

The Status and Future of Research in Instructional Design and Technology

Michael J. Hannafin
Instructional Systems Program
The Pennsylvania State University
176 Chambers
University Park, PA 16802

Abstract. The process of defining a research agenda appropriate for the varied interests of the instructional design and technology profession is difficult. Though unified by a mutual interest in the role of technology in instruction, the backgrounds, orientations, and priorities among members are vastly different. As a consequence, research is often too sporadic and diffuse to impact the field in a systematic manner. In many cases, interest in research seems to have declined. In this paper, many of the problems and issues in developing a meaningful research agenda will be presented. In addition, an attempt is made to set the stage for future research, where the varied interests and expertise in the instructional design and technology profession are supported.

Writing a paper of this type is no small chore. On one hand, representing fairly the valued input of the different schools of thought in research seems essential. However, in many cases simply describing ideas has seldom proven a satisfactory vehicle for encouraging research. Instead, analyzing the various ideas and opinions of colleagues, as well as the instructional design and technology field, requires more than simple reporting. In this paper, a combination of reportorial and analytical styles has been adopted. The paper is intended to stimulate the kinds of thought, evaluation, and action required to generate greater interest in research.

Planning and conducting educational research appears relatively straightforward. The process is simply an extension of the scientific method taught widely

across various scientific disciplines (Bachrach, 1965; Kerlinger, 1973). In general, research in education involves the definition of a problem, the development of hypotheses, the creation of materials and methods designed to test the hypotheses, the implementation of the research study, the analysis of the outcomes of the research relative to the hypotheses developed for the defined problem, and the conclusion of confirmation or disconfirmation or hypotheses (Gay, 1976; Tuckman, 1978).

One might conclude, therefore, that the principle difference in educational research would be related to subject matter or academic discipline differences. The research priorities of educational administrators, for example, are often fundamentally different from science educators. The issues relevant for one group may overlap with the other but are primarily unique within each discipline. In effect, the unique nature of each discipline plays a dominant role in shaping and unifying research priorities within various disciplines.

What, then, are the research priorities of the instructional design and technology field? On the surface, we appear to have a fairly well-prescribed commonality. We are concerned with the systematic application of instructional systems and technologies. We may have particular interest in specific technologies or delivery systems, but we share common interests in the issues and problems confronting the profession. We are, arguably, a collection of individuals having what should be relatively homogeneous interests in instructional research and development issues.

However, this perception may be more illusion than reality. The academic training of professionals in the instructional development field is not homogeneous but diverse. The context for application of instructional systems and technology is also very broad. While interest in the processes of research may be

shared, the nature of the interest is often quite varied. Some individuals focus on immediate learning outcomes, others on social and ethical issues; others focus on longitudinal effects, and still others on the recycling of information obtained during the design and development process. As a discipline, greater latitude is required in the pursuit of research interests than a single research agenda or paradigm permits. The instructional development field is one of diverging research issues and interests but is seeking a converging, unified research agenda.

Given this diversity, is a unified research agenda necessary? Is such an agenda possible? Is the diversity of interest within the ID field an asset or a liability in attaining the scholarly goals of the discipline? Does the scope of interest require the use of alternative research methods? What are the issues affecting the quality and quantity of research generated within the field, and what might be done to further the goals of the discipline?

The purpose of this paper is to describe the status, issues, and future of research in the instructional design and technology field. In addition, several recommendations designed to encourage collaborative research among individuals with diverse interests will be presented.

The Status of Research in Instructional Design and Technology

The instructional development field draws upon the work of individuals from a variety of related disciplines. Some embrace educational and cognitive psychology, others instructional media, and others are aligned with specific content disciplines. A discussion of the status of the field, therefore, could encompass the full scope of research published in the various academic and technical disciplines. While such efforts

are certainly noteworthy, they seldom influence the field directly. For this reason, this paper will focus on research conducted, presented, and published for the purpose of influencing directly the development or refinement of instructional design principles.

The Roots of Experimental Research

Perhaps due to the strong influence of the behavioral sciences on the ID field (Schuller, see article in this issue), experimental paradigms have dominated published research. Some nonexperimental research has been published during the past 20 years, but the overwhelming proportion has featured experimental methodologies.

Experimental paradigms also appear to dominate the implicit definition of acceptable research in the field. This evolved for several reasons. First, many of the same conventions of other "scholarly" disciplines, such as an emphasis on experimental rigor, strict hypothesis testing, and the adoption of widely accepted technical writing and publication guides, were assimilated into the ID field. In effect, the priorities and standards of related disciplines were transferred to the instructional development and technology field.

Next, the promotion and tenure criteria of college and university training programs emphasized experimental research over other kinds of research. This has created an implicit standard for acceptable research. This standard, in turn, has influenced the research of both tenure-seeking faculty and their students at our colleges and universities. Since the majority of published research in the field is generated in academic institutions, where the priority for experimental research is high, most of the published research has reflected an experimental orientation.

Finally, responding in part to pressures to publish the experimental research generated by college and university faculty, the research journals have published proportionately more experimental studies. This was likely a natural consequence of the greater number of experimental research studies conducted and submitted for publication. In any case, an experimental research emphasis was implicitly perpetuated by the dominance of published experimental research studies.

It is important to note that the current situation is not an indictment of experimental research, the publication

priorities of the university training institutions, or the editorial and publication policies of our scholarly journals. The opportunity for pursuing other interests has always existed, albeit a potentially risky option for those seeking tenure and promotion. Scholars in the field have advocated and conducted systematic research using alternative paradigms. Guba (1981), for example, advocated techniques for naturalistic inquiry. Similarly, Heinich (1984) encouraged field-based studies incorporating naturalistic inquiry methods rather than reliance on the traditional experimental methods of the past.

The Locus of Instructional Design Research

It is also noteworthy that much of the instructional research published during the past 20 years has been generated outside of the instructional development field. While several prominent scholars may be readily identified within the instructional development discipline, the field appears to lack pervasive research activity and interest. Apart from a few productive individuals and institutions, the ID field does not have the generaliz-

when paired with the lack of interest shown within the ID field itself, the scholarly identity of instructional development may be jeopardized. In too many cases, individuals in the field have assumed the role of a consumer rather than a producer of research. We must address why so little research interest has been demonstrated within the instructional development discipline. Is it the result of proportionately fewer instructional designers producing a correspondingly lower proportion of research studies? Or is it the case that we, as a discipline, are not generating our "fair share" of research, assuming instead a consumer rather than a producer role?

A Different Perspective

Why has so little research of any type been published by instructional designers? Has the situation resulted from the prevalence of experimental methods to the exclusion of other methods? Or is it due to indifference to research under any circumstances? The problem is not solely with particular research methods per se, but with the

Much of the research during the past twenty years has been generated outside of the ID field.

ed research thrust which is characteristic of the other allied fields. An inspection of the 1979-1984 cumulative author index of the *Proceedings of Selected Research Paper Presentations*, published by the Research and Theory Division of AECT (Simonson & Treimer, 1985), illustrates the unevenness of research productivity within the discipline. Some individuals have remained very active as researchers, while others contribute very sporadically. Unfortunately, many individuals simply do not contribute research to the field. This pattern can also be found in other scholarly journals serving the instructional development field.

During the same period (1979-84), many educational and cognitive psychologists have become involved with research topics relevant to the design of instruction. By itself, this situation poses no problem. However,

failure of the field to mobilize its researchers. Many have become content with debating the problems with research rather than contributing to solutions. The field may be hampered more by collective inactivity than by the tacit acceptance of a particular research paradigm. As a discipline, instructional designers have failed to become proactive in shaping a research agenda for the future. members of the ID field have too often deferred to related fields responsibilities for research, then criticized the efforts as being too narrow and unimportant. The underlying reason for the present dilemma may be deceptively simple—a failure to assume responsibility for shaping the research issues, priorities, and direction of the discipline.

During the UCIDT conference in Bloomington, one generic question was asked repeatedly: "Why isn't anyone doing research in . . . ?" The answer is

simple: More people are asking the question than responding to it. The pattern has become one of research inactivity in the collective instructional development field. If renewed and broadened enthusiasm for research reverses this pattern, then the efforts will have been successful. If the pattern remains, however, the sobering reality that there is no collective will to engage in research must be faced. Hopefully this will not be the case.

Barriers to Research

Declining Interest

The majority of published educational research is generated by students and faculty in colleges and universities. This does not, however, presume that research is necessarily a welcomed priority for all who must produce it. While research for some may be an intrinsically rewarding process, it is likely that most research is driven by motives such as the pursuit of tenure, academic promotion, or the completion of degree requirements. For many, research is simply not a primary interest. Individuals become involved to a degree, but often lack a commitment to research as a principal role. This is a marked departure from the role perceptions and expectations of several other academic disciplines—especially those in the “hard” sciences.

Academic Identity

Underlying the research dilemma could be a fundamental loss of academic identity. In many ways, instructional development has become a market-driven field, emphasizing the preparation of professionals to fill the growing need for instructional designers—especially in business and industry. Several institutions are engaged in extensive proprietary development projects with corporations, often reducing both the amount of time available for research and the impact of such efforts on the field. While partnerships are not necessarily an impediment to research, they often commit valuable talent to specific corporate priorities rather than toward the broader goals of the ID field.

Competing Priorities

Due to preference for other roles, some faculty choose not to engage in research. Individuals believe that their expertise is better used in the pursuit of different priorities. Others prefer to attend to the immediate and pressing issues of the field, believing that they have more impact through direct as opposed to indirect effort. Still others have turned their efforts toward the organizational needs of the ID field. It is difficult to fault individuals who direct considerable energy in these worthy endeavors.

topics believed to be relevant to the ID field. The preoccupation with learning outcomes to the exclusion of other topics such as the social impact of technology is evidence of an implicit standard of acceptability. Organizations interested in the broader implications of instructional technology (e.g., Science, Technology and Society (STS)) support this contention. Others maintain that our scholarly journals are “tunnel visioned” in their endorsement of experimental research to the exclusion of other paradigms. A reluctance to engage in research using methods not widely implemented in the ID field was often expressed at the conference. Concern for the lack of a publication outlet due to the differences in methodologies selected—an important concern for academics—was also voiced.

Local Support

Those actively engaging in research are more likely to possess a supportive environment, access to the required technical resources, the necessary hardware and software to conduct research, and perhaps modest economic and career incentives to excel as researchers. However, considerable untapped expertise exists in settings where support is lacking. The issue of how to provide the needed support to those who indicate interest in research, but lack necessary resources, may be a key to increasing the scope, quantity, and quality of research in the ID field.

The problem is not solely with particular research methods, but with the failure of the field to mobilize its researchers.

Overcoming Barriers to Research: The Future of ID Research

One of the impediments to research, the perception of singularity in the definition of “appropriate” research topics and methods, may be the simplest to resolve. Given the diversity of the ID field, it seems counterproductive to presume that the topics and methods for research can be rigidly prescribed. If the acceptance of alternative topics and methods as valid will improve the quantity and quality of research, then the commitment must be made.

Coupled with this commitment, however, is the recognition that competence in the varied research methods is not likely to be as pervasive as the interest expressed in such methodologies. “Alternative paradigm” cannot be a euphemism for poorly organized and implemented research. As a discipline, the notions of appropriateness can be easily expanded and even supported directly. Individual researchers must at-

Role Models

One of the most serious long-term implications of the diminished research activity in the field is the legacy this trend portends for the future. Faculty at academic institutions model those activities deemed most important. If the models emphasize research, it is more likely to be valued. If the models do not emphasize research, future generations of graduates will develop neither interest nor competence in research. The fate of instructional development research could be sealed through the passivity and indifference of faculty models who are preparing each new generation of instructional developers.

On the other hand, many members of the ID field express interest in research but feel constrained by various influences. The limited money available to support research is often cited by many as a major obstacle. Some individuals express interest in research but are constrained by heavy teaching loads, a lack of facilities, or available research subjects. Others, though interested in engaging in research, feel poorly prepared to design and implement research studies.

Inflexibility in Topics and Methods

Some individuals believe that there is an intolerance for the study of certain

tain competence in the methods of disciplined inquiry required to pursue individual research interests.

The future of instructional development research lies only partly with the expansion of research topics and methods, and the accessibility of dissemination outlets. There is a more fundamental issue to be resolved: Is there a collective commitment to research? Assuming greater respect for inherent differences among our ranks, will more and better research follow? The question strikes at the heart of the research dilemma confronting the field.

To grow as a discipline, the importance of research must be acknowledged. To be successful as a discipline, both the skill and the will to excel as researchers must be demonstrated. Some individuals possess both the skill and the will to conduct research, and these are among our most prominent ambassadors to the educational and psychological research communities. Several possess the skill but appear to lack the will, due to preference or imposed constraints. Others have the desire but lack the resources needed to implement research. The final group possesses neither the skill nor the will to engage in research, opting (hopefully) to direct their talents elsewhere. The goal of more and better research requires the mobilization of individuals with *either* the skill or the will to become more active in pursuing research activities. This can be accomplished by first committing to the research priorities of the discipline, by clarifying the position of the discipline on research standards, and by providing the support needed to mobilize researchers.

The following statement, drafted jointly during the UCIDT conference in Bloomington by the research subcommittee, capsulizes the commitment, the need for alternative research methods, and the range of topics advocated for research:

The knowledge base of instructional systems technology can be expanded using a variety of research methodologies. We advocate the utilization of traditional *and* alternative research methods in examining the processes, outcomes, and contextual variables which guide the *design* of instructional systems. We further advocate the study of the processes and effects of the *implementation* and impact of instructional

systems in varied contexts.

This statement, while providing a commitment to the goal of research, does little to mobilize individuals within the ID profession to greater involvement. The statement does, however, provide the basis for prescribing and implementing recommendations to meet the spirit of the commitment. Such recommendations, and the impact on individuals within the profession, could result in increased interest in conducting research.

Recommendations to Encourage, Improve, and Expand ID Research

The steps recommended to encourage, improve, and expand research fall into four general needs: (a) identifying topics and methods, (b) improving the quantity and quality, (c) providing greater opportunities, and (d) increasing dissemination.

Topics and Methods

Identify topics relevant to the different interests expressed within the ID field. As suggested by Gagne (see article in this issue), a wide range of learning, cognition, and technology topics are available that are appropriate for study. Many of these topics pivot around the notion of designer versus learner intent in the acquisition of knowledge. Heinich (1984) has also suggested several researchable problems based on the "Craft versus Engineering" dilemma endemic to the instructional technology field. Additional interest has been expressed in the study of contextual issues in the design

systematically. Specific researchable problems, irrespective of the methods of research, must be articulated before a judgment of the need for research methods can be made.

Identify research methods and options appropriate for specified topics. Once problem areas have been specified, appropriate methodologies for study can be selected in an informed manner. It makes little sense to insist on the adoption of any research methodology, experimental or other, without first specifying the nature of the problem to be studied. Once the requirements of the problems are known, a variety of research models and paradigms are available for consideration. Considerable interest remains for experimental and quasi-experimental techniques, but field study techniques, naturalistic inquiry methods, integrative methods, and other methods of inquiry have been recommended. Models developed and applied in other disciplines may also prove very useful in ID research, ranging from sociological, to art criticism, to engineering models. Alternative methods for data analysis, synthesis, presentation, and interpretation might be considered. In addition to traditional statistically-based hypothesis testing models, interest in variance-accounted-for by instructional treatments, meta-analysis techniques for more global research questions, and comparisons based on sigma differences is increasing. Researchers have available a wide range of methods and data analysis techniques to support their unique interests.

Partnerships with schools, businesses, and government should be formed to pursue common interests.

and implementation of instructional systems, as well as interests in the social impact of instructional systems, the processes versus the outcomes of instruction, instructional strategies for generalized learning versus specific content, and a myriad of other research topics. The ID field is replete with worthy areas for research activity. However, many areas require more detailed definition before they can be studied

Quality

Evaluate proficiency in utilizing the methodologies for specified problems. For reasons previously addressed, most researchers have greater facility with experimental research methods than other techniques. A few may be proficient with alternative methods appropriate for the problem to be studied. For others, however, many alternative methods will be unfamiliar. The par-

ticular methodology may require procedures or documentation for which an individual researcher may be unprepared. Simply selecting a research problem where an alternative paradigm is appropriate is insufficient justification to implement the study. All research paradigms require proficiency for effective implementation. Researchers need to master the conceptual and procedural aspects of the methods and models selected for disciplined inquiry.

Provide systematic support to individuals seeking further training in particular methods and techniques. Support can be provided in several ways. Most colleges and universities include research expertise across several disciplines. Researchers can seek assistance within their institutions from skilled colleagues. In other instances, assistance can be obtained through intra-university consultation. In addition, consultant net-

First, most are affiliated with training programs offering a significant reserve of untapped but motivated research talent. This includes faculty, graduate students, and potential research audiences. Next, the nature of the problems and interests of potential researchers can be identified clearly. Methods for supporting desired research activity can be better prescribed.

Establish a network where researchers with mutual interests could collaborate at their discretion. If faculty interests and activities are better known, the opportunities for collaboration should increase dramatically. In addition, the geographic breadth of impact of ID research would be expanded. Mutual research thrusts should become more visible to the professional communities, helping to re-capture some of the collective influence of earlier R&D forefathers, such as the National Special

the training of competent individuals to enter the labor force, or the creation of organizations and systems designed to provide training, education, and development. In many cases, however, similar arrangements could be made to pursue joint research interests. For many individuals, partnerships represent a particularly appealing way to tie everyday responsibilities with the desire or requirement to conduct and publish relevant research.

Dissemination

Publish research generated both directly by faculty, as well as that generated through thesis and dissertations, in appropriate scholarly journals. The ID field lacks neither meaningful problems nor publication outlets for scholarly research. The field continues to grow and expand to related disciplines, integrating new technologies in the process. Yet, for many scholarly journals serving the ID field the number of manuscripts submitted for review has declined during recent years. Scholarly journals should present the most rigorous treatment of the most important issues both to the ID field as well as to the educational community overall. The status and credibility of a discipline is shaped largely by the quality and rigor of its journals. When scholarly journals reflect depth, rigor, and quality, the image of the collective field is improved. The decline in submissions is an important early warning sign for the field. It is also vital that the importance of scholarship be reinforced, and that scholarly journals reflect favorably the breadth and quality of research interest within the discipline. The responsibility for contributing research must be assumed by all who profess allegiance to, and reap the benefits of, the ID discipline. The process of research is not complete until the products are shared. Certainly, our scholarly journals should be the focal point of dissemination for research generated within the field.

Utilize the professional conferences to disseminate research. Professional organization conferences provide a relatively fast method for the dissemination of research. Both AERA and AECT include divisions or interest groups designed expressly for the dissemination of instructional systems research. While a large number of instructional developers are affiliated with organizations such as AECT and AERA, the percentage of individuals actively contributing research to their conference

One of the most serious implications of diminished research activity is the legacy this trend portends for the future.

works, including groups of colleagues from several settings who have expertise in particular research methods, could be formed. Instructive articles could be solicited from recognized research authorities and published in scholarly journals or as monographs. In any case, researchers should commit to excellence through the utilization of those research models where proficiency is greatest. Where proficiency is lacking but desired, the development of the necessary competence should be a precondition to conducting research. Completion of such training, paired with receptiveness to alternative methods, should mobilize those individuals who possess the necessary skills but have elected not to engage actively in research.

Opportunity to Participate

Identify the interests and identities of individuals wanting, but presently unable, to conduct research. Identification offers the potential to expand and improve ID research in several ways.

Media Institute (NSMI) described by Schuller (see article in this issue). While potentially beneficial for all, a network may be especially useful for individuals constrained in pursuing independent research. Many faculty members are facing new pressure to publish research, but are receiving inadequate support. Inter-university collaboration might enable interested faculty to conduct erstwhile impossible research. Finally, the mutual growth experienced through collaboration, paired with the generation of new ideas within the field, sharpens the understanding of all within the discipline.

Form partnerships with constituent organizations. Several individuals, and in some cases institutions, have established partnerships with school systems, businesses, or government organizations to pursue common interests. Usually, the thrust of such partnerships is to support such things as the development of instructional materials,

proceedings is relatively modest. Some are simply not conducting research; others, however, have made no effort to disseminate research already completed. In many ways, the trend toward declining submissions to our scholarly journals and the trend observed in professional conferences appear intermingled. Those who present research at conferences seem more likely to eventually publish their work in journals than those who do not. This appears less a question of natural selection than investment of effort. Once the effort has been invested to prepare a manuscript for presentation and the ensuing feedback is received, the probability of refining the manuscript for eventual journal submission is greater. The probability of acceptance for publication in scholarly journals also seems improved by virtue of the input obtained during paper preparation and presentation. Since professional conferences represent the primary method of professional development for many, effort must be expended to disseminate research during these proceedings.

Establish a dissemination network where published and on-going research activities can be shared among interested parties. The time lag from submission to publication of research presents a problem to researchers attempting to keep abreast of current developments. While conference presentations provide a more immediate dissemination outlet, only a fraction of the overall research conducted is likely to be included. Student thesis and dissertation research, for example, is seldom disseminated beyond the submission of abstracts. Research of this type could be more effectively distributed through a dissemination network. Many ID researchers have also expressed interest in on-going and in-progress research, where parallel interests could be identified and developed. The creation of an ID dissemination network, to focus on the sharing of research in-progress and recently completed, could provide an outlet ideally suited to the unique needs and interests of ID researchers.

Summary and Conclusions

The purpose of this paper was to analyze the status and future of research in instructional design and technology. It has become clear that several hurdles to increasing relevant research exist. Some obstacles cannot be removed directly; however, others can be removed or circumvented fairly readily if there

is a commitment to research. The ID field can endure differences in, but not indifference to, the methods and topics constituting meaningful research.

The processes and products of research serve several important functions. The methods of research are judged for appropriateness. The products and processes of research are supported or refuted, disclaimed and contradicted because of the evaluation of individual beliefs with the beliefs of others. Individual and collective notions of disciplined inquiry are expanded by testing a new, better, or different way to conceptualize the research issues of the ID field. Research is the lifeline to self-examination and growth in any discipline. Surely, research can assume a more vital role in the ID discipline.

The key to promoting research rests in part with reconceptualizing notions of appropriate topics and methods for study. Certainly, the ID discipline can embrace scholarship in all relevant aspects of instructional technology. We should not restrict or confine the focus of disciplined inquiry to those aspects deemed popular or acceptable to certain segments of the field. It is necessary and appropriate to transcend the "members only" image of ID research, embracing instead the varied interests reflected in

potential research is wide-reaching. The ID field is not lacking fuel—only fire.

Upon reviewing a number of research manuscripts for possible publications, one somewhat frustrated colleague remarked, "Nothing could be worse than these manuscripts." At the time, the observation appeared an accurate summation to a somewhat frustrating task. The problems seemed ill-defined, the rationales weak, the methods questionable, and so on. Could anything be worse than the manuscripts reviewed? It did not appear possible. My perceptions, however, have since changed. While maintaining an overriding concern for the quality of research, I am also concerned with the decline in research interest and productivity. The absence of research, and the opportunity to reexamine beliefs, expand knowledge bases, and evaluate critically the thinking of colleagues, is a far greater concern than the occasional poor study. While poor research must certainly be reckoned with, such studies at least permit critical evaluation. What is worse than a bad research study? No research at all.

Author Notes. The opinions included in this paper have been shaped by the ideas of the many talented individuals who attended the UCIDT conference. While not necessarily shared by other

The ID field lacks neither meaningful problems nor publication outlets for scholarly research.

the field.

Equally important, however, is the collective commitment of the field to the process and goals of research in advancing the discipline. Without such a commitment, we cannot expect that activity will increase under any circumstances. Support for the differences inherent in the ID discipline has been articulated, but the most important changes are yet to be demonstrated.

To be certain, the range of interests and methods for study provide a vast and extraordinarily fertile base for prospective researchers. The question appears less the availability of researchable topics than which topics and methods should be used. While the cautions related to comparative research must be heeded (Clark, 1983), the range of

participants, the opinions were shaped by the issues, comments, and themes that surfaced during the conference. The author wishes to acknowledge the contributions of all participants, especially those who spent a significant portion of the conference discussing the research issues confronting the instructional design and technology field.

The author has taken the liberty to describe ID as a discipline. The credit (or responsibility) for this designation, however, rests with Dr. Robert M. Morgan, who characterized ID as a discipline in his introductory remarks during the UCIDT conference. The author thanks Dr. Morgan for making this assertion, and removing any burden of proof from the author.

References

- Bachrach, A. J. (1965). *Psychological research: An introduction*. New York: Random House.
- Clark, R. E. (1983). Reconsidering research on learning from media. *Review of Educational Research*, 53, 445-460.
- Guba, E. G. (1981). Criteria for assessing the trustworthiness of naturalistic inquiries. *Educational Communication and Technology Journal*, 29, 75-92.
- Gay, L. R. (1976). *Educational research*. Columbus, OH: Charles E. Merrill Publishing Co.
- Heinich, R. (1984). The proper study of instructional technology. *Educational Communication and Technology Journal*, 32, 67-87.
- Kerlinger, F. N. (1973). *Foundations of behavioral research* (2nd ed.). New York: Holt, Rinehart, & Winston, Inc.
- Simonson, M. R., & Treimer, M., Eds. (1985). *Proceedings of selected research paper presentations*. Published by the Research and Theory Division of the Association for Educational Communications and Technology, Ames, IA.
- Tuckman, B. W. (1978). *Conducting educational research* (2nd ed.). New York: Harcourt Brace Jovanovich, Inc.