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ABSTRACT

Recent developments in the deisgn, application and evaluation of instructional materials and media for the handicapped are reviewed. The first section of the paper stresses the need for personalized education which meets individual needs through the matching of instructional programs to sets of learner variables and through delivery by a medium appropriate to specific learners. Following this, significant curricular adaptions and classroom applications for five types of handicapped learners are summarized and current progress in the assessment of needs and in the development and evaluation of materials is cited. Advances in media utilization in teacher training programs are described and seven major delivery systems are outlined. Main conclusions reached include the following: 1) instructional technology has much to contribute to the personalization of instruction; 2) considerable progress has been made in the development, evaluation and utilization of media and materials; and 3) the developing delivery systems contain within their present elements the seeds of a network capable of providing each handicapped learner the resources necessary to insure him a successful educational experience. A substantial bibliography with 341 citations to documents dealing with instructional media and the handicapped is appended to the report. (Author/LB)

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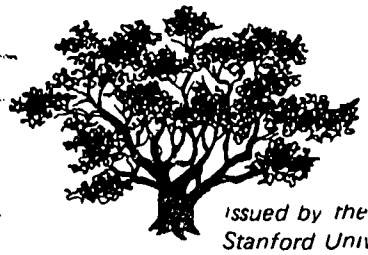
Instructional Media and the Handicapped

by Dr. Wayne D. Lance

December 1973



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INSTRUCTIONAL MEDIA

AND THE HANDICAPPED

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"Each of us cannot have his own shoemaker or tailor, and it appears that each child who needs help cannot have his own special teacher either. Can media and technology help? They had better" (McDonald, Blum, and Barker, 1971, p. ix). So spoke Dr. James J. Gallagher, one of the foremost leaders in the field of educating the handicapped child, as he addressed a conference of educators of exceptional children at our entry into this decade. He echoed the sentiments of earlier leaders, especially the foresighted educators of the deaf. And his words bear even greater support some three years later as the full impact of the enormity of the task of providing personalized instruction for every learner becomes more and more apparent.

We hear much talk today about "mainstreaming," a term referring to our attempt to keep, or bring back, many of our handicapped learners into the central thoroughfare of education. Yet we realize that what we have gained through the emphasis on individualization in the special class must not be lost as we channel handicapped children back into the mainstream within the school, and hopefully, within the real world outside the school.

The Nature of the Problem

Estimates as to the number of handicapped children and youth vary according to the source and definition. Lloyd Dunn (1973) suggests that a prevalence figure of about 10% of the school age population is accepted by the U. S. Office of Education. The precise percentage, however, is of little value, particularly as we become increasingly concerned about providing personalized instruction for every learner. With both human and material resources available through developing delivery systems, the day is rapidly approaching when every teacher can be an expert in providing an appropriate intervention for each child for whom he/she is responsible, regardless of how that learner might be classified. Thus, a label of mentally retarded, learning disabled, or even visually handicapped becomes less meaningful.

What is meaningful is the fact that a child has particular needs in a prescribed curricular area and that these needs can be met through the proper matching of instructional programs to a set of learner variables arising from individual needs. And these programs, for the most part, are deliverable through a medium appropriate to a specific learner. As one educator puts it, "Media are rather rapidly moving from an optional, supplementary and portable nature to a required, integrated and permanent nature" (Wyman, 1970, p. 5).

The problem then, is not so much one of identifying children as handicapped per se, but rather one of identifying the areas in which every child requires special programs and special application of media to enable him to progress at an optimal level. The holding of this idealistic view is not without danger, however. What could happen is that the infused resources, being limited by finances, competency, and time, might be so diluted over the entire school population that the impact would be minimal for children with mild learning problems and almost non-existent for children who are more severely handicapped.

The middle road suggests that we continue to attend to the needs of those children labeled as handicapped with as much creative effort as our resources permit and utilize the products of our inventions for other learners whenever possible. This, in fact, is what is happening. Materials developed for children with specific handicapping conditions are often quite successful with "nonhandicapped" learners. A prime example is the Project LIFE materials (described in a later section of this paper) developed for deaf pupils. These programs have been found very effective with hearing children who have difficulty in developing their basic language skills.

It has been realized for a long time that few materials are so esoteric that only one group of learners with a specific handicap would find them of value. "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" (Ward, 1971, p. 274). While we are concerned, of course, when a child has a visual or hearing impairment, we are more concerned with other educationally relevant variables: How does the child react to media relying on various input and output modes; what curricular areas require materials differing from those being used by the majority of his/her peers; and what interactive aspects of the learning environment must be modified to enhance learning?

Some children do have problems in learning. While we are moving away from some of the more traditional homogeneous groupings of pupils (such as educable mentally retarded, emotionally disturbed, visually impaired, we must not lose sight of the reason why many of these children were singled out for special help in the first place. The necessary modifications and developments in media and materials should remain a foremost goal of the special educator.

Personalization of Instruction

"Individualization as it relates to the new education means prescriptive instruction, not isolated learning experience. Possibly personalization is a more descriptive term than individualization" (McDonald, Blum, and Barker, 1971, p. vi). This quotation from Lawrence Stolurow, one of the leading authorities in programmed instruction for the handicapped, captures the essence of the solution many educators are proposing for the problems some children have in learning. That solution lies in individualization, or the better term, as Dr. Stolurow suggests, personalization of instruction. Personalization implies an active participation of the child in the learning process and this includes the learner in media, not merely the learner using media.

Robert McIntyre suggests that the ". . . most significant aspect of special education, as it relates to media choice, is the great need for individualized instruction" (McIntyre, 1969, p. 22). He goes on to point out that rather than look for the best medium for teaching a child with a particular handicap, individualization requires that we look at the media in relation to the objectives of instruction. And, we might add, we also should look at the means by which the learner becomes involved in the media. This intensive involvement of learners is a characteristic of most systems which lay claim to being an individualized approach. For example, the well known "Individually Prescribed Instruction" (IPI) system developed at the University of Pittsburgh states that one of the four major aims is " . . . to provide opportunities for the child to become actively involved in the learning process" (Yeager, 1969, p. 78).

While educators, and especially special educators, have expounded the virtue of individualized instruction for years, a gap has existed between what has been preached and what has been practiced. It is one thing to say that the solution to the problems of learners with handicaps is the implementation of a personalized approach; it is quite another matter when it comes down to the child in the classroom with the teacher. Several reasons may exist for this state of affairs: (1) teachers are not prepared to diagnose, prescribe, and implement on an individual level; (2) teachers do not have the time to devote to the task; (3) instructional materials are not available; and (4) regardless of the first three statements, teachers do not have access to an effective system to manage the numerous and varied aspects required in a personalized approach.

A review of most competency-based teacher training programs indicates that considerable attention is being given to the first problem listed above. With an increasing emphasis on inservice education as a responsibility of the teacher training institutions, major gains are anticipated. As for management of time, many teachers are finding that employing aids (volunteers or otherwise), using student tutors, or reshuffling priorities can overcome this problem.

Aserlind (1966) postulates that a shortage of instructional materials exists because of four possible reasons: (1) teachers are accustomed to developing their own materials; (2) the market is so small that few publishers dared invest in it; (3) no institutions or agencies are specifically charged to evaluate and assess materials for the mentally retarded -- and this was true of several other handicapping conditions too; and (4) researchers are more interested in basic than applied research. This problem, while far from being totally alleviated, is at least receiving national attention through the network of special education instructional materials centers and the National Center for Educational Media and Materials for the Handicapped (NCEMMH).

The fourth problem encountered in actually implementing an individualized approach as mentioned above concerns the ability of the typical teacher to manage the complexities of personalization in instruction. It is in this area that some of the most exciting and potentially productive work has been carried on by educators in recent years, namely the development of a technology of instruction. This instructional technology contains not only the hope for assisting the teacher in "putting it all together," but also is inclusive enough to address the other aspects of individualization such as teacher competency, manpower requirements, and specialized instructional materials.

Instructional Technology and the Handicapped

It is interesting to note that the Council for Exceptional Children began the '70s with a special conference on "Instructional Technology in the Education of Exceptional Children" (McDonald, Blum, and Barker, 1971). At about the same time, the Association for Educational Communications and Technology began planning for a new national affiliate known as the Association for Special Education Technology (Cotzin, 1973). Each group of professional educators became aware that the other had something to offer and something to learn. The convergence of special education and instructional technology could hardly be prevented -- the merging of their paths appeared to be almost foreordained.

"Instructional technology is a systematic way of designing, carrying out, and evaluating

the total process of learning and teaching in terms of specific objectives, based on research in human learning and communication, and employing a combination of human and non-human resources to bring about more effective instruction" (Ward, 1970). Instructional technology is more than a mere bringing together of program design, intervention, and evaluation; its real value comes from the systematic interweaving of these processes with all elements of the instructional setting: the student, the teacher, and the media.

Edgar Dale (1969) speaks of an "instructional system" as " . . . a systematic body of facts and principles used in achieving instructional purposes through varied media" (p. 612). The words that invariably stand out in any discussion of advances in special education and instructional technology are individualized and systematic. This may partially explain the coming together of those educators concerned with the handicapped and those with expertise in educational media -- the special educators need the systematic methodology of the technologists and the media-oriented educators can benefit from the special educators' focus on individual learning requirements.

While the systems approach inherent in instructional technology offers great potential for improving educational programs for the handicapped, it should not be inferred that "we have arrived." It is true that special educators have been talking about and planning for this forward step for some years, especially in the area of deaf education (Stepp, 1966). Robert Stepp recognized the enormity of the task when he stated that the systems approach to teaching the deaf " . . . will require a re-structuring of course content, the establishment of a new relationship between teacher and student, the formation of new standards and goals, and an involvement with educational media heretofore not envisioned" (Stepp, 1966, pp. 601-602). The fact is, as James Gallagher (1970) so forcefully noted, we don't have an educational system at present, we have an educational tradition.

The brighter side of the picture is a rapid movement toward the application of instructional technology to the problems of educating the handicapped. From a few isolated instances of technology applied to special education some eight or ten years ago (Blackhurst, 1965), we have moved to a place where one writer reviews approximately 100 references while discussing the uses of educational technology in designing a new curriculum in special education (Haring, 1970), and another reports on the application of cybernetic concepts of man-machine communications systems to the education of the handicapped (Kafafian, 1970).

The stimulation provided by the federal government should not be overlooked as a major factor in advancing instructional technology for the handicapped. Edwin Martin, Associate Commissioner, Bureau of Education for the Handicapped, U. S. Office of Education, calls such stimulation a major goal of the Bureau. By 1976, he states, the Bureau wants to provide " . . . systems and resources so that significant relevant educational materials are readily available to teachers of the handicapped so that the objective of providing services to 60% of handicapped children may be reachable" (Martin, 1970).

Perhaps the greatest benefit to come from the merger of special education and instructional technology is the bringing together of student and teacher within the media (Kelly, 1972a) so that we go beyond mere individualization, or simply a match between student and content and the strategy of instruction. Instead, we can reach for the ultimate goal of personalization of instruction, or an " . . . emphasis on increasing the student's ability to function in a variety of instructional settings, instructional modes, instructional inputs and outputs" (Brodack, 1970).

ADAPTATIONS AND CURRICULAR APPLICATIONS FOR THE HANDICAPPED LEARNER

It has already been stated that with a few exceptions, most materials for handicapped learners are not unique to any particular handicapping classification. Materials for the deaf, for example, often are a valuable medium for the mentally retarded or other groups. In reviewing the state of the art, however, it is helpful to discuss adaptations of materials and curricular applications in terms of grouping of children by learning disabilities, since much of the work has been conducted around such groupings. This section uses the following five classifications: (1) Hearing and Oral Communication Disorders, (2) Visual Disabilities, (3) Moderate and Severe General Learning Disabilities, (4) Crippling and Health Disorders, and (5) Behavioral and Specific Learning Disabilities. While precise definitions of categories seem relatively unimportant in a discussion of this sort, the reader is referred to definitions in Dunn (1973) should he/she desire to delve into this aspect of a study of exceptionality.

Hearing and Oral Communication Disorders

It is to the credit of educators of the deaf that their profession has attended to the utilization of media over a longer period and with greater intensity than perhaps any other

group. Much of the credit for this focus can be assigned to the federal government which provides financial support to a variety of projects and centers. Best known among the services funded through the Media Services and Captioned Films program of the Bureau of Education for the Handicapped (BEH) U. S. Office of Education is the captioning and free loan of films for both educational and entertainment purposes. These films are readily available to deaf persons through the Educational Media Distribution Center and its depositories located throughout the country. It seems safe to say that without this federal effort a vast and important instructional resource would be unavailable. A description of this program is available in several sources (Gough, 1966; Delgado, 1969; Kundert, 1970; Hairston, 1972). While few experimental studies have explored the effectiveness of captioned films in aiding learning, those studies that have been reported support captioning (Nix, 1971; Reiner, 1971), and the self-evident advantages more than offset the investment.

The Bureau of Education for the Handicapped (BEH) is also responsible for the support of four Regional Media Centers for the Deaf (RMCD). These centers have had an impact in modifying instruction for the deaf in a manner which goes well beyond what has occurred in the education of other handicapped persons. Teachers of the deaf throughout the country have been trained in the use of media and development of materials by the RMCD. Numerous reports have been published documenting symposia and conferences conducted by these centers (such as: Stepp, 1966; Stepp, 1969; Stepp, 1970; Stepp, 1972). And many of the advances in the area of programmed instruction, instructional television, overhead transparencies, and motion picture films may be traced to the stimulatory and developmental efforts of the RMCD. The relationship of the four RMCDs to the National Special Education Instructional Materials Centers/Regional Media Centers for the Deaf (SEIMC/RMC) Network and to the National Center for Educational Media and Materials for the Handicapped (NCEMMH) will be discussed in a later section of this paper.

It should be noted that both the Model Secondary School and Kendall Elementary School for the Deaf at Gallaudet College in Washington, D.C. have committed themselves to the extensive use of new educational media. No doubt these model programs will influence the development, utilization, and evaluation of media and materials in other schools for the deaf throughout the country.

Because of the severe effect which a hearing impairment has upon learning, the need for media to assist the deaf in making efficient use of their prime receptor (Kopp, 1966) has undoubtedly been a major reason for the thrust in developing such resources. While the use of media with the hearing impaired has long been recognized as a necessity (Jackson, 1966; McIntyre, 1968; Carper, 1972), the involvement of these learners in the media has only recently been enunciated as one of the most effective means of enhancing learning (Shayon, 1972).

Language Instruction. It is not surprising that more emphasis and a greater allocation of resources have been devoted to the development of language instruction for the deaf than to any other area of the curriculum. Obviously, language development is basic to all other learning and is severely impaired by the nature of the handicap. While this paper will not discuss the philosophical viewpoints surrounding the teaching of language to the deaf, it is significant that a recent survey of 56 language teachers in 21 schools for the deaf indicated that a "total communications" approach was used by 79% of the teachers (Takemori and Snyder, 1972). This same survey found some 30 materials and techniques for teaching language to the deaf.

Approaches to language development include a system of assigning colors to speech sounds as an aid to linking the amplified sound with a visual symbol (Caterina, 1972), the use of motion picture films in teaching lipreading skills (Neyhus, 1967), and the use of visible speech apparatus to compensate for the lack of auditory feedback (Pronovost, 1967; Gitlits, 1972). Materials have undergone varying degrees of field testing and validation, with the Withrow Vocabulary Noun Films (Withrow, 1969) and Project LIFE materials among the most thoroughly evaluated.

Seldom in the history of instructional material innovation for the handicapped learner has a total effort been mounted as in the development of the Project LIFE materials. "Language Improvement to Facilitate Education of Hearing Impaired Children" was funded through the Bureau of Education for the Handicapped and administered by the National Education Association, with the planning phase beginning in 1963 and development continuing to the present time. The purposes of Project LIFE are twofold: (1) to provide a significant increase in the rate of learning of language by primary and intermediate age prelingually deaf children, and (2) to upgrade the language skills of postlingually deaf and severely hard of hearing learners (Pfau, 1969b).

The LIFE program is based upon a rationale postulated by Wooden (1966) and encompasses the

the principle that language materials for deaf children must contain intrinsic motivation if they are to be successful (Pfau, 1972). The approach is linear and includes lessons in the perceptocognitive skills and thinking skills, in addition to actual language instruction (Pfau, 1969a). The materials, in a filmstrip format, are utilized with a multiple choice response device and are programmed in hierarchial units on the basis of behavioral objectives. Attention has been paid to the affective domain, according to the developers, (Spidal and Sheridan 1972) so that the child develops not only linguistic structure, but achieves affective objectives as well. The multiple choice response device has been found to be adaptable for locally produced material with a slide, filmstrip, and/or motion picture format (Lowell, 1971). It is of interest that Project LIFE materials are beginning to be utilized by teachers of children with other learning handicaps, especially the mentally retarded.

The Wyoming School for the Deaf has experimented with a multimedia approach to teaching reading to the deaf where a visual input is presented first and then tied to the language in print (Anderson and Laird, 1972). Another noteworthy development is an automated instructional system using 35mm slides on a rear projection screen in conjunction with an automatic data recorder and printout device (Karlsen, 1966). Investigators have concluded that an automated system of non-oral reading instruction can be developed, but that to do so, the programming would require more than 800 programs of 30 to 40 frames each to bring deaf children from beginning reading to fourth grade reading.

A selected annotated bibliography of books, films, and teaching media relating to language for the deaf is included in a publication of the National Association of the Deaf (1970).

Mathematics Instruction. Achievement test results indicate that deaf children learn arithmetical computation with greater success than other subjects which require verbal facility. They do not show inferiority in computation (Myklebust, 1960). This probably explains the limited emphasis on development of new materials especially for teaching mathematics to the deaf. Programmed materials are used rather extensively in teaching arithmetic to this population, but most of these materials were developed for hearing populations. A study by Bornstein (1964) investigates the rate and level of achievement of high school deaf students resulting from the use of programmed texts as against the usual lecture methods. Results of the study did not, for the most part, support programmed materials as significantly superior to the more traditional method. However, as will be discussed in a later section of this paper, there are some distinct advantages to be found in a programmed format.

Career Education. As is true with all categories of the handicapped, career education is receiving a greater emphasis than has been the case in earlier years. A primary reason for this attention is the high priority given career education by BEH, as well as the emphasis placed upon it by professional organizations at conferences, such as the Council for Exceptional Children. One of the most comprehensive listings of sources was completed several years ago at Ball State University (1967). Over 700 potential resource items dealing with vocational and career education were reviewed by committees of select educators of the deaf, and about 60% of these films, filmstrips, slides, transparencies, practice kits, bulletins, and course outlines were recommended as instructional or informative media for the deaf. Again, as has been pointed out in other areas of the curriculum, most of these materials were not developed specifically for the handicapped, but are adaptable for the deaf.

The Affective Domain. Educators are concerned that instructional technology not be reduced to a mechanical implementation of a systematic approach without attention to the emotional needs of individuals who have hearing impairments, along with an emphasis on attitudes and appreciations. In other words, the "humanization of instruction" is a concept which educators of the deaf wish to retain as a characteristic of their profession. A recent symposium on this topic (Stepp, 1972) " . . . explored the potential of educational media as a vehicle for the instruction of deaf students in the affective domain of human behavior" (p. 475). Dr. Stepp explained that educational media can be a significant resource for direct teaching about the feelings of others, can serve as a vehicle for developing value judgments, can be useful as an instrument for recording change in affective behavior, and can be a meaningful form of reinforcement to deaf individuals. Other speakers at this symposium explored the application of media, such as the use of instructional television to develop positive attitudes and feelings and to improve self-image among deaf students (Schmitt, 1972). Others discussed some of the very real problems in designing materials for students who are both hearing impaired and members of minority ethnic groups (Ladson, 1972).

While this kind of attention is being given to attitudes and values, the role of the creative arts in achieving objectives in the affective domain for deaf students is not being overlooked (Grayson, 1972). The creative medium provided by clay, paint, and other manipulative materials has long been recognized as essential to the emotional development of handicapped children and youth (Lowenfeld, 1970).

Visual Disabilities

While educators of the hearing impaired have probably explored the area of media utilization more broadly and have modified instruction in rather divergent directions as contrasted to educators of other handicapped children, it is equally noteworthy that educators of individuals with visual disabilities have provided an abundance of materials so that each blind and partially sighted student is backed by an impressive collection of materials. The Library of Congress was involved in providing materials for the blind as early as 1897, and less than 40 years later federal support was available for talking books (Ward, 1971). The availability of materials through various agencies such as the Instructional Materials Reference Center of the American Printing House for the Blind (services described later in this paper), the American Foundation for the Blind, and the Michigan State University SEIMC is indicative of the depth of the supply of resources (Clark, 1963; Dorward and Barraga, 1968; Mullen, 1968; American Foundation for the Blind, 1969; Berger and Kautz, 1970; Leach, 1970; Instructional Materials Reference Center, 1972; State University of New York, no date; Michigan State University SEIMC, no date (a).

At least one agency has specialized in providing materials through a correspondence school format (Gearreald, 1969). A selected bibliography from a foreign source may also be of help to educators in searching for materials to meet the media needs of the visually impaired (Ostberg and Lindgvist, 1970).

The availability of materials is indeed impressive, but the need is far from fulfilled. Requiring special attention are those individuals referred to as the multiply-handicapped visually impaired. A survey of perceived needs results in the conclusion that materials are in short supply in the following areas in order of descending importance: communication skills, self-concept formation, sensory development, motor skills, cognitive processes, self-care and daily living skills, and mobility and premobility skills (Leach, 1971). This same reference provides suggestions of materials for each of these instructional areas.

The nature of the handicap dictates three basic forms in which materials may be innovated or adapted: tactile, visual enlargement, and auditory.

Braille and Other Tactile Adaptations. It is estimated that the average blind senior in high school reads braille at about 90 words per minute. This compares with the 250 words per minute read by his sighted peer, and the 175 words per minute of most voice recordings (Goldish, 1968). Even with this marked hinderence to obtaining information by tactile means, and the accompanying problems of translation from print to braille (expense, availability of human resources, bulkiness in storage, immediateness), the use of braille continues to be necessary.

The Commission on Standards and Accreditation of Services for the Blind (1970) has established standards for the production of braille materials (as well as standards for large print and recorded materials), and these guidelines offer the promise of quality not always apparent in the production of materials for individuals with other handicaps. Exciting advances which offer at least a partial solution to the problems of production and use of braille are the electro-brailler (Schopper, 1971) and computer translation of braille (Schack, 1969). The Optacon reader which makes it possible for a trained blind person to read ordinary ink print through an array of vibratory reeds in concert with an optical scanner without braille translation is another hopeful development (Bliss, 1970).

In addition to braille as a tactile medium, all sorts of manipulative models and three dimensional surfaces are common characteristics of materials for the blind.

Large Print and Optical Enlargement. The National Society for the Prevention of Blindness is a source of information on large print (18 to 24 point type) (Bowers, 1966) and has published guidelines for the production of such material (Gibbons, 1965). It is interesting to note that many publishers regularly produce selected materials in a large type edition for students and non-student populations. Problems associated with this adaptation are the obvious ones of cost, bulkiness, and immediateness. Visual enlargers, ranging from hand-held vision aids to video cameras and viewers and special devices like the Optiscope Enlarger (Hellinger and Berger, 1972), circumvent the necessity of special large type editions.

Auditory Adaptations. Disc recordings have long been available to the blind, and with the recent emphasis on the development of cassette tape instructional programs for sighted learners, the supply of auditory materials continues to expand. It already has been noted that most voice recordings run at 175 words per minute as contrasted to the average high school senior's ability to read at 250 words per minute. It has been found that auditory recordings can be increased in speed or altered by a compression procedure in order to achieve a words per minute rate near visual reading speed without a significant loss in comprehension (Bixler, 1961; Foulke,

1964). While this procedure has utility, its widespread application has not been adopted and it remains a very limited technique for adapting instructional materials for the visually impaired.

Special Curricular Applications. An obvious and useful material for teaching mathematics to the blind is the abacus; this device has been adapted and information about its use is available (Gissoni, 1964, Davidow, 1966; Huff, 1972). A less obvious material for teaching mathematics to the blind recently has been suggested by Tinsley (1972) who found that Origami (Japanese paper folding) is a unique way to arrive at certain mathematical concepts. Other suggestions for modifying mathematic materials to the needs of the visually impaired are included in some of the 137 references listed by Geffen and Palmore (1969).

Handwriting is obviously a skill where special adaptations and innovations are required for visually handicapped learners. Stark (1970) described various materials such as templets and raised line paper, their adaptations, and availability in a recent article pertaining to adults in a rehabilitation setting. These same procedures offer guidance for the teacher of younger learners.

The appropriateness of basal reading material for teaching reading to young visually impaired children has been explored by a number of investigators. Bleiberg (1970) used a questionnaire to obtain responses from teachers of the blind. Nearly two-thirds of those surveyed expressed a need for a new beginning reading series and three-fourths of the respondents indicated they would use a new basal series if one were developed.

A careful analysis of braille features in four basal reader series was conducted by Rex (1970, 1971). Analysis of the use of braille contractions indicated that the four series were very similar. The second part of his paper (Rex, 1971) reports the development and field test of experimental materials and provides implications for use of the results in early reading and remedial instruction, transition from print to braille, word recognition, and phonic instruction.

A rather unique innovation of a reading material for the blind is the use of fragrance particle strips which release an aroma when scratched by the reader (Scratch, 1972). While such materials might be difficult for typical teachers to develop on their own, this does provide an example of the multisensory approach.

Examples of other curricular applications for the visually impaired include the use of three dimensional raised surface landforms for teaching geographical concepts (Franks and Baird, 1971) and selected instructional materials for teaching music to blind learners (Mooney, 1972). Linn (1972) reports on the development of an experimental science curriculum designed to provide visually impaired children with the same concepts and phenomena as their sighted peers. Participation and involvement are stressed in this adaptation of the Science Curriculum Improvement Study (SCIS), twelve units designed for elementary school-age pupils in the physical and life sciences. The model for adapting materials, as reported by Linn, is a useful one when an existing curricula is modified for a learner with a special handicap.

Mallinson and Mallinson (1967) developed and tested thirty-two braille-type symbols for use in science materials for secondary students. This carefully selected list includes symbols which were field tested and were found to be distinguishable when compared to regular braille symbols.

Moderate and Severe General Learning Disabilities.

Dunn (1973) has abandoned the term "mental retardation" in referring to school-age children in need of special education whom we have traditionally classified as nonadaptive educable mentally retarded (EMR), trainable (TMR), and severely mentally retarded (SMR). Instead, he recommends a more educationally relevant term, "general learning disabilities." For the purposes of this discussion, the term general learning disabilities will be used interchangeably with EMR, TMR, and SMR.

The inappropriateness of many "regular" materials for the mentally retarded and the need for proper media application have been pointed out by researchers and curriculum specialists, among them Gunzburg (1966), Happ (1967), and Mauk (1971). While investigations of the factors involved in designing materials for the mentally retarded have been conducted, such as the work of Seitz and Merryman (1970) and Driscoll (1968), probably more attempts have been made to apply the results of research already completed. Lance (1970) reviewed research in the area of motor training and physical education, language training, social-perceptual training, and methodology, and suggested several implications for programs for the trainable mentally retarded. An even more direct application of research to the adaptation and development of materials for the mentally retarded was compiled by Aserlind (1969). He discusses more than ten research implications ranging from a requirement to overcome an attention deficit characteristic of the retarded to the desirability of attending to the mediation phenomenon.

The use of Montessori instructional materials

with the mentally retarded has been a common procedure for many years. Banta (1971) reviews the application of Montessori methodology to the teaching of the retarded and describes some of the didactic materials developed by Marie Montessori. Further principles underlying the development of Montessori materials can be found in several books on the subject, among them the recent work by Lillard (1972).

Numerous lists of selected materials for use with the mentally retarded have been developed by local and state education agencies as well as by Special Education Instructional Materials Centers and other projects. Among the lists are those compiled by McCarthy (1969), Reichard (1970), Davis (1970), Logan (1970), and the New England SEIMC (1970a). In addition, texthooks pertaining to the education of the retarded contain suggestions for instructional materials (Molloy, 1972; Kolstoe, 1970, Frankel, Happ, and Smith, 1966).

Socialization, Pre-Vocational, and Vocational Education. Among the most extensive and long-term efforts aimed at developing curriculum and materials for a handicapped population is the construction of a Social Learning Curriculum at Yeshiva University (Goldstein, 1972). This project, underway for several years, has involved sizeable field tests during each phase and promises to provide a comprehensive curriculum in which instructional materials will be developed and validated. Need areas have been identified within the psychological, social and physical aspects of an expanding environment, and materials have been geared rather specifically within each of the identified cells of the curriculum model.

Socialization also has been the topic of materials developed by Edmonsen, Leach, and Leland (1969) and the focus of an experimental design to test a training program to teach social behavior as reported by Ross (1967).

Pre-vocational and vocational education have long been a concern of teachers of the retarded. Jackson and Petersen (1973) developed 15 OCCUPACs containing slides, tapes, and other materials on various occupations in order to increase young children's awareness of the world of work.

Personal property concept is the topic of the two package programs developed for trainable level children by the University of Wisconsin SEIMC (Bloom, 1971). Like many of the newer instructional multimedia packages, these two packages state behavioral objectives and provide guides for the teacher. Other uses of media in the vocational and pre-vocational area include 8mm film loops (Bitter and Bolanovich, 1966), videotaping of work stations in industry (Retzlaff, 1973), and UNIPACs as a special format for grouping materials (Scheibe and Tolonen, 1973).

Among references listing resources for teachers concerned with vocational and prevocational education for the retarded are the guide prepared by the New England SEIMC (1970b), the information list compiled by the Cobb County School System in Georgia (McCord, 1968), and a listing compiled by the Northwest Regional Educational Laboratory (Towne and Wallace, 1972). This latter listing, entitled Vocational Instructional Materials for Students with Special Needs, is undoubtedly the most comprehensive document available, with lists of hundreds of materials by title, length, date, author, and notations on relevancy for special groups, potential use, concise description of the material, media requirements, and source.

Science Instruction. Another area of the curriculum in which some rather intensive effort has been directed toward materials development for the retarded is that of the life sciences. Developers of the Biological Sciences Curriculum Study (BSCS) have been concerned about students with learning problems for some time (Grobman, 1965), and in more recent years have produced a complete instructional program for the EMR known as "Me Now." This program is designed for EMR pupils at the intermediate level and has undergone field testing prior to development of the commercially available version (Dailey, 1971a). Self-instructional audio programs to teach science to secondary students have been described by Townsend (1972). The feasibility of modifying "Science--A Process Approach" materials for use with the retarded was explored by Wilson and Koran (1973). They conclude that SAPA materials appear to be adaptable with only minor revision and expansion.

Number and Arithmetic Instruction. In a summary of research on the teaching of mathematics, Dunn (1973) arrived at two conclusions pertaining to materials.

> "Concrete materials for teaching mathematics, such as colored Cuisenaire rods, Distar Arithmetic, and Stern's Structured Arithmetic materials, appear to work well with the mildly retarded" and "The considerable body of literature on the use of programmed instruction in teaching mathematics to the mildly retarded has generated more confusion than order, with little clear evidence for the superiority of either programmed instruction or teaching machines over individualized teacher tutoring. Programmed instruction appears to be superior for the lower IQ pupil when small-step sequences and a small error role are built into the program and when branching is not used. As with reading, a combination of programmed instruction and good teacher tutoring appears to produce the best results" (p. 149).

Examples of rather extensive efforts in arithmetic materials development are the efforts of Higgins and Rusch (1967) and another project at the University of Connecticut (Soeffing, 1972). Higgins and Rusch developed a device referred to as the "Audio-Visual Manipulative (AVM) Desk" which includes a visual image, audio messages through earphones and a speaker, and a response surface on which the child can write or manipulate objects. Twenty-one different sequential arithmetic programs were developed and tested along with a teacher's guide and reinforcement materials for classroom use. Researchers at the University of Connecticut (Soeffing, 1972; Cawley and Vitello, 1972; Cawley, 1972) offer an alternative to current arithmetic programming for the retarded in a process-oriented model which provides the teacher with a multiple option curriculum rather than a fixed frequency program. Problem solving and cognition are emphasized rather than mere computational skills. Three sets of instructional materials have been developed as part of the program. Approximately 11,000 units of instruction are planned for the program.

Distar materials, referred to by Dunn, while not developed specifically for the retarded, have been used rather extensively with this population. The materials follow a direct teaching approach based upon principles disucssed by Becker, Engelmann, and Thomas (1971). See also Engelmann (1969).

Other special materials for teaching arithmetic to the retarded include the "Decicounter" (Watchman, 1971) to assist in learning basic arithmetical processes, the Cuisenaire Rods (Callahan and Jacobsen, 1967), and the "DOT Overlay Technique" (Kramer and Krug, 1968). A description of manipulative materials to teach numeral-quantity association to trainable-level children was prepared by Armstrong and Schmidt (1972). Gross and Werlin (1972) propose several guidelines for selecting manipulative devices for teaching arithmetic to young children.

Language and Reading Instruction. According to Dunn (1973), "the evidence is very mixed on the effectiveness of teaching machines and programmed instruction in teaching reading to the mildly retarded . . . A combination of tutoring plus programmed instruction appears to hold greatest promise for average teachers" (pp. 147-148). Dunn goes on to say that various media such as Rebus symbols, the Initial Teaching Alphabet, and the standard alphabet, have produced reading gains, as have various methods emphasizing a phonic, kinesthetic, or look-say approach. He concludes that the crucial variable appears to be the teacher. While many teachers of the retarded have developed their own materials, and while literally hundreds of materials are on the market for teaching reading and language skills, the actual number of materials developed, field tested, and marketed especially for the retarded is small.

Woodcock (1970) uses symbols or pictures to represent an entire word or part of a word in teaching beginning reading to the retarded. The materials in this "Peabody Rebus Reading Program" include programmed workbooks and readers using the rebus approach with an ingenious procedure for pupil response. The pupil uses a dame pencil eraser to make the response -- a correct answer will show green and an incorrect answer till turn red.

Distar reading and language development materials (Engelmann, 1969) have been used rather widely with the retarded, apprently with considerable success. However, like the Distar arithmetic materials, they were not designed especially for the retarded. These materials are developed following the new teaching technologies discussed by Becker, Engelmann, and Thomas (1971).

Perhaps the best known and most widely used materials for developing basic language skills with the mentally retarded (as well as with other groups of handicapped learners) are the "Peabody Language Development Kits" (Dunn and Smith, 1965, 1966, 1967, 1968). These kits, developed for various levels of young children, had their inception in the early work of the authors with the mentally retarded.

Numerous investigations have been conducted with the Distar materials and Peabody Kits, and the conclusions of most researchers, along with the testimonies of teachers, indicate that materials which provide the teacher with detailed instructions and a ready supply of teaching aids are highly desirable.

As indicated above, hundreds of materials are available for teaching reading and language, and many of these are easily adopted for use with the retarded. This brief review has not begun to enumerate all of the available materials. Further comments on appropriate materials are included under the section on programmed instruction.

The Creative Arts. Ray (1972), in a discussion of media for the exceptional child, places considerable emphasis on the values inherent in media in providing learners with a sense and awareness of beauty. Aesthetic education, he believes, has been neglected, but this deficiency is not difficult to remedy. Imagery, including verbal, aural, and visual, can be profitably utilized via the many media resources available to the classroom teacher.

Selected materials for teaching art to the

mentally retarded are specified in an article by Alkema (1968) which is representative of numerous writings on the topic. Most writers suggest that the creative arts are an essential part of the curriculum for the mentally handicapped and that these children require just as much opportunity to interact with the creative media as do children without learning disabilities.

One of the more unique involvements of media in teaching music to the handicapped is an electronic device called the "Dynalevel," an instrument which transforms the volume of sound into light. One report calls the Dynalevel a valuable aid in helping the retarded discern variations in musical sounds (Instrument, 1970).

Crippling and Health Disorders

Teaching materials for physically handicapped children range from simple homemade pegboards for helping children improve coordination to highly sophisticated electronic devices designed to compensate for poor motor control characteristics of children with cerebral palsy.

Herron (1969) compiled a description of adapted equipment, with drawings of 60 kinds of materials and instructions for assembly. Directions for making self-help skill and language skill materials are provided in a reference by the Wisconsin State Department of Public Instruction (1969). Another excellent resource for teachers of the young physically handicapped child is Dorward's Teaching Aids and Toys for Handicapped Children (Dorward, 1960). Rosenberg (1968) provides directions for constructing over 100 inexpensive devices designed to aid the physically handicapped in carrying out typical functions required of an individual in the home and work world. Guidelines for special equipment needs for students in wheel chairs are provided by Yuker (1967). The special instructional material needs of the young multiply-handicapped child are addressed in a book by Schattner (1971). An indication of future innovations utilizing knowledge acquired from electronic technology, neurophysiology, and other sciences is gained from a reading of a recent article by Hedrich (1972).

The reader's attention is directed to a later section of this paper where a system is described for retrieving information about adaptive equipment for the physically handicapped (Melicar, no date).

Behavioral and Specific Learning Disabilities

A diagnostic-prescriptive approach to teaching children has found its largest number of proponents among those who teach children with behavioral and specific learning disabilities. The aim of this approach is to pinpoint the specific educational problems of each child and to prescribe an educational program, including specific instructional materials, to remedy the identified needs. Fortunately for the practitioner, a number of annotated lists of materials are available, and more helpful yet are the lists of materials matched to subtests of various diagnostic instruments.

Another consequence of the diagnostic-prescriptive approach is an emphasis on what some call "pre-academic skills," namely auditory, visual and tactile perceptual skills. Haworth (1969) describes the benefits of a multisensory approach in improving perception and points out that such an approach requires many different materials. Ashlock and Grant (1972) present a description of both commercial and locally developed materials; Buist and Schulman (1969) identify commercially available toys and games; Epps (1958) suggests teaching devices with their sources; Stock (1970) emphasizes materials for young preschool aged children; and Rosner (1971) limits his in-depth discussion to two devices for improving visual perception skills.

The Rocky Mountain SEIMC (Button, 1973) has matched instructional materials for remedial use to subtests of the Illinois Test of Psycholinguistic Abilities. The New England SEIMC (1971) has developed a resource guide which classifies materials to match areas of strength and weakness as revealed by subtests of well-known test batteries.

Two sources particularly useful in selecting instructional materials for teaching reading to children with behavioral and specific learning disabilities are those prepared by Garten (1968) and the ERIC Clearinghouse on Reading (Berridge and Siedow, 1971).

The role of media in teaching the emotionally handicapped was the topic of an institute conducted in New York (New York Education Department, 1970). This institute described the use of Computer-Based Resource Units (to be described in a later section of this paper), the Talking Typewriter, computer-assisted instruction, and the use of instructional television. Ucer, Gaulden, and Mazzeo (1968) found that the use of motion picture films with emotionally disturbed retardates resulted in improvements in interpersonal relationships among the population studied.

CLASSROOM APPLICATIONS

Moving away from a discussion of media and material adaptations and applications for various categories of handicapped learners, it seems profitable to review some of the applications of

the various modes by which learning is enhanced. In this section, classroom applications will be discussed in each of the following categories: (1) videotechnology, (2) computer applications, (3) programmed instruction, (4) tapes, films, and transparencies, and (5) systems and attempts at standardization.

Videotechnology

Videotechnology has probably progressed further in its use with the hearing impaired than with any other group of handicapped learners. This is at least partially due to the emphasis placed upon this technology by the Regional Media Centers for the Deaf. Several of the symposia and workshops sponsored by these centers, and especially by the RMCD at the University of Tennessee, have assisted in sharing of information and advancement of knowledge in this area (Southern Regional Media Center for the Deaf, 1969; Jackson 1969; Stepp, 1970; Propp, 1970). In analyzing the results of a 1970 survey of television facilities at residential and day school programs for the deaf, researchers estimated that about 78% of some 40,000 deaf pupils enrolled in such programs did not have access to equipment and systems for an adequate instructional television experience. While educators of the deaf might bemoan the fact that such instruction is not available to a larger proportion of deaf children, they might take some comfort in realizing that they are still in the lead in developing and providing such programming for the handicapped.

The use of videotape with the handicapped has the potential for improving educational programs in several ways. Ryan (1969) has pointed out that " . . . videotape enables people to communicate with themselves about what they are doing and thereby extends their ability to control their behavior" (p. 30). The feedback loop has considerable value to both the handicapped learner and the teacher. Shayon (1972; 1973) sees a real value when handicapped children get involved in the media and he urges teachers to get children actively involved in using video cameras and recorders, not only in the classroom, but more importantly out in the real world. Altschuler (1970) reinforces this viewpoint with a conclusion that students who plan a videotape production, as well as take a real part in its development, gain more from the experience than if they were more passive observers.

Guldager (1972), in writing about the use of videotape with deaf-blind children, emphasizes the value of teachers evaluating themselves through videotape, as well their students. Marinoff (1973), in working with cerebral palsied children, reports four values from the use of videotapes: (1) immediate feedback for teachers to evaluate themselves and their pupils, (2) a measure of the child's growth when standardized tests cannot be used effectively, (3) a source of relevant teaching material, and (4) a way to help parents better understand the learning needs of their child. Liberman and Swope (1969) have utilized "Flander's System of Interaction Analysis" to assist teachers in evaluating their own teaching behavior as recorded on videotape. Among other reports on the use of television with the handicapped are those of Ryder and Cohen (1969) and Efron (1970).

Educational television, especially the well-known programs "Sesame Street" (Lesser, 1972; Ball and Bogatz, 1972) and "Mister Roger's Neighborhood" (Sharapan, 1973), has been viewed by handicapped children over the past several years. "Mister Rogers" has focused on four types of activities to help support the self-esteem of the handicapped individual. An atmosphere is planned in each program to support the development of a healthy ego; differences among individuals are respected by the program participants; attention is given to motivation, frustration, and tolerance; and handicapped guests are invited to participate.

The captioning of commercial television as well as educational television is being explored and encouraged by educators of the deaf (Proff, 1970; Southern Regional Media Center for the Deaf, 1969).

An attractive feature of a closed circuit television system is its ability to act as a light amplifier. This distinct advantage is being explored with partially sighted individuals who can use the amplified light to read books with regular print size and to monitor their own handwriting without moving their heads close to the work (Genensky, Barak, Moshin, and Steingold, 1969).

The learning needs of deaf adults were explored by Shurtz (1968) whose research led to an experimental program to teach child psychology at the college level via television. Recommendations for future research of this type are included in the author's report.

Goforth (1968) has suggested television systems for the handicapped which specify needs in individual classrooms and then extend to a schoolwide system, a regional system, and a national system. It appears that such a plan which considers local, regional and national requirements will be the eventual means whereby the ultimate potential of videotechnology for the handicapped can be achieved.

Computer Applications

An early article by Tondow (1964) suggests the potential of computers in special education. Further suggestions have been made by Blackman (1967). A very comprehensive review of the use of computers in special education is being prepared at The Pennsylvania State University by G. Phillip Cartwright and Keith A. Hall (G. P. Cartwright, Personal Communication, July 1973).

Cross (1973) classifies the uses of the computer in education in two groups: Computer-Managed Instruction (CMI) and Computer Assisted Instruction (CAI). CAI, according to Cross, ". . . brings the student into direct communication with a computer, generally through the use of a special terminal . . . . from which the child receives instruction and to which he responds." In CMI " . . . the computer is used to identify and assess the appropriateness of new learning experiences for the child" (p. 1). Both CAI and CMI applications have been investigated for use with the handicapped, and several noteworthy advances have been accomplished with this population.

Among the more intriguing uses of CAI with the handicapped is the "Talking Typewriter" developed by the Responsive Environment Corporation based upon the work of O. K. Moore (Responsive Environment Corp., 1968; Kant, Ramos, and Shanks, 1970). The computerized electric typewriter is coupled with a tape recorder, speaker, viewing screen, and slide projector. As the child manipulates the typewriter keys, an audio response is activated, thus pairing the letter name with the audio response. More complex acitvities can also be programmed into the talking typewriter, and reports indicate successful use with handicapped learners, especially autistic children.

CAI for teaching reading, arithmetic and spelling has been used in special education classes in Putnam-Westchester, New York, for a number of years with significant success (Cross, 1973; Leonard, 1970).

Knutson and Prochnow (1970) utilized CAI to teach change-making to mentally retarded teenagers and young adults. An adaptation was made in the keyboard of the terminal so that actual coins could be placed upon the keys. All students involved in the study showed some improvement in change-making skills.

Rathe (1969) suggests that "the primary advantage of CAI in teaching the deaf is that it does not discriminate between the deaf and the non-deaf" (p. 122). This same comment could be applied to the use of CAI with learners with other handicapping conditions, and this advantage becomes apparent as one reviews the increasing utilization of CAI in special education. (The reader is encouraged to obtain a copy of the forthcoming paper by Cartwright Hall at The Pennsylvania State University if he/she wishes to review the literature more fully).

The most widely used application of computer technology in special education is with CMI rather than CAI, and more specifically involves the dissemination of information to teachers via Computer Based Resource Units (CBRUs). This system, developed by the New York SEIMC Network and distributed in many parts of the United States by elements of the SEIMC/RMC Network, enables the teacher to select both group and individual objectives from approximately 40 units, and receive a printout of group and individual activities, instructional materials, and evaluation procedures, all matched to the identified objectives. In summarizing the value of CBRUs and other forms of CMI, Cross (1973) indicates that "in general, the function of Computer Managed Instruction is to provide for the teacher the widest range of instructional possibilities so that instruction can be individualized to meet the peculiar needs of each student" (p. 2).

Computer applications for training teachers of the handicapped will be discussed in a later section of this paper.

Programmed Instruction

Programmed instruction, with its emphasis on small, sequential steps, is pedologically consistent with the learning strategies so often deemed beneficial for handicapped learners. The rationale for applying the principles of programmed instruction to the handicapped has been suggested by several educators (Abraham, 1966; Falck, 1973; Watts, 1969; Pipe, 1971). In considering the broad implications of programmed instruction, Hofmeister (1971) views it as a process that can and should be applied to the development of learning systems. He identifies eight phases of the process: (1) selection and definition of the task to be learned, (2) preparation of the instructional sequence, (3) development of the instructional materials, (4) development of the feedback loop, (5) formal field testing, (6) placement of the learner in the instructional sequence, (7) monitoring of the progress of the learner, and (8) final evaluation with consideration of the criterion measures prepared in the first phase.

While programmed instruction has most often been utilized in developing programs in the traditional academic areas (Hendershot, 1967), there are those who suggest that it should go beyond the basic skills and be utilized in teaching skills and concepts in the area of socialization (Vandini, 1969). With the emphasis on practical living skills in programs for the

handicapped, this later emphasis appears to be one which requires more innovation.

Among the applications of programmed instruction to the teaching of the mentally retarded are the use of Individually Prescribed Instruction developed at the University of Pittsburgh (Yeager, 1969), the use of a programmed textbook with EMR pupils (Rainey and Kelly, 1967), the rather rigorous investigation by Bijou and others of teaching basic skills to the retarded (Bijou, Birnbrauer, Kidder, and Tague, 1966; Bijou, 1971), the testing of mathematics programmed materials with EMR junior high students (DeZelle, 1971), and a number of others as reviewed by Greene (1966).

Programmed instruction also has had rather heavy utilization with deaf learners, as described in the work of Lennan (1969), Roy (1964), Murphy (1971), and others as reported by the Regional Media Centers for the Deaf (Stepp, 1969).

Thiajarajan (1973) has developed a procedure for use with handicapped learners which he calls "Programmed Tutoring." He applies the principles of programmed instruction to a non-professional adult tutor and student situation, and finds this an effective way to manage the learning environment. Interestingly enough, he reports several advantages of a human tutor as contrasted to a computer.

Tapes, Films, Transparencies

While the more traditional uses of motion pictures and still photography for teaching the handicapped are widely accepted (Viggiani, 1969; LaGow, 1972; Goldstein, 1964), the developing emphasis appears to be involving the handicapped in using the media. Wallace (1971) and Murphy and Delmonte (1971) describe ways in which Polaroid cameras can foster communication skills among deaf children, while Comba (1969) and a report from St. Mary's School for the Deaf in Buffalo (Teaching, 1969) suggest advantages to be found when cameras are put into the hands of children. Meister and Hainfeld (1969) recommend the use of Super 8mm film for recording the progress of handicapped children, thus insuring a permanent record for evaluation purposes.

The audio tape recorder, which has become almost as common a piece of equipment in classrooms for the handicapped as the overhead projector, has received relatively little coverage in the literature, perhaps due to the rather straight-forward advantages apparent in this media. Smith (1966) provides a number of advantages along with practical suggestions for using the tape recorder with mentally retarded pupils. With headphones, the cassette tape recorder can be used by individual learners who may have problems with written instructions, thus freeing the teacher to work with groups and other individuals.

Smith (1967) also provides suggestions for using overhead and opaque projectors with EMR pupils, and Harrington (1972) expands these suggestions with information on the production of transparencies. Both common and not-so-common uses of the overhead projector are suggested by Wyman (no date) in writing for teachers of the deaf. The real value of this device is probably more fully realized by deaf educators than by any others, but methods employed in teaching the deaf might be adopted and adapted by teachers of other handicapped learners.

Systems and Standardization

The development of an actual total learning system for teaching the handicapped has yet to be achieved, but elements appear to be coming together which hold out hope for the future. Haring and Lovitt (1967) have noted that "in the applied setting, emphasis has been on an arrangement of children rather than on an arrangement of the total learning environment" (p. 41). This need to arrange the total learning environment in a systematic manner also is emphasized by Heinich (1966) in discussing the role of the media teacher within a systems concept of learning. The systems described below should perhaps be considered "sub-systems" which have some potential for being absorbed into a total system of the future.

A "Mediated Interaction Visual Response" system (MIVR) for deaf students has been developed by Ray Wyman at the Regional Media Center for the Deaf, University of Massachusetts (Wyman, 1969). The MIVR system " . . . is an attempt to add an instantaneous visual response mode to a group of eight students in front of their teacher who, in turn, has a variety of oral and visual presentation modes and materials at his command" (p. 155). Students work in groups of up to eight in number, each with his/her own individual overhead projector. The teacher, in addition to an overhead projector, has other equipment such as film strip projectors, motion picture projectors, and record and tape players. Each student can respond immediately (not in order) and the teacher is able to monitor all responses instantaneously.

Dr. Wyman also has proposed a single system for individual study (Wyman, 1973). "A major and heretofore overlooked reason for the infrequent and inappropriate use of media is the great variety of forms and formats for individual study that have haphazardly evolved from a variety of media primarily designed for group presentations or teaching" (p. 29). To overcome this serious problem, Dr. Wyman proposes that all

still and moving images and combinations thereof be converted to or originally produced in Super 8mm film format in a standard cassette for use in a standard machine. All audio materials would be produced in or converted to a new standard cassette format. The audiotape would contain the pulses required to advance the film. This revolutionary proposal, if adopted, would do much to enhance the media learning environment for individual handicapped learners.

"The Special Experience Room" located in an elementary school in Warminster, Pennsylvania, has been utilized with children with various handicaps (Dailey, 1971b). The circular instructional media room has a hemispheric dome, carpeting, a projection area, climate control, odor ducts, and sound equipment, but no furniture. The room, coupled with educational programs, is designed to involve the child in vision and sound experiences which increase his perceptual skills.

"The Learning Wall System" in a California school consists of a large wall (11 x 21 x 8 feet) for projection of images in place of the conventional screen (Heilig, 1971). Special lighting and other equipment permit the child to respond by touching images, superimposing images on projected images, drawing on the surface with felt-tipped pens, and in other ways become involved in the media.

MATERIALS DEVELOPMENT AND EVALUATION

Standing foremost among the unmet needs of handicapped children and youth as identified by educational task forces at the beginning of the previous decade was the relative dearth of instructional materials designed for this population of learners. The U. S. Office of Education, through its Bureau of Education for the Handicapped, sought to move resources into this vacuum. With the assistance of enabling legislation and appropriation of funds, responses to this need have been made and continue to progress into the '70's. Through various efforts, such as Research and Development Centers, grants to individual researchers, development of the SEIMC/RMC Network, and establishment of a National Center for Educational Media and Materials for the Handicapped (NCEMMH), significant advances in the development and evaluation of materials are being achieved. This section of the paper reviews the three areas of needs assessment, materials development, and materials evaluation as they relate to handicapped learners. A discussion of the purposes, functions and activities of the SEIMC/RMC Network and of the NCEMMH concludes this paper.

Assessment of Needs

That an initial step leading to the development of materials should be an assessment of needs for materials is hardly a profound pronouncement. Educators writing about the development of materials for the handicapped often list the assessment of gaps in the supply of available materials as the necessary first step (Lance, 1967; Ward, 1968). Yet is must be admitted that much development has proceeded on the basis of a rather shaky assessment of what the needs really are. Some units within the SEIMC/RMC Network have surveyed the needs of handicapped students as perceived by teachers (such as Ward, 1968; Lilly and Kelleher, 1971). While such investigations indicate certain curricular areas where teachers feel a lack of materials, the needs of the handicapped in relation to materials have not been systematically and comprehensibly determined. In this regard, it is encouraging that such a national needs assessment is underway through the NCEMMH (Belland, 1973). The results of this comprehensive assessment will be available to guide materials development not only as funded by the federal government, but by independent and commercial producers as well.

Materials Development

Regardless of the ever increasing supply of commercially produced materials, many teachers of the handicapped will continue to create their own materials for a number of reasons suggested by Lance (1967; 1968). This teacher-assumed responsibility has been challenged by several educators (Gallagher, 1967; McCarthy, 1966; Zbinden, 1967) who point out not only the time consuming aspect of individual materials development, but also the benefits derived from materials developed according to more highly sophisticated standards than are usually within reach of the typical classroom teacher. With the ever increasing resources available through the local, regional and national elements of the SEIMC/RMC Network, it appears that the trend is to move the responsibility for materials development away from the teacher to other professionals who have both the time and resources necessary to achieve a better developed and well verified final product.

Several models have been suggested for the development of materials for the handicapped. No one model has come to the forefront however, and many models and adaptations will undoubtedly be employed. Drew and Martinson (1971) have proposed a model conceptualized in terms of "primary distinguishing characteristics" which can result in a match between the unique strengths or weaknesses of a product and the unique requirements of a learning situation. McNeil (1972),

focusing on the particular needs of emotionally disturbed children, recommends a model based upon theoretical assumptions, content variables, media characteristics, organismic variables, and goals. McNeil's model is directed toward the teacher who may create his/her own materials, but the model has equal relevancy for material developers outside the classroom. A third model attempts to bring educational diagnosis and materials development together based upon a common rationale (Ensminger, 1972). Ensminger's model of instruction includes a consideration of learning stages and the interactions among input and output systems.

Those concerned with the development of materials for the handicapped apart from the theoretical models will profit from an examination of guidelines for this activity. Locatis and Smith (1972) have stated some 22 rules classified as formulation rules, design rules, verification rules, and installation rules. Belland and Rothenberg (1973) of the NCEMMH recently have formulated guidelines for preparing materials suitable for wide distribution. Both sets of guidelines, along with others available in some of the basic works on educational technology, are recommended to anyone entering into the development of materials for special education.

Materials Evaluation

Evidence of the widespread interest in the evaluation of instructional materials for the handicapped is apparent in the large numbers of articles written on the topic. Bibliographies compiled by three SEIMCs are available to assist in locating these documents (Naegle, 1970; Jacobs, 1971; Armstrong, 1973). That the SEIMC/RMC Network should assume a major role in the evaluation of materials is a position supported by several researchers (Moss, 1968; Swisher, 1968; Singh and Barnard, 1969). Elements of the Network have grappled with this evaluation role for nearly 10 years. Realizing that evaluation models for verifying materials for the non-handicapped are in many respects relevant for materials for children with special needs, educators have looked to the work of specialists such as Gagne (1967), Stake (1967), and Stufflebeam (1968). At this point, while many special educators are engaged in generating working models, the most definitive statement that can be made about materials evaluation models as accepted practice is that they are evolving.

One such model is described by Armstrong (1971). This model actually begins with the need determination phase and proceeds through twelve major steps, including development and evaluation. A six phase model is described by Singh and Barnard (1969). McIntyre, R.B. (1970) suggests a systems model incorporating input variables, event variables, behavioral objectives, and final results. Educators voice the opinion that teachers are instrumental in the materials evaluation process (Williams, 1966; Sheperd and Rolland, 1967; Drew, Altman, and Dykes, 1971) and actual practice supports this contention (Espeseth, 1967; Armstrong and Senzig, 1970; McCarthy, 1971; Meyen, 1970; Meyen, 1971; Lovitt and Schaff, 1972). One study indicates that special education teachers are not only willing to participate in the evaluation of materials, but also perceive themselves as having the ability to do so (Baum, 1972).

Many instruments have been designed to assist teachers in evaluating special education materials (such as Eash, 1969) and copies are available through most regional SEIMCs. It is interesting to note that experienced teachers of the handicapped are apparently better evaluators than undergraduate students (Engelsen, 1969) and that a teacher's impression of an instructional material may be significantly influenced by the evaluative activities of SEIMCs (Bogatz, 1971).

A rather large-scale effort to evaluate material against student performance was initiated in the Syracuse City School District and involves a computer for data storage and analysis (Syracuse City School District, 1971; Cross, 1973). Both educable mentally retarded and emotionally disturbed pupils are included in the study of materials from the Media Services and Captioned Films depositories.

Among the numerous examples of the application of evaluation procedures to materials for the handicapped are the following: Krug and Hawkins' (1970) materials to teach syntactical meaning of words to the deaf; Dunn's (1968) studies of the effectiveness of the Peabody Language Development kits; and Tringo's (1970) report on the Kentucky TIME program. Already mentioned in a previous section is the ongoing development of language improvement programs for the deaf, Project LIFE (Pfau, 1972), which incorporates a rather rigorous verification phase in the development-evaluation-production cycle.

TEACHER TRAINING IN MEDIA UTILIZATION

With numerous changes occuring in media resources available to teachers of the handicapped it is not unexpected to find administrators, supervisory personnel and university faculty members concerned about assisting teachers in developing competencies in selecting, developing or adapting, and utilizing instructional materials and media. Needs, problems, and potential solutions in this regard were discussed at the CEC Conference on "Instructional Technology in the Education of Exceptional Children" (Council for Exceptional Children,

1970) and CEC also has compiled a selective annotated bibliography on professional education (CEC Information Center, 1972b) with some references on educational technology. Probably the most useful document to teacher trainers is the recently developed field test version of a Sourcebook on Instructional Development for Training of Exceptional Children (Thiagarajan, Semmel, and Semmel, 1973). This sourcebook should assist teacher trainers in preservice course development and inservice training, and in selecting and applying an appropriate format.

Preservice and Inservice Training

Programs to meet the needs of teachers have ranged from short, one day or less inservice training sessions to multi-year programs designed to prepare media professionals. The University of Massachusetts has developed a three-year curriculum leading to a bachelor's or master's degree for media specialists who will be employed by schools for the deaf (Panko, 1969). A graduate course designed to teach students to produce a self-instructional package of learning material for deaf students has been described by Torr (1971). Project Hurdle (Summers, 1970; Ferguson, 1969) trained media specialists at a Regional Media Center for the Deaf and then placed each individual in a school for the deaf for a period of several weeks in order to provide inservice training in media production and utilization. An evaluation of the effectiveness of this project indicated that it was a productive model for upgrading the competencies of teachers of the deaf.

At least two studies encompassing populations from one or more states have attempted to assess teachers' perceived needs for inservice training, and the results have shed some light on needs in the area of educational technology. Meyen and Carr (1968) polled teachers in Iowa and identified several curricular areas in which teachers needed assistance. Lilly and Kelleher (1971) did a similar survey of teachers in the northwest.

Meyen (1968, 1969a, 1969b) utilized the results of the Iowa survey to develop an inservice training model for special education teachers in that state. The training model was based upon the premise that " . . . special class teachers are sensitive to their instructional problems and given sufficient support, possess within their ranks the necessary leadership talent to conduct their own in-service training" (p. xiii). Thus, consulting teachers were selected, given special training at a central location, and then returned to their home regions to train other teachers in the skills of curriculum and materials development and utilization.

The Instructional Materials Center for Special Education at the University of Southern California has emphasized small group, task oriented, interactive, and time loaded procedures in organizing inservice training for teachers (Dailey, 1972; MacIntyre, 1972; McIntyre, 1969). Hundreds of teachers have been trained with this model in the use of behavioral objectives in curriculum development, contingency management, selection of media, and other aspects of educational technology. The training model recently has been utilized by other regional SEIMCs in various sections of the country.

Simulation as a training strategy has been used with professors of special educators at the university level as well as with school administrators in local districts (Sage, 1970; Burke and Sage, 1970; Hudson, 1968). Applications of simulation strategies to the training of special education teachers in educational technology have yet to be fully explored.

Other examples of inservice training activities include a project in the Atlanta schools designed to facilitate the utilization of media to improve the instruction of EMR children (Roelke, 1971) and a special study institute in Tennessee designed to train teachers of the visually handicapped to locate, acquire, and utilize instructional materials (Tennessee State Department, 1969).

Training Packages for Teacher Education

Self-instructional and group instructional training packages are rapidly taking their place among strategies for improving the competencies of parents and teachers who work with handicapped children. This interest may be attributed partially to the emphasis on competency-based education which breaks the curriculum into small measurable units suitable for packaging and also to the availability of cassette tapes, videotapes and other convenient forms of packaging information. A bibliography of 229 packaged programs and guides for teacher training includes many pertinent to educational technology (Tarling, 1972). Guidelines for developing training packages have been offered by Tyler (1973).

The Cloverpark School District in the state of Washington has developed and disseminated rather widely a series of Learning Activity Packages (LAPs) targeted at both handicapped learners and their teachers (Latta and Kalenius, 1972). The format of the LAPs allows for the specification of instructional objectives, small incremental learning steps, and continuous evaluation.

Training by cassette tapes has been found

effective with paraprofessionals who work with severely and profoundly retarded children in a residential institution (Scoggins, 1972). Latham and Hofmeister (1973) packaged a media training program for parents of young mentally retarded children and achieved good results.

Teachers in rural areas have been assisted through Packaged Self-Instructional Programs for Isolated Teachers of the Handicapped (Passarell, 1970). This package includes training in a wide variety of skills and methodologies required by special education teachers.

Computer Assisted Instruction for Teacher Education

The Pennsylvania State University has pioneered computer assisted instruction (CAI) for teachers of the handicapped over the past several years (Lehmann, 1971; Cartwright, Cartwright and Robine, 1972; Hall and Mitzel, 1973). This application of CAI is known as Computer Assisted Renewal Education (CARE) and includes a series of courses offering preservice and inservice preparation to regular class teachers. The courses include instruction in early identification, diagnostic teaching and instruction of the visually handicapped. They are offered not only on campus, but by means of a mobile laboratory which travels throughout the country to offer the CAI. Other applications of CAI to teacher training are reviewed in a forthcoming publication by Cartwright and Hall at The Pennsylvania State University.

DELIVERY SYSTEMS

This paper has reviewed the state of the art of the development, evaluation and application of instructional media and materials for the handicapped. While advances in these areas are most encouraging, even greater enthusiasm can be generated by the prospect of a national delivery system which pulls all of the pieces together. Gallagher (1970), in addressing the CEC Conference on Instructional Technology, pointed out that we need to make a heavy investment over a prolonged period of time to develop and test new delivery concepts. Such a concept ought to go well beyond the mere stockpiling, retrieving, and distribution of materials, and should reach into the very classroom with whatever resources are necessary to bring about the optimal learning situation for every child.

Such a system would meet the instructional materials requirements (McCarthy, 1966) and the information needs (Withrow, 1973), and would include a vehicle for providing the teacher with related competencies in selecting, developing and utilizing materials. The delivery system of the future, as envisioned by some, also would include provisions for insuring the identification of handicapped children, a proper educational diagnosis, and an ongoing prescriptive process which would match each student's learning requirements with the most appropriate educational program. This program would include the media and materials and competent teacher to complete the final step in delivering services to children.

The SEIMC/RMC Network

The history of the Special Education Instructional Materials Centers/Regional Media Centers for the Deaf Network (SEIMC/RMC Network) has been documented in several sources (Olshin, 1967; Aserlind and McCarthy, 1969; Aserlind, 1970; Norwood, 1972) and will not be repeated here. Suffice to say that the network is presently composed of 13 regional SEIMCs, four Regional Media Centers for the Deaf, the Instructional Materials Reference Center of the American Printing House for the Blind, the CEC Information Center on Exceptional Children, the National Center for Educational Media and Materials for the Handicapped, and a national coordinating office in Arlington, Virginia. All the above elements are funded by the Bureau of Education for the Handicapped, U. S. Office of Education.

In addition to these regional and national units, over 300 Associate SEIMCs have been developed throughout the country through use of local, state, and federal funds. While not officially a part of the Network, the Educational Media Distribution Center which has the responsibility for captioning and disseminating films for the deaf, works closely with the units mentioned above. The Regional Resource Centers for the Handicapped (Council for Exceptional Children, 1972), whose primary mission includes technical assistance to state educational agencies in identification, diagnosis, prescription, and programing for the handicapped, are not officially a part of the Network. These Centers, however, coordinate their efforts with SEIMCs and RMCs serving overlapping regions. It is the position of a number of special educators that the needs of handicapped children can best be met by merging the Regional Resource Centers and the SEIMCs/RMCs into a broader delivery unit, encompassing the full continuum of services from child identification to materials delivery. Such a concept might be termed a "Learning Resource System for the Handicapped" and would include national, regional, and local units designed to perform various functions in the delivery process.

It is premature to claim that the SEIMC/RMC Network has all -- or even most -- of the characteristics of a true network. The encouraging fact is that a start has been made and the commitment to the concept is strong. One very significant activity which will bring the Network closer to this goal is the intensive planning for revising operations now underway among network personnel (Blackhurst, 1973). The resultant set of specifications and guidelines will cover instructional materials development; identification, development, and dissemination of teacher training materials; development of a national information storage and retrieval system; standard procedures for operating a national circulation system for instructional materials; guidelines for development of state and local teacher support services; and specifications for management procedures.

Regional SEIMCs and RMCs

The work-scope of the regional SEIMCs (Maietts, 1969; Ruvin, 1969; Wolinsky, 1970) and RMCs for the Deaf (Jackson, 1970) can be categorized into five basic areas. The first is concerned with the development of child-use instructional materials and stems from the assessment of needs (now being conducted by the NCEMMH) on both the national and local level. Prototype materials developed by regional centers are usually field tested within the region prior to further dissemination throughout the country and eventual consideration for final development and release for marketing by the NCEMMH.

The second area includes the identification of existing non-print, media training packages for providing teachers of the handicapped with competencies in media, materials, and educational technology. Where such materials do not exist, and the need is realized, regional centers develop the materials through the prototype phase and again utilize the services of the NCEMMH for final testing and development. Within this area of work, the non-print media teacher training materials are disseminated to appropriate agencies, such as Associate SEIMCs, state departments of education, local educational agencies, and colleges and universities with special education preparation and inservice programs.

Third, the regional centers participate in media and materials information retrieval and dissemination activities. Included are identifying child-use material and their evaluation, entering information into a data base (soon to become a national data base), and responding to inquiries for information.

Fourth are the activities involved in the actual materials delivery system. These include acquisition, processing, collection maintenance, and loan procedures. Regional centers may maintain their own central collection for direct loan to users, or they may channel such services through Associate SEIMCs, or a combination of both, depending upon the extent of development of the delivery system within the region.

Finally, regional centers provide technical assistance to state departments of education and the states' designated agencies in order to foster the development of intra-state delivery of services. The centers provide training for Associate SEIMC staff and for practitioners in the field, plan and evaluate delivery services, and assist states in the dissemination of information about media and materials.

THE CEC Information Center

As the name implies, the Council for Exceptional Children Information Center is primarily concerned with the collection, retrieval, and dissemination of information about exceptional children -- the gifted as well as children with handicaps (Erickson, 1971). One service involves answering individual requests about programs, materials, and many other aspects of special education. Information may be retrieved by a computer search of the data bank of the Educational Resources Information Center (ERIC), or by the selection of an appropriate literature packet. Abstracts of all documents stored on the Center's computer file are printed in the quarterly Exceptional Child Education Abstracts. Documents abstracted for ECEA include research reports, journal articles, curriculum guides, teacher's activity manuals, professional texts, surveys and guidelines, and literature for parents and students.

Teaching Exceptional Children, a practical quarterly journal for practitioners in special education is a joint publication of the CEC Information Center and the SEIMC/RMC Network. The Center also contributes abstracts to ERIC's Research in Education and Current Index to Journals in Education.

Selective bibliographies, such as a recent one with annotated references on instructional materials for exceptional children (CEC Information Center, 1972a), are published periodically. An Instructional Materials Thesaurus for Special Education (CEC Information Center, 1973) now is available in its first edition and is a most useful tool for indexing and retrieving information on instructional materials for exceptional children.

One product of the Center is commentaries obtained via telephone interviews with selected leaders on current issues of interest to special educators. Reports emanating from special

conferences are available both in printed form and on cassette tapes.

Instructional Materials Reference Center for the Visually Handicapped

The IMRC is located within the American Printing House for the Blind, Lexington, Kentucky, and serves as a national reference source for instructional materials for the visually handicapped (Lappin, 1972a, 1972b, 1973). The Center maintains a catalog of information about materials and supplies descriptions of materials upon request. It also develops, adapts, and evaluates materials such as instruments for science measurement, simple machines, various mathematics materials and social studies materials. A number of materials for early childhood and multi-handicapped programs have been developed and tested. Training and demonstrations in the utilization of materials are also part of the Center's activities.

NCEMMH

The newest addition to the array of resources designed to deliver services to handicapped children, their parents and teachers is the National Center for Educational Media and Materials for the Handicapped (Ofiesh, 1969; Lavor, 1969; Bureau of Education for the Handicapped, 1970; Delgado and Withrow, 1970; Belland, 1973; Martin, 1973). The NCEMMH was established by an act of Congress in 1969, and like other units of the SEIMC/RMC Network, it is funded through the Bureau of Education for the Handicapped. The Center is located on the campus of The Ohio State University in Columbus. The major work elements assigned to the Center are the same as included in the activities of the regional SEIMCs and RMCs, except that the area of intra-state program delivery is not included among the national Center's responsibilities. However, as Belland (1973) indicates, the NCEMMH has special responsibilities in the remaining four work areas which are unique to that Center.

A national materials needs assessment is underway which will provide information about what materials should be developed to individuals, other projects and centers, and commercial producers. The Center will revise, recycle, field test, and polish prototype child-use and teacher training materials developed at other places. Of equal importance, strategies will be developed to insure that thin-market materials proven effective are channeled into the commercial market or in some way made available where needed. An archive of materials generated by federal funds also will be established and maintained by the Center.

Information and delivery systems development will be coordinated or expanded, or if necessary, completely redesigned to assure that the highest possible criteria of performance is achieved.

The NCEMMH also will provide direct service to the Model Secondary School for the Deaf and the Kendall Deomonstration Elementary School in Washington, D. C. as well as to the various elements of the SEIMC/RMC Network.

EMDC

The Educational Media Distribution Center (Gough, 1966; Delgado, 1969; Kunder, 1970; Hairston, 1972), mentioned in an earlier section of this paper, has the responsibility for selecting and captioning films for the deaf and for distributing them on a nationwide basis to deaf students and adults. This is among the older and well-established programs of the U. S. Office of Education and has proven itself as an invaluable resource to deaf individuals and their teachers.

ASEIMCs and Other Local Delivery Vehicles

No matter how extensive and sophisticated the national and regional delivery elements of a network, the success of the venture can only be measured at the classroom level where the media, materials, training, and information are actually utilized. Thus, it is not surprising to note the rapid increase in the number of Associate Special Education Instructional Materials Centers (ASEIMCs), which now number somewhere over 300. These centers are established at the local level to provide direct service to teachers and to serve as the delivery arm of the other elements of the network. An audio-filmstrip Total Information Package titled The Development and Maintenance of ASEIMCs* (Northwest SEIMC, 1972) presents a rationale for these centers, details the activities of an ASEIMC, examines costs and sources of funds in establishing a center, suggests personnel and material needs, and in other ways assists the administrator or coordinator in determining the need for a local ASEIMC, and if desirable, in proceeding with the establishment of a center.

Definite trends have developed in recent years to merge the services of school libraries and media centers (Wheelbarger, 1972; Pearson and Butler, 1969) and to develop cooperative programs among school districts in geographically contiguous areas (Liberman, 1972). These trends are evident in the organizational patterns showing up in ASEIMCs throughout the country. Special purpose centers for a particular group of

*Available for loan through regional SEIMCs.

handicapped individuals also are merging into the Network, as for example the development of ASEIMCs at schools for the deaf (McCarr, 1971). Innovative delivery services out of local centers include the "Suitcase Classroom" at a media center for special education in Indiana (Balthaser and Burns, 1972), a child-centered multi-media center in Nebraska (Mahaffy, 1969), and a book-mobile resource room for the handicapped in Kentucky (Morsink, 1972).

If the key to the success of national and regional delivery services is the local ASEIMC, the key to the success of the ASEIMC is its personnel. Lilly (1971) presents a convincing case for support personnel performing as instructional specialists, and his concepts have been seconded by others (Cartwright and Cartwright, 1972). The "Instructional Specialist," or "Methods and Materials Specialist," or "Consulting Teacher," or "Stratitition" performs as the human interface between the classroom teacher and the myriad of material resources and methods. (Northwest SEIMC, 1973b).* This concept has been tested at the Educational Modulation Center in Kansas (Welch, 1970) as well as in many other settings. While the titles and job descriptions may vary, the main objective is to provide the classroom teacher with assistance ranging from educational diagnosis to prescription, to materials selection, to intervention. Undoubtedly, regional SEIMCs, RRCs, and RMCs will continue to be called upon to train these instructional specialists and to provide them with support services (Burke, 1969).

Information Retrieval

SEIMCs, RMCs, and ASEIMCs all have a common need to retrieve information about materials and to find satisfactory means for making this information readily available to teachers. Several systems exist and/or are in the process of development. These range from computerized information systems (Cottrell, 1971) to less sophisticated, but still useful manual systems. The Los Angeles Unified School District (1972) has developed "System FORE" which enables teachers to readily retrieve materials matched to specific learning objectives in the areas of language, reading, and arithmetic. Several variables in the learning environment and in the characteristics of the learner are included in System FORE. The "Prescriptive Materials Retrieval System (PMRS), another manual system, is described in a Total Information Package (Northwest SEIM, 1973a),**

*A Total Information Package titled "The Instructional Specialist for Teachers of Exceptional Learners" is available through regional SEIMCs.

**TIP #3 titled "Selected Retrieval and Information Systems" available on loan from regional SEIMCs.

as is the "Educational Information Service for the Visually Handicapped and Deaf/Blind," the "Therapeutic Recreation Information Center" and "Computer-Based Resource Units." Melichar (no date) has developed a rather comprehensive system to retrieve information on adaptive and assistive equipment used in schools for the physically handicapped.

It is anticipated that a national computerized system for collecting, storing, and retrieving information on materials for the handicapped will be developed and implemented through the national Network within the next several years. Until that time, and perhaps even subsequent to that occurrence, the manual systems will continue to serve most teachers who require access to the pool of materials in the local ASEIMC.

CONCLUSIONS

This paper began with a discussion of the need for personalization in the instruction of handicapped children and the need to look at children on the basis of their own particular learning requirements rather than focusing on their handicaps per se. It was suggested that instructional technology has much to contribute toward achieving personalization. Examples of numerous adaptations and curricular applications for handicapped learners were presented and further examples of media innovations were discussed. It is apparent that while needs for new and better materials and techniques are still evident, considerable progress has been made in the development, evaluation, and utilization of media and materials. Finally, it is seen that a developing delivery system contains within its present elements the seeds of an actual viable network for eventually providing each handicapped learner the resources necessary to insure him/her a successful educational experience.

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