succeed, given the portability of generalization training. The turbulent environments swamping far too many city public school systems strains the very credulity of any realistic application of federal mandates. A “functional analysis of behavior” in most large public school settings is unmanageable. We practitioners and principals know that, embracing rhetoric to the contrary. Metal detectors, hallway patrols, surveillance cameras, shouting levels of social interaction, daily threats of violence, disruptive classrooms, police patrols -- full inclusion requires exposure to these pre-instructional “setting events. Happily, laptop-based instruction and practice in extra-school settings offers hope to all who dare to care.
- New and used laptop computers are both reliable and inexpensive. The pre-owned models offered on the dell.com website, for example, are excellent value. The “ebay” swap site (ebay.com) offers even better value, though at some risk of unreliability and/or non-delivery.
- USB removable flash drives are small, inexpensive, and fast (see tigerdirect.com). A school therapist or classroom teacher can set up homework, weekend, or longer term assignments on the school computer. Via a USB port, the assignment set can then be transferred to a flash drive the shape and size of a cigarette lighter. The student tucks the drive into an inside pocket, takes the information home, and there it is ported to the laptop computer, again via the USB port. Laptop based generalization training can be delightfully efficient. It can also be “promoted” in a safe, secure, calm, and loving environment.

Conclusion

We educators know our consequences. We agree that "the process of applying research in special education can never be better than the local practitioner is able to make it" (Malouf & Schiller, 1995, p. 423). We therapists and teachers know that a merge of computer technology with instructional design can improve special education in the trenches, in the classroom, at the

grass roots -- the autochthonous -- level of change. In spite of surrounding chaos, we street-level educators can draw on our computer skills to inject hope where despair is all too common. Our hope lies with young VB-competent, programming-savvy teachers and therapists entering city public schools these days. The time spent tailoring source code of empirically-based instructional software ensures time well spent on helping the learning handicapped truly “Become All They Are Capable of Being.” Such was the *IDEA* behind the open source code approach of the twenty-year *FACTS+* curriculum project.

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Address correspondence to
Charles Hedbring
Director, Program *STEPPE*
310 Riverside Drive, New York, NY 10025.
1 (212) 866-6694
Email: steppec@aol.com