



Instructional Devices and Techniques for the Handicapped¹

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Contemporary special education attempts to combine therapy, remediation, and education in one setting. In fact, however, these three elements are often only superficially different.

Therapy may be of a physical, medical, environmental, or psychological nature; but its purpose, and often its method, is to reduce the impairments of the physical, emotional, and social relationships in order to allow the individual to function productively. Remediation also may be of several kinds, but its basic concern is for restoring the individual's functions, to whatever extent possible, so that he can return to a semblance of normal experience. Education in the sense of gaining knowledge, skills, and attitudes required for effective citizenship and autonomy, depends upon the learning capability that therapy and remediation bring about and maintain.

Handicapped children have very special educational needs. Even in children whose learning processes and capabilities are normal, a physical handicap creates needs for special instructional services. Whether temporary or permanent, an impairment or disability will tend to draw a child off the paths of normal learning. This effect is most easily seen in cases where a handicap limits the experiences available to the child. For example, because learning depends partly on seeing, the blind child lacks the visual experiences that produce certain learnings; because learning depends partly on hearing, the deaf child lacks the aural experiences that produce certain learnings. Extend this point to the crippled child who cannot participate in the learning that comes from going places with others his own age, and we begin to see that social and emotional development is also likely to be impaired substantially by physical handicaps.

Handicaps that are less physically apparent, such as mental and emotional problems, also produce both direct and indirect effects on learning. Mental retardation, for example, obviously makes learning more difficult; a secondary handicap occurs because the retarded child, having failed to learn what his peers have learned, begins to be excluded from the experiences and activities that would give him some of the additional learning he needs.

To try to meet some of the complex learning needs of handicapped children, a wide variety of special education services have been developed. These range from residential institutions to special procedures for accommodating the handicapped within ordinary school programs and classrooms. The important common elements among the varied approaches to the educational needs of the handicapped are, first, the conviction that something can and should be done to reduce the learning impairments that result from physical, emotional, and mental handicaps; and second, the specific selection of instructional materials and techniques to reduce the particular learning impairments inherent in, or resultant from, handicaps.

Classes for the handicapped have a more individualized approach and a lower students-to-teacher ratio than do classes for normal learners. Although the specific teaching procedures for the handicapped are most easily understood through the instructional materials that are employed, there is a general strategy for teaching the handicapped: Teaching must do more than compensate for the particular handicap, that is; it must concentrate on developing the perceptual capabilities remaining to the person while preventing or relieving secondary learning impairments.

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Education for the handicapped is being transformed from *remedial* education to *special* education. The change in terminology reflects a fundamental shift away from “making up for the handicap” toward “making the most of the person.” In the view of many professionals in the field, remedial education has been too shortsighted: In the case of those whose handicaps do not constitute profound learning impairments, the remedial aspect of education should not become the obsessive main emphasis; and in cases of serious learning impairment (such as blindness, severe mental retardation, or neurological damage,) preoccupation with remediation is futile. For virtually all other handicapped students, some remediation is necessary, but to be significant, education must consist of a long-term program of experiences especially designed to help the individuals make the most of themselves.

Selection. Handicapped learners have an even wider range of capabilities and needs than do normal learners. An instructional procedure that works very effectively for one learner may prove unworkable for another. Any well-planned instructional experience for a handicapped child takes into consideration a large amount of personal and educational information. Trained teachers exercise diagnostic skills in selecting the materials, devices, and procedures indicated in order to meet each student’s need for enhanced learning experiences.

The selection of instructional materials is a professional task. Although the layman may be easily impressed by what seems to be a logical case for widespread use of a particular instructional device, material, or procedures, teachers and administrators in special education are more likely to be cautious or skeptical because they are aware of the need for careful evaluation of instructional resources in terms of specific students. Further, they are likely to be aware of the disservice to the children, to their parents, and to the profession itself that comes from oversell. The widespread focus of public attention on teaching machines, for example, has led to disillusionment and to an unfortunate setback in the appropriate adoption of worthwhile programmed instruction. This oversell, although not limited to special education, has been particularly damaging to the development of much-needed programmed materials for those with unusual learning needs.

Materials and procedures. Instructional materials have progressed from their novelty and sideshow phase into the mainstream of educational operations. No longer do instructional materials compete with the teacher for the time and attention of learners. Today instructional materials are an extension of the professional role and person of the teacher. Few teachers of the handicapped would feel prepared to meet the needs of learners without appropriate instructional materials.

The general rule about instructional materials for the handicapped—that is that special devices and materials for facilitating learning are rarely unique to particular handicaps—has two major exceptions: braille books and hearing aids. Large print books are useful for the retarded as well as for those with vision losses; talking books are useful for a wide array of handicapped learners, not just for the blind. Captioned films are not only useful in providing a substitute for the sound track for the hearing-impaired, but they are also useful for certain kinds of perceptual development for the mentally retarded or perceptually handicapped.

The view that materials and devices are rarely unique to a given category of handicapped learner is slowly taking hold. However, some services for the handicapped are still organized along categorical lines; in fact, certain highly versatile materials have been exclusively available to limited groups of users. But changes are beginning to be made. For example, the Library of Congress collection of talking books are now available for other than the visually handicapped, and the Bureau of Education for the Handicapped (of the U.S. Office of Education) has broadened the scope of its four regional media centers, which originally served only those with impaired hearing. These centers are now full partners with instructional materials centers in the omnibus Special Education

IMC/RMC Network for Handicapped children, and offer new and broader media services to the deaf and other handicapped persons.

Most instructional devices and techniques for the handicapped fall into four categories: visual, auditory, tactile, and motor-skill. Materials and methods from each of these categories are used in varying combinations for virtually every type of handicapped learner.

Visual devices and techniques. The major purpose of visual devices and techniques is to make information more meaningful through pictures, diagrams, and printed texts. These devices and techniques constitute by far the largest category of instructional materials and procedures largely because print-based materials are basic, even for the education of the handicapped. For learners with reduced vision as well as for the mentally retarded and those with impaired physical co-ordination or limited mobility, large print materials are widely used. Depending on the individual's needs, such enlargements range from twice to three times the original size of verbal and pictorial materials. Experimental electronic systems providing variable size and contrast according to the dictate of the individual are now in use. The use of the cathode-ray tube (with a television-type screen) is among the promising future applications of visual electronics for special education.

Print-based paper materials are also giving way to combinations of computer-stored print and film-based print-and-pictures. Color microfilm allows large quantities of pictorial-verbal materials to be made available for the use of individuals in the classroom and also allows for contrast and display-size control as prescribed for specific learners.

Within the general category of visual devices and techniques are the programmed instruction and teaching machines that have attracted considerable attention. These materials have been accepted into special education more readily than into general education largely because of the common recognition that handicapped children need highly individualized learning experiences.

Similarly, color filmstrips have been widely used in special education. A second generation of filmstrip display technology, combining filmstrips and programmed instruction devices, is now well established in virtually every field of special education. The increasing use of display machines by small groups and individuals allows the teacher to deal more adequately than before with the wide range of interests and abilities characteristic of a special education classroom.

The technology of programmed instruction grew from the scientific observation that taking a carefully sequenced test and being informed item by item about the accuracy of one's responses is an effective learning procedure. Similarly, the observation that coping with problems of size and space relationships results in perceptual development has led to a new variety of perceptual training materials. These materials are designed to remedy the perceptual difficulties that are secondary effects of such handicaps as retardation, emotional disturbance, and low vision.

Motion pictures are widely used in special education, both in ordinary ways and in several unusual ways. Basically, the sound motion picture is used because of its highly communicative mixture of visual and auditory information. For the deaf child, the captioned film has subtitles (as in foreign films) to replace the sound track. The captioned film has also become an exploratory means of helping the child with normal hearing who has difficulty reading by providing him with simultaneous readable and listenable presentations of the dialogue. Other special motion-picture applications include the single-concept film and the non-verbal film. The single-concept film is usually a short, cartridge-loaded motion picture loop dealing with only one piece of information, often a demonstration of a process or of a cause-effect phenomenon. Especially for learning disability cases, such focusing of attention, combined with instant and frequent repetition, constitutes a useful technique. The non-verbal film is an adaption of the old cartoon-comedy technique of providing within the motion picture such explicit action and sequence that the use of words is unnecessary. This technique can help students whose learning capability is greater than their verbal facility. The earlier

approach was to remedy the verbal facility first and then to instruct verbally. The non-verbal film is based instead on the propositions that verbal facility is secondary and that learning can take place apart from reading and listening.

Even printed materials for special education are in transition. Workbooks, the standby of yesterday's classrooms, have become shorter and often deal with only one unit of study; they are often designed in the manner of programmed instruction and provide for more independent progress and useful self-checking (feedback.)

Perhaps the most distinctive common feature among the materials in the visual category is the trend toward co-ordinated sets of materials. A textbook is no longer expected to stand alone as an instructional device; today's special education teacher has combinations of several forms of presentations to use with individuals, with small groups, and for full-class activities. Such sets or kits of materials may include filmstrips, single-concept films, a sound motion picture, poster-size pictures for discussion or drill purposes, and programmed workbooks or worksheets for individuals.

Auditory Devices and Techniques. The major purpose of auditory devices and techniques is to increase the capability of learners to comprehend ideas in such a way as to be able to talk about them. To be able to hear words, to form appropriate mental images, and to put together the appropriate words to express ideas are the essential skills of social functioning. Regardless of the primary handicap, whether retardation, deafness, speech impairment, or blindness, all handicapped children run the risk of a secondary handicap in aural-verbal skill.

Special education has drawn readily and deeply from the audio communication technologies. The tradition began with Alexander Graham Bell whose personal concern for the special communication and learning needs of the deaf preceded his invention of the telephone in the 1870's. Subsequent development of the electronic hearing aid was virtually simultaneous with the development of the larger field of electro-mechanical and electronic communication of speech. Perhaps because listening aids have long been used and because of the substantial improvements in speech therapy brought about by technology, audio devices have been well accepted into special education. Their applications have been many and varied. Talking books have been a mainstay of the education of the blind. Tape recorders have been widely used for note-taking, for preserving lectures, and for assisting readers for the blind. Powerfully amplified sound can be made to cross the auditory threshold of the near-deaf. Thus, whole new teaching procedures have been based upon electronic recording and amplification of sound.

The first breakthrough was electronic amplification, which made the degree of loudness variable and allowed for individualized listening through earphones. The second, and more recent breakthrough, was the audiotape medium for sound and signal recording. The flexible uses and lower costs of audiotape technology have made the recording function as convenient and as inexpensive as the playback function, and cassette packaging of tape provides ease of handling. The uses of recording and playback of sound are being greatly expanded. Flash cards now can "talk" thanks to recordings on oxide coatings on their edges; reproducible worksheets for individual students can provide auditory cues, sound effects, or instructions, thanks again to sound recorded in the coating on the back. The tape cartridge or cassette not only can carry on a dialogue with the student but also automatically advances filmstrips or slides, turns on and off other visual devices, and programs itself and the instructional experience on the basis of response buttons pushed by the learner as he does the exercises.

When linked to computer control, random access playback devices are able to carry on fairly flexible conversations with learners and to provide auditory feedback instead of the printed feedback common to teaching machines.

Elaborate configurations of audio and visual devices under the interactive control of a computer and a learner simulate many important learning problems from life. Especially for the handicapped, audiovisual simulation promises a significant enrichment of the range and intensity of truly important social behavior learnings within the classroom.

Tactile devices and techniques. The major purpose of tactile devices and techniques is to train and refine the sense of touch in order to augment or replace other senses. Few people develop their sense of touch to anywhere near its fullest potential. But when one is deprived of the sense of sight, touch becomes an important substitute; in the case of the deaf-blind, it becomes the single link to other human beings.

Research on the uses of the sense of touch has not produced substantial changes in earlier instructional practices. The first tactile reading system to be put into widespread use was invented in 1826 by Louis Braille, and its invention preceded by more than a half century, the scientific research in tactile sensory discrimination. Curiously, for all Braille's many shortcomings and difficulties, no alternate system has superseded it. Although it has been improved somewhat—largely through standardization and the addition of shorthand-like forms for the advanced reader—and although additional codes have been created for special problems such as mathematics and music, it stands essentially as Braille designed it.

Tactile procedures are often used in the early stages of training the deaf to lip-read. The teacher places the learner's fingertips on the teacher's lips or cheek while the teacher produces the words or sounds being taught. Thus, tactile perception establishes a link between the spoken words being observed and the vibrations of one's own speech. Extended, this procedure is a basic mode of communication with the deaf-blind.

Most deaf children are taught to speak, but the best technique for talking to the deaf is a matter of continuing debate. Sign language is clearly the special language of the deaf, and it lends itself to remarkably precise and fluent conversational use. On the other hand, since the deaf must interact with many people who do not know sign language, lip-reading is a highly useful alternative. As is true in most debates of this sort, there is value in both positions. The deaf person who can use sign language and lip-reading is at an advantage. But those who work with deaf people find sign language and finger spelling very useful techniques.

Motor-skill devices and techniques. The major purpose of motor-skill devices and techniques is to produce a co-ordinated person capable of utilizing to fullest potential the physical and mental skills required for health, mobility, social performance, and worthy occupation. From the precisely specified routines of therapeutic "patterning" exercises to the casual informality of a balance-board, the instructional world of the handicapped is filled with physical and psychomotor training devices and therapeutic routines. Since virtually any physical handicap tends to reduce mobility and since almost any mental or emotional handicap tends to restrict mobility, it can be said that the handicapped, in general, must be given special opportunities and often remediation in motor-skill learnings. Exercise itself is physiologically necessary, and many general and special exercise devices are employed. Further, it is now known that there is a relationship between the factors of general learning, perception, mobility, and motor co-ordination. Thus, it is not only the blind student who needs orientation and mobility training; the retarded and the orthopedically handicapped also must be given special training in motor skills and physical co-ordinations.

For those whose physical or mental condition presents a likelihood of low employability, learning such psychomotor skills as typing may constitute vocational training of long-range value. Materials and procedures for this sort of training are typically adapted from business and industry and are selected for the individual so as not to demean his ultimate capabilities.

Classroom Tools. Innovations in instructional materials inevitably lead to modifications in the procedures and tactics of teachers. In that some materials are primarily tools for the teacher's use in planning, demonstrating, or leading discussions, they cannot be grouped with the devices discussed above. The overhead projector and its associated transparency systems, for example, have been a major innovation in the special education teacher's procedure. The projector increases visibility and visual detail and consequently reduces the necessity for the teacher to talk—an important factor in teaching the handicapped.

Just around the corner is the use of the computer to help teachers keep track of student needs, abilities, and progress. As more is known about how best to meet the learning needs of individual children, there is an increasing demand for timely and precise recall of the vast quantities of data needed for prescription of appropriate experiences. Experimental applications of the computer to serve this purpose are in use.

The trend toward more individualization and less lockstep total-class activity has been established. Although teachers of the handicapped are still assigned to "teach a class," they are trying to focus on individuals within the group. Providing students with individual attention has placed extra burdens on the teacher's time and talents. Teacher aides—often volunteers, parents, or persons with less than full academic credentials for teaching—are being employed to extend the usefulness of the teacher in meeting the varied individual needs within classroom groups.

Sources of Materials. Many instructional materials designed for normal learners are also useful in teaching some handicapped learners. Teachers of the handicapped have a tradition of adapting regular materials to meet the needs of special education.

Another type of instructional materials for the handicapped is those designed by classroom teachers themselves. Although the efficiency of the practice is debatable, teachers of the handicapped spend considerable time planning and producing instructional materials to use with their students. Many of these materials never travel beyond the teacher who makes them; in fact, many are used only once. The fact that the supply and variety of appropriate commercially produced instructional materials for the handicapped are increasing may reduce the need for teachers to make materials, but the more creative teachers are apt to continue to make their own materials.

In addition, to adapted materials and teacher-made materials, there is a third type: a rapidly growing catalog of materials specially designed to meet the particular learning needs of the handicapped. The distinctive characteristic of these materials is their careful focus on known learning problems. Unlike most general instructional materials, they are not concerned with applying a given medium or approach to a broad expanse of curricular materials but are focused instead on a limited set of skills or cognitive developments. Whereas some materials—filmstrips, for example—may be designed to show that they can teach anything and everything reasonably well, a collection of filmstrips especially designed for the mentally retarded is apt to deal only with a limited set of skills such as personal hygiene. Some commercially produced instructional materials originated as teacher-made materials; it is likely in the years ahead that the commercial potential of the better teacher-made materials will be recognized and realized.

A person's range of experiences has a great bearing on his learning. If he has had limited experiences, he is handicapped in the sense that his mental storehouse of information is inadequate to allow him to make the most of new experiences. Television, even in its ordinary commercial form, may prove to be the most important instructional aid of our era for all but the deaf-blind. Through television, even the bedfast and the institutionalized can travel far and wide and can encounter more verbal ideas than anyone reads in a lifetime. The net effect of television for the handicapped is very hard to measure and may never be determined, but it is clearly one of the important new instructional resources.

Evaluation. Evaluating the worth and effectiveness of an instructional material or device is an especially difficult task. Particularly in regard to the special learning needs of the handicapped, any material is rarely good or bad in itself. Rather, a material must be judged in terms of how it is used, even describing a particular material without a discussion of the associated teaching procedures is often difficult. Thus, competent selection of instructional materials demands both knowledge of the learning needs of the particular handicapped persons for whom the materials are intended and knowledge of the procedures that will facilitate learning.

Every instructional aid should have one basic characteristic: it should facilitate learning. In order to do so, the material must make a communicative link between the learner and something of value for him to learn. Thus, in selecting or developing materials, the educator is particularly concerned with two questions: how well does the material relate to the perceptions and understandings of the learner? and, how important is the learning which is facilitates?

Instructional materials centers. Involvement of the Library of Congress in providing special learning materials for the blind dates from 1897. By 1934, the talking book system was well enough developed to have been added as a federally supported service. Changes in the regulations of the Division for the Blind and Physically Handicapped in 1966 made these materials available to all persons whose physical disability prevents their reading or manipulating ordinary printed books. Conditions other than impairment of vision that make a person eligible for this free service include paralysis and nerve and muscle diseases that seriously reduce co-ordination and control. The Library of Congress program of free services is administered through the state library systems in most states and through certain metropolitan libraries.

Within recent years a remarkable increase in emphasis on instructional materials has given rise to promising innovations not only in materials and devices but also in their management, storage, and distribution. Many local school districts have made use of federal and state funds to establish and stock instructional materials centers. A small center may exclusively serve teachers and students within the school where it is located; a large center may provide a service and source clearinghouse for an entire state.

In certain states the residential schools for the handicapped have substantially aided in this development by providing, through their own facilities, centers for services and distribution. In other instances, the state departments of education have established service and resource centers to meet the needs of handicapped children.

The experiences of the 1960's have produced several changes in the concept and design of instructional materials centers. The early centers were very little more than specialized versions of the audiovisual centers of the past, which provided a repository for films and recordings circulating at the request of authorized users. More recently, models for instruction materials centers have favored specialization and intercenter communication. The dominant thought seems to be that no one center can fill all needs. The most recent evidence of this thinking is in the extensive and elaborate design for a nationwide system of instructional materials centers. This national instructional materials network has been planned by the Bureau of Education for the Handicapped of the U.S. Office of Education. Current thinking calls for utilizing the resources of a wide array of local, state, and regional agencies as well as profit and non-profit manufacturers to provide appropriate instructional experiences for every handicapped child.

Long-standing dissemination centers such as the specialized divisions of the Library of Congress, the American Printing House for the Blind, and state libraries are being more effectively integrated and utilized. At the same time, new specialized units, particularly materials development and evaluation centers, are being created in order to fill the gaps in the national network.

The first substantial efforts toward achieving an integrated and comprehensive network have been taken: the four regional media centers (primarily serving as instructional materials centers for the deaf) have been integrated with the 14 regional instructional materials centers (each of which serves a different set of needs, in most cases on a multi-state basis.) This initial combination is the nucleus of a developing national network. Each of these units has affiliated centers that operate on levels close to special education classrooms. Many of the affiliated centers have been designed according to counsel and data provided by centers already in the national network.

As of 1970, steps had been taken on three fronts: (1) legislation was standing for the establishment of a national center, intended to become the hub of the network and specifically commissioned to fill certain known gaps, particularly in the area of materials production, (2) centers affiliated with the network were re-defining their roles and functions, an undertaking destined to increase the degree of specialization of the individual centers; and (3) ways and means were being developed for other units, especially state and local materials centers, to interact as members of the network.

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