

CONCEPTUALIZING EDUCATIONAL RESEARCH IN DISTANCE EDUCATION

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INTRODUCTION

The application of distance education (i.e., e-learning,² distributed education, computer-based education, computer-assisted instruction, online training, etc.) in schools, colleges, universities, and businesses is currently growing and evolving at a rate that far exceeds that of the research and critical reflection in the field. In conjunction, a growing number of educators, course developers, instructional designers, and other professionals are being required to make business-critical decisions related to distance education without a rigorous foundation of educational research to guide their determinations. The continued growth and development of distance education as a viable format for offering educational and training opportunities is, however, dependent upon the parallel evolution of research on distance education as a field of practice.

The expansion of distance education requires a significant research base supported

by evidence derived from formal investigation. The field of educational research can provide this foundation on which informed decisions can be made with regards to distance education. The discipline of research related to distance education, in its many varieties, however, is behind the curve when it comes to producing useful, reliable, and generalizable information for decision-makers in education and training.¹ The current literature related to distance education most commonly details best-practice case studies rather than the scientific discussion of empirical research. While useful in many ways, most of the case study literature provides decision-makers with little reliable and generalizable information related to the consequences of the complex decisions they are making.

Like research on other educational interventions, the distance education is largely anecdotal in nature (Hanson, et al., 1997), contains a considerable amount of cross-referencing (where many of the

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papers and summaries cite similar research or reference each other), consists of only a rather small body of high-quality original research (Phipps and Merisotis 1999), and—given the rapid evolution of distance education—is dated. (Lewis, Farris, Snow, & Levin, 1999)²

The development of technologies to support distance education will, in all likelihood, continue to grow at accelerating rates in the decades to come. These new technologies will feature a host of new conveniences, accompanied by a growing requirement for valid information to guide design, development, and implementation decisions. Challenged by the difficult questions of education, professionals from government agencies, educational institutions, and variety of business sectors will continue to seek the guidance of educational researchers in their decision-making³. To meet this challenge, the foundations, scope, and rigor of distance education research should be examined (or re-examined) by researchers.

This article suggests a starting place for those interested in formal inquiry into research on distance education. Ideally, by examining the foundations and nature of educational research, the scope of research in distance education can be derived in a systematic fashion. Further, by defining guidelines for distance education research based on the scientific process, the researcher can acquire a basic framework for ensuring the rigor (and thus the utility for decision-makers) of distance education research. With this as a basis, continued study of (and diligence to) the methods of social sciences research should provide the discipline of distance education research with a sound basis for supporting the profession.

EDUCATIONAL RESEARCH

Though educational research shares a common ancestry with philosophy, the medical sciences, as well as with *hard* sciences (e.g., physics, chemistry, biology, etc.), educational research has identified most closely with experimental and cognitive psychology in its

development and history.⁴ However, like many disciplines in the social sciences, the realm of educational research is limited to the production of *soft knowledge* due to the complex nature of humans and human interaction (Labaree, 1998).

Researchers pursuing *soft* knowledge, nonetheless, “find it much more difficult to establish findings that are reproducible and whose validity can be successfully defended against challenges by others” than those in the *hard* sciences (Labree, 1998, p. 5). Further, philosophical differences related to the very nature of learning vary among researchers, leaving causal relationship continually challenged and placing utility as the primary goal of the discipline (rather than findings that are verifiable, definitive, and cumulative). Limited in its ability to make claims of fact, the field of educational research has maintained a primary focus on the creation of applied knowledge that offers a high level of usefulness for teachers, administrators, and politicians⁵ (Labaree, 1998; Heinich, 1995).

In recent decades, research in the social sciences has made remarkable strides and has continued the development of scholarly research processes. Social science researchers have identified numerous techniques (both in research design and statistical procedures) for coping with the challenges to the research process that are entailed when human behavior is a variable. Social science researchers, though, continue to struggle with the formidable tasks related to the search for *soft* knowledge. It is the nature of educational research, as a social science, that it is difficult to establish durable and cumulative claims based on research findings. Because of this, educational research findings are commonly accompanied by a host of qualifications and are characterized by limited generalizability.⁶

The impact of the limited nature of educational research is not, however, a concept that should be discouraging to the educational researcher. The constraints of research in the social sciences have, in many ways, created a dynamic field of educational research that

offers the researcher many opportunities and considerable freedom in how educational research is conducted (Labaree, 1998). Further, many philosophical differences can be tolerated within the flexible boundaries of the discipline, thus allowing researchers to follow many pathways of inquiry, with few restrictions.

RESEARCH ON DISTANCE EDUCATION

The scope of distance education research is broad, drawing on fields including psychology, education, information technology, as well as a diverse host of specific curriculum areas. However, this wide array of research areas has been limited by several factors. Feasley (1991) discusses six factors limiting the role of research in distance education as first described by Coldeway in 1982. While Feasley documents growth in the available literature on distance education, many of challenges initially identified in 1982 still persist today:

- educational researchers are rarely present during the design of distance education systems;
- there is no clear paradigm for research in distance learning, and it is difficult to attract funds to develop one;
- there have been no consumer groups or publication outlets for such research (although this is changing);
- some institutions are averse to defining boundaries and variables clearly because practitioners work with macro-level variables (such as tutoring) and fear that breaking them down into components will complicate the phenomenon;
- educational researchers often ask questions of no practical or even theoretical relevance. The tendency to ask, 'What happens when you try this?' diverts them from the more important issue of 'How do you make this happen?'; and

- researchers in distance learning test variables that are really classes of variables (such as comparisons of distance and classroom learning). The results are impossible to replicate and of dubious utility anyway." (Feasley, 1991).

As Feasley notes, some progress has been made in regard to Coldeway's factors limiting the role of research. Specifically, today there are a numerous research journals and professional publications focused on the disciplines of distance education. For example, in the discipline of distance education, leading research journals now include: *Distance Education*, the *American Journal of Distance Education*, *The Journal of Distance Education*, and the *Quarterly Review of Distance Education*. In addition, trade publications, including *Training*, *Training and Development*, *Educational Technology* and others commonly feature articles related to the application of technologies (e.g., Web-based instruction, streaming video, etc.) in distance education and training.

Other factors limiting educational research are, nevertheless, not likely to be improved upon soon. Labaree (1998) submits that "As a soft applied field, education is characterized by high 'technological ambiguity' (a diffused intellectual focus) and high 'resource dependency' on 'an environment in flux' (that is, a need to respond to practical issues arising from school and society rather than from the theoretical logic of the research effort itself)" (p. 7). This perspective suggests that the nature of educational research on distance education is not likely to be suitable for the emergence of a common and clear paradigm for research. Further, the divergent nature of research within the field supports heterogeneity in the underlying theoretical constructs that provide the foundation for distinct research agendas.

Though the boundaries of research on distance education offer a broad array of options, the perspectives and philosophical foundations of the researcher often provides guidance within the field. Thus, based on an epistemological belief related to the nature of knowl-

edge (or learning), the researcher may establish basic boundaries for his or her research *paradigm*⁷. This research *paradigm* may or may not be similar to that of other researchers within the field or the discipline. Kuhn (1962) noted that the paradigm that guides our research necessarily delimits our problems, theoretical assumptions, and methodologies. Further, the requirements for information relative to the continuous improvement of education within the society may further guide the practice of the educational researcher. Thus, a comprehensive understanding of educational philosophies and beliefs (including their impression on the paradigm of the researcher), as well as consideration of current educational issues is essential in deriving a pragmatic research agenda⁸.

RESEARCH PARADIGMS

Briggs (1982) and Driscoll (1995) offer a discussion of research paradigms that are applicable to research of distance education. Based on their suggested research paradigms, the following descriptions offer a range of research paradigms that are applicable to the distance education researcher.⁹

Experimental and Quasi-Experimental

Experimental research designs can provide educational researchers with the "most effective means of establishing causal influences on a phenomenon of interest" (Driscoll, 1995, p. 323). By controlling variables through sample selection and research design, experimental researchers attempt to eliminate bias or error, and thus offer evidence supporting hypothesized causal relationships. These controls, however, often come at the expense of generalizability.

Research designs that do not meet the sampling standards of experimental designs, but are close, are referred to as quasi-experimental designs. According to Gall, Gall, and Borg (1999) "quasi-experiments are similar to true

experiments, except that research participants are not randomly assigned to the treatment and control conditions." (p. 241) While quasi-experimental research designs may be less effective than their counterpart in providing evidence of casual relationships, they do offer pragmatic alternatives when meeting the requirements of experimental designs are not practical.

Meta-Analysis

The meta-analysis research design is "a widely used method for combining results from different quantitative research studies" (p. 71) on the same phenomenon (Gall, Gall, and Borg, 1999). The meta-analysis offers a systematic process for synthesizing findings from multiple research studies into a single research analysis.

Case Study/Ethnography

Case study research designs can be used to answer a variety of research questions. According to Trochim (2001), "A case study is an intensive study of a specific individual or specific context . . . There is no single way to conduct a case study, and a combination of methods (such as unstructured interviewing and direct observation) can be uses." (p. 161) The case study research design is useful in describing, explaining, or even evaluating phenomenon (Gall, Gall, and Borg, 1999).

Technology Development and Evaluation using a Novel Technique

As a field of research focused on useful application, distance education research should be active in the development, application, evaluation, and continuous improvement of technologies (including novel techniques described below). Driscoll (1995) suggest that "Factors stemming from the context in which a new technology or instructional system is implemented can greatly affect its success or

effectiveness in the setting . . . Systems-based designed will enable us to determine what makes technologies effective in some setting and not others, so that we will be less likely to discount a technology simply because it was not the solutions to a particular problem." (p. 326) The basis of research in this paradigm is not to necessarily compare one media to another, but rather to provide data on the effectiveness and efficiency of a technology so that it can be selected for appropriate use. This approach, however, lacks the rigor and generalizability that other alternatives do. Though it should be noted that sociologists have used equivalent approaches for years.

Cost-Effectiveness and other Cost Analysis

The requirements of decision-makers for data related to the cost-effectiveness of distance education (and related technologies) presents researchers with a pragmatic research paradigm with obvious application benefits. The systematic frameworks for cost-effectiveness research can provide a structure that pushes the researcher beyond mere auditing of programs to a level of evaluation that examines both short-term and long-term benefits, as well as a range of costs from instructional development to opportunity-costs¹⁰.

Model Development and Evaluation

According to Krathwohl (1998) "When we can link all, or a great many, of the variables in the situation and make an even more precise prediction, we have a model." (p. 65) *Models*, then, offer researchers and/or practitioners a useful tools for conceptualizing the relationships and complexities among the components of a system.

Novel Technique Development and Evaluation

Techniques are the processes used by researchers and practitioners to accomplish results (i.e., produce products, obtain outputs, and/or achieve consequences). The develop-

ment and validation of a novel technique for accomplishing results within distance education is an essential role of the educational researcher.

Each of the various research paradigms (above) provides educational researchers with an alternate set of boundaries and guidelines for answering questions related to distance education¹¹. However, each paradigm can be applied to a medley of research questions representative of various ingredients in a distance education system. Each of the components and related tasks in a distance education system can be the basis of research from any (or all) of the research paradigms.¹²

SUB-SYSTEMS OF A DISTANCE EDUCATION PROGRAM

From an educational research perspective, distance education offers many opportunities for research. Below is a sample of the various sub-systems in a typical distance education program:

Needs Assessment

Preceding the decision to implement a distance education program (or any performance improvement intervention), a system-focused needs assessment should be completed with internal and external partners and stakeholders (Watkins and Kaufman, 2003; Kaufman, Watkins, Leigh, 2001; Kaufman, Watkins, Guerra, 2001). With a focus on the accomplishment of useful results within the context of society, institutions can thereby integrate strategic planning and needs assessment initiatives to ensure that decisions to distance education (and other alternatives) are aligned with organizational, institutional, and societal goals and objectives.

Analysis

Prior to the design and development of any distance education program, a thorough and rigorous analysis should be completed. Rigorous analysis will ensure that all sub-systems of

distance education are aligned with the achievement of useful results as defined in the needs assessment. The analysis sub-system provides the link between the identified and prioritized needs (gaps in results) and the alternative solutions that will be considered for implementation. The sub-system should include, at minimal, needs analysis, task analysis, context analysis, and performance analysis.

Solutions and Alternatives

When adequate data indicates that a targeted performance related intervention (e.g., training, decision support, process reengineering, etc.) is required, and then alternative solutions should be evaluated to determine which is most appropriate for the situation. Within this subsystem of distance education the educational researcher may want to examine the strengths and weaknesses of alternatives to instruction, as well as models and/or techniques for determining which performance improvement tactic is best used under differing conditions. Research related the appropriate applications of distance education would also be related to this sub-system of the distance education program.

Instructional Design

When instructional interventions (e.g., classroom training or distance education) are selected to be the appropriate solution to performance discrepancies or as the befitting manner for delivery of an education program, then instructional design is the next useful sub-system of distance education. The instructional design component includes such tasks as learner analysis, instructional analysis, media selection, writing of objectives, designing assessments, developing instructional tactics, and formative evaluation.

Instructional Development

Following the design of instruction to be delivered at a distance, instructional develop-

ers produce the products required for delivery. From the development of WebPages to CD-ROMs, and from the production of instructional audio cassettes to paper-based course guides, the domains of viable research within the sub-system of instructional development are numerous.

Media and Delivery

Closely related to, and often overlapping with, instructional development are the media and delivery sub-systems of the distance education program. This component consists of processes related to the effectiveness and efficiency of various media technology and delivery techniques. The focus in this sub-system is, however, not on the design or development, but rather the application in distance education.

Evaluation and Continuous Improvement

The performance of a distance education program is not static, and the continuous evaluation and improvement of the program (or the individual sub-systems) is essential for long-term success. Research related to the effectiveness and efficiency of the program or sub-systems provides many fertile areas for the educational research. In addition, the development and validation of systematic processes for improving the sub-systems in relation to the external impact of the overall program can provide for the application of any of several research paradigms.

Diffusion

Innovations in distance education practice and research are useful to the extent that they can be applied. However, prior to broad-base application, the findings of the research and practitioner communities must be shared. Diffusion techniques and tools are the focus of this sub-system of the distance education pro-

gram, where tasks related to gaining acceptance, increasing use, and motivating users are central to success.

The sub-systems described above are from the performance technology perspective. Therefore, the sub-systems presented may not represent a framework that is all-inclusive of the diverse areas of inquiry discovered by researchers in the field of distance education. The components do, however, provide an initial framework for conceptualizing the types of research that are viable and applicable within the field.

A MATRIX FOR CONCEPTUALIZING DISTANCE EDUCATION RESEARCH

Table One (based in part on Driscoll, 1995; and Briggs, 1982) offers a matrix for conceptualizing pragmatic research on distance education based on the both the research paradigms and sub-systems described above. Each cell of the matrix provides an example of the type of research that may be a candidate for the particular research paradigm when applied to the specific component of the distance education program. Though the matrix does not provide a conclusive array of all possible research on distance education, it can provide initial guidance for a novice researcher.

Although Table One offers a map(or frame) for viewing the many types of viable research agendas available to the distance education researcher, we do not suggest that novice researchers simply select a row and then column of interest to define their research. Defining a research agenda of interest is a process that commonly goes through many revisions by the researcher before an agenda of the *correct* scope and rigor for the individual is identified. Based on Table 1 and other aids, researchers should define their general research areas of interest. By reading in the literature of the field, as well as other areas of specific interest, the researcher will commonly find their interests changing and evolving to include many new ideas and constructs.

The hourglass offers a metaphor this growth in that many broad areas of research will likely be of initial interest to the novice researcher (e.g., online education, learner interactions, formative evaluation)¹³. As the researcher focuses their interest these will narrow to a few domains. Then, however, the literature in those few domains will again broaden to include the specifics of the many viable research agendas (e.g., asynchronous online educational tools for feedback, motivational techniques for increasing learner interaction effectiveness, collaborative techniques for formative evaluation). For some researchers the hourglass will be a single episode that defines their research agenda, for others they may travel through the hourglass several times for finding an agenda of the *correct* scope and rigor for their interest.

Being a *soft* science (see above) does not preclude educational research on distance education from academic rigor and scholarship. The valid research methods and statistical techniques of the social sciences offer the educational researcher a basis for scientific inquiry; and while educational research is limited in its ability to *prove* causal relationships and other *facts*, evidence supporting the validity and reliability of research results is essential¹⁴.

Glasick, Huber, and Maeroff (1997) suggest that the standards are *scholarly work* are met by researchers when they: identify clear goals [and objectives]¹⁵; made adequate preparations prior to conducting research [including a thorough review of the literature]; employ appropriate research methods; demonstrate significance [statistical and/or practical]; effectively present results to the research community; and provide a reflective critique. Fortunately, each of these stipulations for scholarship is attainable by education research approaching *scholarly work* from a variety of research paradigms. It is the role of the educational researcher to ensure that appropriate scientific rigor is applied, regardless of the research paradigm.

TABLE 1
A Matrix for Conceptualizing Research on Distance Education (based in part on Driscoll, 1995 and Briggs, 1982).

	<i>Needs Assessment</i>	<i>Analysis</i>	<i>Solutions and Alternatives</i>	<i>Instructional Design</i>	<i>Instructional Development</i>	<i>Media and Delivery</i>	<i>Evaluation and Continuous Improvement</i>	<i>Diffusion and Adoption</i>
<i>Experiment and Quasi-Experiment</i>	Effect of alternative planning tactics in aligning goals and objectives within a strategic planning and needs assessment process	Comparison of alternative task analysis methods for identified performance discrepancies	Effect of changes in specified variable of a reward/incentive program in improving performance	Which of specified variables in materials increase student motivation/mastery/satisfaction.	Comparison of two feedback systems for improving learner performance	Effect of alternative timing of feedback on learner performance	What factors influence a learners level one (or two, three, four, or five) evaluation of an online course	Effects of specific variables in adoption of distance education in a professional school
<i>Meta-Analysis</i>	Systematic review of needs assessment research on similar variables in terms of performance accomplishment	Systematic review of task analysis research on similar variables in terms of performance accomplishment	Systematic review of performance system design research on similar variables in terms of performance accomplishment	Systematic review of instructional strategy research on similar variables in terms of performance accomplishment	Systematic review of visual literacy research on similar variables in terms of performance accomplishment	Systematic review of instructional video research on similar variables in terms of performance accomplishment	Systematic review of goal-free evaluation research on similar variables in terms of performance accomplishment	Systematic review of diffusion research on similar variables in terms of performance accomplishment
<i>Case Study/ Ethnography</i>	Case study of alternative tactics in conducting needs assessments	Case study of teams or organizations conducting needs analysis	Case study of learners using EPSS systems	Case study of projects converting courses for online delivery	Case study of development projects of CD-Rom media	Case study of an institution utilizing a new educational technology	Case study of programs' improvement processes for training units	Case study of a new technology being integrated into schools
<i>Technology Development and Evaluation using a Novel Technique</i>	Development and evaluation of a tool for conducting aligning strategic planning and needs assessment using a novel technique	Development and evaluation of a tool for conducting a context analysis using a novel technique	Development and evaluation of job aid systems using a novel technique	Development and evaluation of tools for increasing creativity problem solving tactics in design using a novel technique	Development and evaluation of tools for developing online activities using a novel technique	Development and evaluation of a tool for integrating mixed media using a novel technique	Development and evaluation of a tool for synthesizing evaluation data using a novel technique	Development and evaluation of tool for generating adoption of a new technology using a novel technique

<i>Cost-Effectiveness and Costs-Consequences Analysis</i>	Cost-effectiveness/ efficiency of conducting a societal-focused needs assessment	Cost-effectiveness/ efficiency of conducting a performance analysis	Cost-effectiveness/ efficiency of instructional and/or course delivery alternatives	Cost-effectiveness/ efficiency of conducting formative evaluations; summative evaluations; goal-free evaluations.	Cost-effectiveness/ of the application of computer design tools	Cost-effectiveness/ efficiency of compressed video delivery	Cost-effectiveness/ efficiency of collecting useful evaluation data online	Cost-effectiveness/ of slow adoption models
<i>Model Development and Evaluation</i>	A model for prioritizing needs (gaps in results) in a unique context	A model for conducting context analysis in a unique context	A model for selecting effective and efficient non-training solutions	A model for selecting appropriate/ effective learner to learner interactions at a distance	A model for the rapid prototype development of online instruction	A model for effectively using a new media for the delivery of instruction	A model for assessing learner performance on the job after instruction	A model for spreading the use of a technology in a unique population
<i>Novel Technique Development and Evaluation</i>	Method for using online technologies in the collection of needs assessment data	Method for conducting a task or performance analysis at a distance	Method for the application and impact of alternative performance technologies	Method for selecting the appropriate media for instructional objectives	Method for using storyboards to develop instruction	Method for motivating learners in distance education	Method for improving low quality distance education courses	Method for involving leaders in the diffusion of a technology

Note: The elements of educational research on distance education (along the top) and research paradigms (down the side) are not intended to represent all possible research in the field. Rather, they offer a reasonable sample and a starting place for those looking to develop a research agenda.

SUMMARY

The continued growth and success of distance education as a viable format and vehicle for education and training requires the ongoing development of empirical research as a foundation. In this article we have suggested a framework for viewing the many types of viable research agendas that will be essential for the long-term success of distance education initiatives.

NOTES

1. Though in his book *The No Significant Difference Phenomenon* Russell (1999) identifies a large body of literature related to media comparison studies, the scope of distance education literature related to other essential issues (e.g., return on investment, instructional design, learner motivation, etc.) is minimal.
2. Also see Jegede (1994); Murphy and Terry (1998); and Hara and Kling (1999).
3. see Clark and Estes' (1998, 1999) discussion of the division of "craft" and "technology" based professions.
4. See Boring (1950) for an analysis of the historical development of experimental psychology and its relationship with philosophy, physiology, and other sciences; and see Saettler (1990) for a descriptive history of educational technology.
5. Rather than the development of *hard* knowledge that commonly carries with it a high level of *exchange* value (i.e., prestige and well paid faculty positions) as well as a varying level of utility (e.g., physics, medicine, chemistry, etc.) as described by Labaree (1998).
6. Which is also often true of physical and biological (i.e., hard) sciences as well, though these limitations and qualifications are commonly reduced through rigorous application of scientific procedures and methods.
7. Paradigms, according to Barker (1989) are the boundaries and ground rules we use in making decisions.
8. Additionally, Luiz (1982, as quoted in Solomon, 2000) suggests, "instructional developers [should] know the implications of their decision when advocating on philosophy, rather than another. It is assumed that their personal philosophies, implicit in their actions, act as a screening device through which their individual decisions are filters (pp. 110)."
9. Briggs (1982) discusses six research paradigms in relation to an instructional systems design process, and offers eleven additional paradigms that should be considered. Driscoll (1995) provides eight research paradigms along with examples of research studies conducted within each. The research paradigms discussed in this article are based primarily on these two articles.
10. See Watkins, Leigh, Foshay, and Kaufman (1998) and Kaufman, Watkins, and Sims (1997).
11. Additional research paradigms offered by Briggs (1982a) include replication studies, analysis of old data using new analysis methods, illuminative evaluation, futurism and consensus techniques.
12. Future formulations might take a "system approach" in order to align distance learning with the learning as well as societal context. Such alignment would better assure that distance learning would add value to internal as well as external clients and stakeholders. This "systems" approach takes a within-the-organization frame and is thus limited (see Watkins and Kaufman, in press).
13. See Trochin, 2001
14. Additionally, from certain research paradigms (e.g., post-positivist) the notion of "proving" any causal relationship is not existent.
15. According to Kaufman, Watkins, and Leigh (2001) goals typically are measured on a nominal or ordinal scale of measurement, while objectives are ideally measured on an interval or ratio scale of measurement.
16. See Kaufman, Watkins, Leigh, 2001.

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