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STRATEGIES FOR OPTIMIZING THE APPLICATION OF MEDIA TO
VOCATIONAL AND TECHNICAL EDUCATION CURRICULA.

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THE ASSUMPTION IS MADE THAT VOCATIONAL AND TECHNICAL
EDUCATION IS "UNDEVELOPED" IN TERMS OF ADEQUATELY EXPLOITING
THE FULL RANGE OF POSSIBILITIES INHERENT IN MODERN
EDUCATIONAL MEDIA AND TECHNOLOGY. THIS PAPER PRESENTS AN
OVERVIEW OF THE BROAD SETTING IN WHICH VOCATIONAL AND
TECHNICAL EDUCATION FUNCTIONS, THE GENERAL BENEFITS OF
APPLICATIONS OF MEDIA TO DIVERSE AND VARIED INSTRUCTIONAL
SITUATIONS, AND STRATEGIES FOR OPTIMIZING APPLICATIONS TO THE
VOCATIONAL AND TECHNICAL EDUCATION CURRICULA. SELECTED
EXAMPLES WHERE MEDIA HAVE SPECIFIC IMPLICATIONS FOR
VOCATIONAL AND TECHNICAL EDUCATION ARE DISCUSSED. EXAMPLES
INCLUDE PROGRAMED MATERIALS, SINGLE CONCEPT FILM LOOPS,
AUTO-TUTORIAL MATERIALS, TELEVISION MONITORS, MEDIA MATERIALS
FOR SIMULATED EXPERIENCES, COMPUTER ASSISTED INSTRUCTION,
COMPUTER GAMING TECHNIQUES, CLOSED CIRCUIT TELEVISION,
AIRBORNE TELEVISION, COMPUTER ASSISTED COUNSELING, AND
MICRO-TEACHING. SUGGESTIONS AND RECOMMENDATIONS ARE MADE TO
HELP ASSURE THAT FUTURE DEVELOPMENTS OF MEDIA ARE POSITIVE
AND EFFICIENT. (PS)

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STRATEGIES FOR OPTIMIZING THE APPLICATION OF MEDIA
TO
VOCATIONAL AND TECHNICAL EDUCATION CURRICULA

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Introduction

This paper is primarily concerned with optimizing the application of educational media to Vocational and Technical Education curricula. It includes examples for utilizing media in these instructional areas and addresses itself to alternative strategies for implementation. The assumption was made that Vocational and Technical Education is "underdeveloped" in terms of adequately exploiting the full range of possibilities inherent in modern educational media and technology. It is recognized that the general setting of Vocational and Technical Education today provides a favorable climate for further developments in these curricular areas.

This paper is not a research review or an evaluation of past media efforts. Neither is it an exhaustive treatment of all media. Rather, it is an overview designed to provide examples, stimulate thinking, identify priorities and alternatives, and perhaps provide an intuitive leap forward in the applications of media to Vocational and Technical Education curricula.

It should be mentioned that the writers are not media specialists but, rather, are instructionally oriented and primarily concerned with the applications of media to the Vocational and Technical Education area.

The sections which follow are concerned with the broad setting in which Vocational and Technical Education functions, the general benefits of applications of media to diverse and varied instructional situations, and strategies for optimizing applications to the Vocational and Technical Education curricula.

The Climate for
Vocational and Technical Education

In properly considering the many factors and forces impinging on the optimal application of media to Vocational and Technical Education programs, attention needs to be given to the milieu in which these programs are operating and conceivably will be operating in the future.

It is evident that the nation is literally rediscovering education. Education is being viewed as an instrument of national policy, as a vehicle for achieving broad social goals. We are living in an age of conscious social change, with schools assigned a central role in effecting this change. Further, the full range of resources of the federal government are being amassed in a multifaceted attack on a broad range of social problems. This increased interest and investment by the many departments of government is reflected in terms of new organizational structures, new relationships, increased funding and resources, and improved communication and interaction among relevant agencies. Obvious indications of this increased activity are evident in the regional educational laboratories, research and development centers, state research coordination units in Vocational and Technical Education, Educational Research Information Center (ERIC) clearinghouses, supplementary service centers, and improved library facilities. The impact of these efforts has caused a ripple throughout the educational community, resulting in increased emphasis on effective leadership from state departments of education, the development of educational research structures within states, and the formation of educational compacts between states.

In essence, these emerging forces and factors mean increased interest and attention, improved funding, and the capacity to focus a wider range of resources

and talents on critical problems in education, of which Vocational and Technical Education is an essential part.

The increased investment by government at all levels is a recognition of the impact of accelerated social change, the imbalances it creates, and the implications it has for the entire educational community. The changing nature of society and of science and technology require an increased responsiveness, adaptiveness, and flexibility on the part of the entire school community. Society increasingly looks to the schools as a means of implementing national goals and solving or ameliorating problems growing out of the following socio-economic trends.

- **The pace of technological change is accelerating through more pervasive utilization of computers and other processes of automation.
- **Technological changes are creating a number of imbalances in employment which ultimately find their way to the doorsteps of schools.
- **The advance of automation and technology places additional urgency upon upgrading and retraining significant portions of the nation's labor force.
- **The increased productivity per worker is based in large measure on the rising educational level of workers.
- **Increasing numbers of women are entering and reentering the work force.
- **There is a shift from blue collar to white collar workers and from production and manufacturing positions to increased numbers of service workers.
- **Mobility among workers is increasing.
- **Use of systems in government and industry is increasing. The full impact of the "systems" approach has not yet been realized in the educational community.

- **The benefits of technology resulting in increased leisure time continue to spawn additional problems for education.
- **There are significant changes in the age distribution of population, with a greater proportion of people under 25 and over 65.
- **It is recognized that education is a continuous process and that individuals need to be made effective, self-directing learners to perform effectively as citizens and economic contributors. Schools face the responsibility of preparing individuals to become "lifelong students" and to learn more about learning as it applies to them individually. They also face the responsibility of developing the capacity of individuals to take advantage of the self-study opportunities that will become increasingly available.
- **The diffusion of educational facilities throughout society, with schools likely to become 24-hours-a-day and 12-months-a-year institutions, will provide opportunities for an individual to maximize use of time for self-improvement and improved vocational efficiency. Learning cubicles where individuals can effectively use auto-instructional materials may be situated at factories or other places of employment, airports, apartment buildings, public transportation, and other facilities frequented by large numbers of people.
- **There are indications that the trend toward decentralized neighborhood schools is shifting toward community educational centers and/or educational parks where the "critical mass" of essential resources, human and physical, can be assembled to maximize the learning process in a given community or attendance area.
- **There is a strong likelihood that training will become one of our largest employment areas. Recognizing the economic returns on investments in human resources, employers will assign increasing numbers of employees to training situations.

- **Recent studies and advances in school organization and operation, such as flexible scheduling, are contributing to a climate that will facilitate the increased use of media in education.
- **Media is becoming recognized as an educational essential, not a luxury or frill. Hardware and software are becoming increasingly accepted in the classroom and the professional educator is viewing them less as a threat and more as a means of assisting him in improving the educational and economic efficiency of his teaching and in introducing more individualization in the teaching-learning process.
- **Attention is shifting from teaching to learning. This seems to place additional emphasis on accommodating, within the educational structure, the needed flexibility and adaptability to individualize instruction, to help students become self-actuated, learning at their own speed, making proficient self-diagnoses, and taking corrective measures.
- **The potential inherent in state, regional, and national communication and library networks provide a viable means of enriching instruction in the isolated school district and assisting the specialized individual teacher in the school system by bringing to bear a wider range of resources for learning.
- **Recognizing the increased use of media in education and other segments of life, students, beginning with pre-schoolers, will have increased exposure to and will develop sophistication in the use of many types of media as a means of learning. Hence, students entering Vocational and Technical Education programs of the future will presumably have acquired measures of competence in the use of media as a part of the learning process.

It is impossible, in a paper of this length, to adequately or completely treat the implications of these trends for education, Vocational and Technical Education, and media. They are included as a backdrop for the sections which follow and to sensitize the reader to draw other implications and options from his experiences and insights.

Further, in assessing the climate for media, recognition also should be given to the "new partner in education"--private industry. Recent developments have resulted in the merger of a number of electronic firms and publishers which has brought into being an increased capacity for developing "learning systems". Recent successes in national curriculum efforts point to the opportunities and possibilities inherent in broad-based educational development efforts as a means of further facilitating the utilization of media in improving the school curriculum.

The unescapable conclusion drawn from the developments in society, the world of work, and education is that a favorable climate exists for the rapid and effective application of media to education in general and to Vocational and Technical Education specifically.

Applications of Media to Vocational and Technical Education

The general values and benefits of increased use of instructional media in education have been well demonstrated and documented. It would seem that these same benefits might also be applicable to Vocational and Technical Education; however, it may be that because of the emphasis on the psycho-motor domain in certain aspects of Vocational and Technical Education, media may have even more intensive and extensive use. This is not to say, however, that applications of media are not as desirable in the cognitive and affective domains of Vocational and Technical Education, but recognizes the relative emphasis of Vocational and Technical Education on "learning by doing".

It is recognized that increased efforts in basic research and field testing of both the hardware and software of media on Vocational and Technical Education student populations and teaching settings need to be effected to assure their optimal contribution to these curricula areas. It is believed, however, that there is presently sufficient knowledge to make positive and effective applications of selected media to the Vocational and Technical Education field.

It is not the intent of this paper to be exhaustive but to bring to the attention of the profession some of the benefits which might accrue to Vocational and Technical Education programs from increased applications of media. A variety of ways in which media could be beneficial to the Vocational and Technical Education curricula follow.

****Present instructional programs can be supplemented by using media to bring increased realism to the classroom, shop, or laboratory, thereby providing experiences that are not available locally or are beyond the resources of the local community.**

****Appropriate media could make available to small and/or isolated communities a wider range of instructional alternatives in Vocational and Technical Education.**

****Media could contribute effectively as a component of total learning systems for Vocational and Technical Education, spanning the range of activities from student selection to job placement. Media can be another component which vocational educators can use, along with modular scheduling and simulated laboratory experiences, in achieving greater flexibility and adaptability in their offerings.**

****Media could contribute specifically to the training programs of different groups of learners (e.g., high school students, out-of-school youth, and adults), as well as provide a means of meeting diverse**

needs within a given vocational class, both in terms of occupational goals and student learning rates.

****Vocational offerings for the disadvantaged, particularly with reference to remedial and compensatory type classes, could be improved with the use of media. Further, increased applications of media in working with the disadvantaged would provide a means of achieving more immediate and positive reinforcement of student responses, a critical factor in working with students who have not enjoyed academic success. Since media are "impersonal" and display "infinite patience" in their relationship to the learner, they are a prime requisite in classes for students with special needs.**

****Media could contribute to more effective utilization of personnel by increasing the number of students with which individual teachers can work or reducing teacher responsibility for conducting repetitive drill and routine information-giving aspects of instruction, thereby providing them with increased time to work with individual students on more advanced or individual problems.**

****Simulation and other media approaches should be useful in substituting for or reducing practice time on expensive equipment or in serving more students with limited equipment.**

****Accelerated development and utilization of media can provide a means of assisting Vocational and Technical Education offerings in keeping abreast of changing occupational requirements.**

****Media could be used in introducing new vocational training programs (e.g., gainful employment programs in home economics education and off-farm agricultural occupations programs) and in keeping up with changing emphasis in vocational programs.**

****Media could contribute to students becoming increasingly responsible for**

their own learning, with attendant carry-over to continuing adult education and retraining programs of formal and informal nature.

****Media may be used to improve the identification and recruitment of vocational instructors. Varied approaches could enable prospective teachers to gain a better insight into the responsibilities of the vocational teacher and assist them in making a more valid and lasting occupational choice.**

****Media may provide a means of accelerating the preparation of vocational teachers and reducing the amount of time required to secure essential professional and technical skills.**

****Media, extensively applied to in-service education programs for Vocational and Technical Education instructors, should contribute to improving their effectiveness in directing the teaching-learning process.**

****More extensive use of media could contribute effectively to vocational choice among present and prospective Vocational and Technical Education students.**

****Multistimuli media, utilizing sight, sound, color, and motion, could be used to improve and accelerate learning of key concepts and procedures in Vocational and Technical Education.**

****The current "explosion" in the research effort of Vocational and Technical Education will undoubtedly result in a greatly increased need for development as it relates to the implications and applications of research findings. Extensive use of media will be required to adequately implement these findings.**

****Media provide a potential means of contributing informally to the continued vocational preparation of individuals who cannot or will not avail themselves of formal classroom situations.**

****New dimensions of thought in the educational community, recognizing the need for specialized assistance for teachers in the form of technical aides and teaching assistants, coupled with the effective use of media, would provide means of extending the sphere of influence of "master teachers" to more students.**

****Media can contribute to increased educational and economic efficiency in Vocational and Technical Education curricula.**

****To achieve the potential inherent in media, vocational and technical educators will need to further clarify their teaching objectives. Therefore, a potential side benefit from increased use of media should be a sharpening of vocational teaching objectives.**

These potential benefits to Vocational Education from more extensive applications of media are not without their problems. The difficulties in moving toward their achievement are recognized but, intelligently approached, their potential can far outweigh their limitations--thoughtfully proceed with caution but proceed, we must.

The foregoing discussion of the general advantages of increased utilization of media in Vocational and Technical Education could potentially "trigger" numerous specific applications. There follow some selected examples where media have specific implications for Vocational and Technical Education. These are not intended to be an exhaustive treatment of applications of media to Vocational and Technical Education curricula, but, rather, are designed to generate thinking concerning additional applications.

****Certain aspects of Vocational Education are highly oriented toward skill development. Programmed materials could be used to assist vocational instructors in securing adequate drill and practice in these fundamental skill areas. Machine set-up procedures and operation, adjustment,**

and maintenance of tools and equipment are examples. Electronic circuit boards and panels are applications in this area.

****Vocational skills, such as machine set-ups and materials handling systems where ordering or sequencing of materials or sequential steps in an operation are critical, also lend themselves to a media approach.**

****Identification of tools, equipment parts, organisms, or materials is fundamental to many Vocational Education programs. In these instances, programmed learning materials could be used to assist students in proceeding at their own pace in learning the names of tools or of symbols used in drawings and blueprints, or in identifying weeds and insects, material samples, or parts of the anatomy as in the health occupations. Multiscreen and random-access equipment might be effectively used as one type of media although less expensive media could be used.**

****Single concept film loops need to be explored in greater depth. Uses might include such simple skills as resoling a shoe, operating a key punch in data processing, or adjusting an oxyacetylene cutting torch.**

****Auto-tutorial materials provide a means of more effectively meeting individual needs and interests in Vocational Education classes. In cooperative education programs students are placed in common yet diverse employment situations (e.g., drug stores, supermarkets, children's specialty shops, and clothing stores) and it is not always possible for the coordinator to provide the amount of individualized instruction desirable. Programmed materials in stock and inventory control could be used to assist students in independent study on unique problems relating to this occupational skill in their own employment situation and in securing more extensive instruction**

(drill and practice) on the common elements of merchandising. Other media might be used to enrich the general experiences of accelerated students by going beyond the normal class instruction.

****Television monitors could be used in industrial plants and other employment locations to provide vocational instructors with a means of monitoring a complex machine operation that is not available at the school shop or laboratory, thereby introducing the world of work to the classroom, shop, or laboratory. Such a procedure would minimize the amount of time required for field classes, reduce interruptions at the place of employment, provide for needed repetition and continued observation, and would be less disruptive of both school and business schedules. Further, such operations could be recorded on video tape and made available as part of a local, state, or national media library. Cameras also provide a means of securing a view of a procedural operation or technique where it is physically impossible or difficult to have large class observation; for example, in the health occupations area. A variety of tapes or film might be used in teaching safety where it may not be desirable or possible to have class participation, such as police and fire training programs and shop safety training programs.**

****Experiences in the space program and other areas of endeavor provide convincing evidence of the values of simulation as a means of securing "pre-employment experience" through procedures less expensive and/or hazardous than the actual operation. Media materials could be used to secure simulated experiences on highly expensive machines or machines that are currently used in industries but are not available to the schools because of cost, space, or other reasons. Further, such an approach would presumably reduce the amount of time that individual**

students would need to spend on "drill and practice" on the actual machine. In more complex operations it will be necessary to use a multimedia approach in developing critical understandings and abilities.

****Computer assisted instruction could be adapted to a wide range of uses in Vocational and Technical Education. It would be applicable to drill and practice, tutorial, and dialogue systems. A computer assisted program could be developed wherein individual classrooms within a district or schools within a state or region could draw on a "bank" of programs to secure specialized help and assistance in a wide range of specific areas of Vocational and Technical Education. For example, programs could be developed on shop mathematics, business letters and forms, and preparing supervisory and management personnel, to name but a few.**

****Computer gaming techniques also seem to hold promise for certain Vocational Education areas relating to management instruction, such as farm, home, and small business management.**

****Statewide networks of closed circuit television can be developed to further contribute to providing a broader range of instructional opportunities to individual classrooms and districts. A series of programmed demonstrations, supplemented with auto-tutorial materials and teaching discussion guides and similar materials, could be used in a wide range of situations, such as demonstrating decorating a room, closing a sale, preparing floral arrangements, or conducting employee training and supervisory conferences.**

****Airborne television, such as the Midwest Program on Airborne Television Instruction, should be utilized as a means of providing more programmed materials oriented toward Vocational and Technical Education. Such**

materials should not be limited to students but should also be used as a means of in-service education for vocational teachers.

****Various media techniques should be used to assist vocational teachers and students with evaluation of student knowledge and performance.** Such applications would permit both groups to be self-evaluative; the student in terms of specific strengths and weaknesses about a given concept or skill, and the teacher through the use of the individual and summation reports of students performances in diagnosing deficiencies and limitations in his instruction and in planning needed remedial or corrective instruction. For example, in developing needed skill and understanding in closing an accounting year, where a number of learning stations are linked to a single computer with such a program, the vocational instructor could utilize the print-out during and at the end of the class to assess past instructional efforts and to plan future instruction.

****Instructional packages drawing heavily on multimedia devices, if carefully developed, could be used by a variety of vocational curricular areas to achieve vocational teaching objectives common to several occupations.** A number of vocational areas have the similar need to develop student skills in the use of measuring devices. Other examples are design, layout, and planning, as in sheetmetal, woodworking, or drapery shops, and in the organization and placement of tools and equipment to expedite work flow.

****The area of vocational guidance provides a fertile setting for more extensive applications of media.** In addition to some of the traditional career film strips, booklets, and films, more sophisticated approaches of computer assisted counseling and career gaming techniques should be

explored. Current studies underway in this area should yield new insights into these alternatives and opportunities. Experiences to date would seem to indicate that multimedia approaches to vocational counseling should be developed and beamed at audiences other than the student. For example, mass media should be utilized to acquaint parents and other groups who influence vocational choice with the wide range of employment opportunities, training requirements, and working conditions of various occupations.

****The obvious applications of more extensive utilization of media in updating and acquainting counselors with the world of work and their responsibilities and opportunities in working with non-college-bound students should not be overlooked.**

****The application of micro-teaching to vocational and technical teacher education preparation promises to increase efficiency and effectiveness. It provides a means for the student teacher and the supervising teacher to review the "capsuled" teaching experience by evaluating and discussing in detail the several dimensions of the teaching-learning process, such as planning and organization, student participation and thinking, classroom management, and techniques and procedures in use of media, models, and materials. Alternative adaptations of micro-teaching should be considered in Vocational Education. For example, in certain vocational fields where primary emphasis is placed on apprenticeship teaching, a technician could capture the micro-teaching experience of the apprentice on video tape and transmit it to the supervising teacher who might then utilize the tape for a depth discussion and in-service session at a more convenient time and place. Consideration might be given to using communication media to explore the implications**

of the tape's contents through a simultaneous review by the apprentice teacher and the supervising teacher in their respective locations, without an actual face to face confrontation. This procedure should enable the supervising teacher to react to more and varied teaching situations during the apprenticeship period. District meetings and/or discussion among teachers, utilizing video tapes, in pre-service and in-service training sessions, should be utilized.

****A wide range of possibilities for increasing the use of educational media in in-service teacher education are possible. One of the continuing problems in vocational teacher education is the matter of maintaining vocational competence, of continually updating vocational skills in light of changing occupational requirements and new technological advancements. In this connection, electronic devices, such as the electrowriter and accompanying audio-linkage mechanisms, would provide a means of keeping vocational instructors throughout the state in closer contact with technical specialists in the universities and/or industries. Subject-matter specialists could provide quick responses to technical problems confronting vocational instructors. This technique also could provide a linkage for systematic in-service classes. This equipment installed in the vocational school could be utilized by all areas of education and for adult education classes. This same technique could be used in working with former vocational students in more technical occupations. For example, a technician might utilize this device to secure follow-up instruction and clarify specific problems unique to a given employment situation. The electrowriter or comparable equipment would offer a particular advantage to those vocational students who do not have the requisite typing skills for utilizing some computer-based instructional programs.**

While not restricted to a specific media, a general point should be made concerning the use of color in applications of media to Vocational and Technical Education. Color is a critical factor in certain diagnostic techniques involved in vocational instruction, such as identifying nutritional deficiencies in plants, tempering metals, tracing electronic circuits, preparing advertising layouts, or tinting hair in cosmetology.

The optimal applications of media to this Vocational and Technical Education curriculum are practically infinite. Large-scale research and development activities are needed. Aggressive, creative leadership and financial support at state and national levels must be provided. Specific attention needs to be given to both the identification of media requirements in Vocational and Technical Education and the development of new media that can contribute to improved effectiveness in this instructional area.

Strategies for Securing Increased Application of Media to Vocational and Technical Education Curricula

Upon the supposition that further development and use of media in Vocational and Technical Education are essential, this section addresses itself to broad strategies which might be employed to achieve more optimal utilization. It also takes cognizance of some of the potential problems and limitations in this development. The authors take the fundamental position that educational media should augment the educational process, not structure it.

Following are a number of tactical approaches that might be employed to achieve the broader strategic goals. These interrelated items are in no inherent order.

****The Vocational and Technical Education community should address itself**

to the fundamental problem of identifying objectives stated in behavioral terms to give added direction to the development of needed media.

****The Vocational and Technical Education profession should work toward the identification of priority problems in attaining program objectives that provide appropriate opportunities for assistance from media. These problems should relate to such factors as meeting the vocational training needs of all age groups, future employment opportunities, projected student numbers, and the potential contributions of media to a given occupational area.**

****Extensive research efforts should be undertaken to identify the common and unique behaviors of major and emerging occupations in Vocational and Technical Education. To the degree possible, these behaviors should be "clustered" as a means of justifying more extensive investments in media. Media might be developed for competency clusters that would be applicable to a wide range of vocational objectives.**

****Considerable emphasis should be placed upon developing increased "consumer sophistication" in the Vocational and Technical Education profession. Inherent in this need is the desirability of working toward a "labeling" procedure for media that might correspond to the type of descriptive materials now available on standardized tests. Such labels should include information as to specific behavioral objectives sought, student group or learner population for which the materials were developed and upon whom they were tested (replications and geographical location), and other research findings on the relative success of the media under field tests. Other information which should be provided the media consumer includes age group of learners for which the media were designed, desired prerequisites for the learner**

in terms of concepts and experiences, and the occupational area to which the behavioral goals relate. Suggestions to the teacher should include methods of reinforcement, supplementary materials, and follow-up activities.

****It would seem desirable to develop an educational consumer guide that would assist local vocational teachers and administrators in obtaining critical information about their future investments in media. Ultimately it would be desirable to have a publication for the users of educational media materials that would provide them with valid information on media, just as the Mental Measurements Yearbook provides on tests and measurements.**

****Conferences should be called to provide researchers with opportunities to communicate their latest findings to media producers and vice versa, giving special attention to message design and media development. Continuing dialogues need to be established and maintained. Educators need a communication whereby they can transmit their findings and requirements to the commercial producers of media. Further, deliberate mechanisms should be established for the invention and development of hardware, teaming the most appropriate talents from the educational and technological communities.**

****There is need for more extensive development and testing of new formats and designs in educational media. For example, we have been locked into the pattern of 16 mm. films whose length too often has been determined by reel size and other non-educational considerations. It would be particularly helpful to vocational teachers to have a number of "trailer clips" on films that would convey a single concept or specific sequence of activities identified in the context of the main**

film. The attached trailer clips could then be shown several times for needed repetition.

****One of the critical problems in the commercial development of needed media is the decentralized market which exists in Vocational and Technical Education as well as in the general education field. There also exist decentralized decision-making and decentralized purchasing, which pose real problems for commercial producers of educational media. As an approach, it may be desirable to give attention to the possibilities of developing state specifications for media or placing developed media materials on a state-approved or adopted list. This might provide commercial companies with additional incentives to make the investments needed to carefully develop and test materials for specific Vocational Education purposes. An alternative to the approach of developing state specifications and then placing those media which meet the requisite quality requirements on the adopted list would be to develop educational specifications and contract for their development through competitive bidding. While the state is the most logical organizational unit to achieve this, consideration also should be given to the alternative of multistate or a regional approach.**

****Progress should be made in the Vocational Education profession in developing "educational specifications" for media that would sharpen message design and identify the target learner group. These specifications also should include such factors as behavioral changes to be achieved; characteristics of the learner group, including age and educational level; the operational setting in which it is designed to be used; the hardware available; and other media available to supplement it.**

****Educational leaders should be aware of the potential danger of media acting as an inhibitor of needed curricular changes. Commercial producers may be loath to change or update media, consonant with the changing requirements of the world of work, if they have not yet achieved a satisfactory sales volume. Further, the temptation is always there to continue to market last year's model to avoid additional costs of development, testing, and refinement.**

****Recognizing the expense involved in developing desirable educational media designed for specific educational purposes, objectives, and audiences, consideration should be given to seeking governmental subsidies for the development of needed media materials. Such materials should be exemplary in terms of the requirements set forth earlier in the paper.**

****The structures of the regional laboratories and the research and development centers should be utilized in clarifying objectives, identifying priorities, surveying "market" needs for media within Vocational and Technical Education, and communicating these needs and specifications to appropriate agencies.**

****Consideration should be given to the feasibility of establishing an ERIC clearinghouse dealing primarily with research and development in educational media. The present Vocational and Technical Education ERIC clearinghouse should acquire, index, abstract, and disseminate information on research and media materials related specifically to Vocational and Technical Education.**

****Procedures for the dissemination of research information to consumers of educational media should be initiated and structured so as to increase the teacher's sophistication in the most effective selection and use of media.**

****Evaluation of media should take into account their educational and economic efficiency, raising such questions as the comparative advantage of Media A versus Media B in terms of amount of learning, the time required to achieve this level of learning, and the economic costs of producing and utilizing the media. In this connection, it should be noted that much of the hardware and software currently being marketed was designed for neither education in general nor Vocational and Technical Education specifically, but has been adapted to their use. Further, work in this area requires sharpening of education's needs and the testing of these materials with appropriate groups in normal settings.**

****There should be developed a profession-wide research program designed to assess the optimal application of media to Vocational and Technical Education, to conduct field testing of specific programs including both hardware and software in normal classrooms, shops, and laboratory conditions. Such assessments should include provisions for testing equipment of all kinds, considering such factors as simplicity of operation, efficiency, and appropriateness for the Vocational Education classroom. Demonstration centers should be established to facilitate the rapid dissemination and adoption of tested media innovations applicable to Vocational and Technical Education curricula.**

****State vocational administrators should consider increasing investments in certain areas of media as a means of advancing programs in desired directions.**

****Vocational and technical teacher education programs should be examined with a view to improving their contribution to more extensive and**

effective utilization of educational media. The training experiences of prospective vocational teachers should not be limited to the mere manipulations and operation of audio-visual equipment but also should develop an understanding of the implications of the findings on educational media research for the Vocational Education classroom. Preparation should be designed to help them become more sophisticated and discriminating consumers of educational media. Further, teacher education programs themselves should consider increased use of media in the professional sequence. The use of micro-teaching has been identified earlier as a promising example.

****Instructional programs in Vocational and Technical Education should give consideration to making their present students self-actuating learners by training them in the proper utilization of auto-tutorial instructional materials and other media approaches as a means of enhancing their abilities to continue to learn. This should enable former vocational students to keep abreast of technological change by helping them to further develop their learning skills through self-directed study and diagnosis.**

Summary

This paper has been based on the premise that increased use of media would add to the effectiveness and efficiency of Vocational and Technical Education. Suggestions and recommendations were made to help assure that future developments of media are positive and efficient. Needed relationships were identified.

This paper was intended to stimulate ideas, initiate dialogue, and contribute to future development and applications of media to Vocational and Technical Education curricula.

It is recognized that a great deal more research, development, and testing need to be done in terms of specific media applications; however, limited insights into the learning process restrict optimal development. Further, current knowledge of hardware and software and their most effective combinations pose limitations. There are many unanswered questions but enough is known to merit aggressive development in this area.

This paper is not an end, but, hopefully, the beginning of what should become profession-wide concern and involvement.