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UNIVERSITY OF OKLAHOMA

GRADUATE COLLEGE

AN INVESTIGATION OF INSTRUCTIONAL SYSTEMS DESIGN PRACTICE VIA ESURVEY METHODOLOGY

A Dissertation

SUBMITTED TO THE GRADUATE FACULTY

in partial fulfillment of the requirement for the

degree of

Doctor of Philosophy

By

JOAN E. SCHRODER-HENDRIX

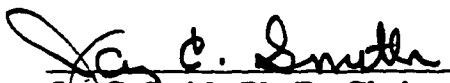
Norman Oklahoma

1997

AN INVESTIGATION OF INSTRUCTIONAL SYSTEMS DESIGN PRACTICE VIA ESURVEY METHODOLOGY

A Dissertation APPROVED FOR THE DEPARTMENT OF EDUCATIONAL PSYCHOLOGY

BY



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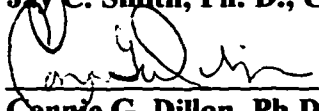

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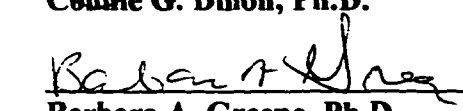

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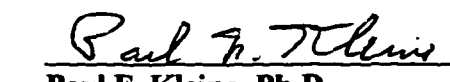

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AN INVESTIGATION OF INSTRUCTIONAL SYSTEMS DESIGN PRACTICE VIA ESURVEY METHODOLOGY

BY JOAN E. HENDRIX

MAJOR PROFESSOR: JAY C. SMITH, Ph.D.

An esurvey was designed to be implemented via the Internet and targeted toward a large, heterogeneous population of Instructional Designers and developers from educational, corporate, government, and technical environments. The overall goals of the study included contributing to the evolving research foundation of Instructional Systems Design (ISD) models, practices, and measurement. Respondent data sets were analyzed according to two different grouping structures. The first grouping structure concerned the number of years experience in working with ISD projects where respondent data sets were grouped into three categories, Novice, Intermediate, and Expert. The second group structure categorized the data according to three levels of ISD project complexity. Analysis of Variance procedures and the Newman-Keuls Multiple Comparison test were performed for each of the seventeen ISD activities represented in the esurvey instrument. The data results included three findings of statistical significance at the 0.05 level. Statistically significant differences were found between the Novice mean and the means for both the Intermediate and Expert groups for the ISD activity, "Determines if the need can be solved by training"; the Novice group rated this item significantly lower than did the Intermediate and Expert Groups. For the ISD item, "Selects instructional strategies", the High Level Complexity group responded significantly differently than did the Medium Level Complexity group, with this activity receiving higher ratings by the High Level

Complexity group. Also when grouped by Project Complexity Levels, the mean responses to the ISD item, "Conducts individual trials of instruction before completion" were found to be statistically significant between the Low Level Complexity group and the High Level Complexity group. In addition to these findings of statistical significance, a rich array of qualitative comment data was provided by the esurvey respondents. Three general themes were identified within the comment data. The respondents indicated that when ISD is successfully used, they generally have an accepted model or procedures of conducting ISD which are used to guide the process. The respondents also clearly indicated that the barriers to successful implementation of the ISD activities included contextual and resource issues such as client and management support, sufficient time, and adequate funding. An additional theme was indicated concerning the use of ISD activities within the academic and university environments. Although not specifically asked to identify this type of environment, a group of respondents provided vivid information concerning special concerns and problems with the practice of ISD in the academic context.

An Investigation of Instructional Systems Design Practice

Via Esurvey Methodology

Chapter 1

Introduction

Recent review of relevant literature indicates that the current social science research paradigms do not yet fully support the optimization of characteristics inherent within the emerging information technologies. While the structure of the emerging Instructional Systems Design (ISD) models are responding to the influences of information and communication technologies, research practices and evaluations of new instructional technology learning products appear to be lagging behind the actual needs of the practitioners in the field. Although some innovative marketing research is being conducted, and research paradigms in the educational psychology field have broadened to include qualitative data such as case studies, ethnographic, and observational studies (Richey, 1995), ISD researchers appear to be adhering to the more traditional methodologies of investigative research.

With the emergence of the new technologies of the information and knowledge age, when the speed, intensity, and complexity of change increases constantly and exponentially, our ability to shape change depends upon our ability, competence, and willingness to create systems that have "goodness of fit" with the emerged new realities (Banathy, 1994). Banathy (1994) discusses that in times of accelerating and dynamic changes, when a new era is unfolding in societal evolution, inquiry must not limit perception by focusing within the existing system. Rather, inquiry should direct attention

to adjust or modify the old design in which many of our systems are still rooted. As media evolve, research organizations are encouraged to empirically test new methods which appear promising in the context of the inherent characteristics of the medium being measured. Methodological experimentation is encouraged within the Coalition for Advertising Supported Information and Entertainment (CASIE) guidelines (CASIE, 1995). Research organizations are encouraged to be innovative in methods and practice by considering not only the methods already established, but also the possibility of new methods of particular promise for the new media. The CASIE principles place the burden of proof of the validity of the measurement, and of conclusions based on the measurement, on the particular research organization (CASIE, 1995).

Evolving Instructional Systems Design research indicates that effective practice may consist of decisions to include some design activities and exclude (or minimize) others. The Wedman and Tessmer (1993) study identified reasons why design activities were sometimes excluded from ISD projects, but no attempt was made to determine why activities were included. Wedman and Tessmer (1993) suggested that future research, should attempt to understand when and why ISD activities are included in particular projects. Individual project complexity may greatly influence the inclusion or exclusion of ISD activities and may provide a significant indicator to address the issues of inclusion/exclusion, and levels of activities. Another factor which might be a significant contributor to the inclusion/exclusion of ISD activities is that of individual expertise. In addition, Instructional Systems Design evaluation activities have been shown to greatly affect the instructional quality of products (Department of the Air Force, 1995; Shapiro,

1995); however, this is a set of activities which are frequently only minimally conducted, or not at all, especially within the life cycle context of the instructional product (Department of the Air Force, 1995). Additional research can help establish an empirical basis for a practical model of Instructional Systems Design, development, and the employment of evaluation activities throughout the life cycle of the instructional system.

The development and implementation of the ISD esurvey contributes to the currently evolving ISD research foundation, and further contributes to the development of a rubric for measurement of ISD activities. In addition, the successful completion of this esurvey research project provides supportive indications for the validation of the esurvey as a social science research tool.

Research Objectives

The research objectives of this Internet esurvey project include:

- Analyze the inclusion and exclusion of ISD activities during Instructional Systems Design and Development projects.
- Explore the use of life cycle evaluation activities in ISD projects and practice.
- Analyze differences between novice and expert use of ISD practices.
- Explore the relationship between project complexity and the inclusion/exclusion of ISD practices.
- Explore the diversity of ISD esurvey respondents.

These research objectives were accomplished by designing an esurvey to be implemented via the Internet and targeted toward a large, heterogeneous population of Instructional Designers and Developers from educational, corporate, government, and technical environments.

Definition of Terms

- Complexity Level - the ranking of ISD projects according to factors such as the inclusion of multimedia instructional materials, the magnitude and breadth of instructional topics, and the number of instructional hours in the completed ISD product. Complexity is ranked according to three levels: highly complex, medium level complexity, and low level complexity.
- Context - The situational factors which influence the structure of ISD practices.
- Diversity of ISD background - This includes descriptive factors of the designers' varying experience levels and working environments.
- Esurvey - A questionnaire measurement instrument which is designed to be implemented via Intranet or Internet email systems.
- Expert - For this study, those respondents who rank themselves in the more than ten year experience category.
- High Complexity Level Projects - As defined in the esurvey instrument those projects containing multimedia, multiple topics, and numerous hours of instruction)
- Instructional Designer (ID) - For this esurvey, ID is used to indicate the person who is conducting the Instructional Systems Design (ISD) activities. (See ISD definition below.) Although in actual practice, this person may be hired under some other job title, including that of Instructional Systems Designer (ISD), in order to eliminate possible confusion, these somewhat arbitrary definitions are used to provide distinction between the use of ID as the Instructional Designer and ISD as the Instructional Systems Design theory, models, and practices. However, when included in actual respondent quotations, the terms will

not be modified unless required to clarify meaning which may not be obvious within the context.

- Instructional Systems Design (ISD) - For this esurvey, ISD is used to indicate the theory, models, and practices of designing instructional systems and the associated instructional products. Although some models refer to Instructional Systems Development, or just Instructional Design (omitting the system part), to simplify discussion, this study will refer to such theory, models, and processes as ISD. (Contrast this definition with that of the Instructional Designer.)
- Low Complexity Level Projects. - As defined in the esurvey instrument, mostly paper-based and/or instructor led materials which consist of 1-2 hours of instruction. Respondent data were categorized in the Low Complexity Level by selecting Item 1.
- Medium Complexity Level Projects - As defined in the esurvey instrument, those projects which contain some multimedia, several topics, and more than 1-2 hours of instruction. Respondent data were categorized as Medium Level Complexity by selecting Item 2.
- Novice - In this study, those respondents who rank themselves in the zero to six months experience category, or the six months to less than two years experience category.

Limitations

The limitations of the study include some pertinent issues concerning the sample population for the Internet esurvey methodology. The advantages and disadvantages of the methodology, and the possible impacts to the resulting data were carefully considered based upon the results of previous research in this area, and most importantly, in respect to the research objectives of this particular study. These issues will be more fully addressed in a separate section at the closure of the literature review.

Chapter 2

Review of the Literature

This section is structured to address each of the research objectives for the study. Following the discussion of this literature, a more general review of the documented use of esurveys in social science research is provided, as well as issues related to sampling limitations, and esurvey advantages and disadvantages.

The Inclusion and Exclusion of ISD Activities

Surveys of ISD practice have indicated that traditional ISD models are not based upon actual practice (Tessmer & Wedman, 1990; Wedman & Tessmer, 1993; Zemke, 1985). The Zemke (1985) research identified eleven basic activities that are represented in the majority of ISD models. The Tessmer and Wedman research practice studies (Holcomb, Tessmer, and Wedman, 1996; Tessmer and Wedman, 1995; Tessmer & Wedman, 1990; Wedman & Tessmer, 1993) have been based upon these eleven ISD activities:

- Conduct a needs assessment
- Determine if the need can be solved by training
- Establish learning objectives
- Conduct a task analysis
- Identify the types of learning outcomes
- Assess the trainee's entry level skills and characteristics
- Develop test items

- Select instructional strategies
- Select instructional media
- Pilot test instruction before completion
- Conduct a follow-up evaluation after training

The recent research conducted concerning Instructional Systems Design (ISD), its practice, and its models has indicated that in general, the practice of ISD does not adhere to any one specific model, but rather that ISD practices are tailored to fit the requirements and constraints of the situational context for each particular project (Holcomb, Tessmer, and Wedman, 1996; Tessmer and Wedman, 1995). The Layers of Necessity Model (Wedman & Tessmer, 1990) is an adaptive ISD model which has been successfully used for business training. The authors described the Layers of Necessity Model as a combination of several models which range from simple to complex. The Layers of Necessity Model is supported by research which indicates that designers create multiple layers of Instructional Systems Design activities depending on the different design situations (Tessmer & Wedman, 1992; Wedman & Tessmer, 1993). They also identified a number of variables which contribute to the inclusion or exclusion of different steps or activities which are grouped in layers within the model (Wedman & Tessmer, 1990). The model suggests that designers may choose one or another layer according to different contextual factors. The contextual factors are identified as "load", or the costs of undertaking a certain activity, "payoff", or the benefits that result from an activity, and "pressure" from the organizational and situational demands (Wedman & Tessmer, 1990).

Independent doctoral research (Hendrix, 1992) was being conducted on a subset of the ISD subjects responding to the surveys which were the foundation of the 1992 and 1993 papers by Tessmer and Wedman. The Hendrix (1992) survey contained only qualitative open-ended items, whereas the Tessmer and Wedman research consisted of rating the inclusion of various ISD activities (Tessmer & Wedman, 1990; Tessmer & Wedman, 1992; Wedman & Tessmer, 1993). Upon analysis, the qualitative survey results were very similar to, and strongly supported, the results reported by Tessmer and Wedman (1992) and Wedman and Tessmer (1993), indicating that many constraints inhibit conducting all ISD activities, to an in-depth level, for all projects. The qualitative survey data contained vivid and rich examples of situational factors serving to inhibit the practice of ISD, according to the traditional models (Hendrix, 1992). Depending on the time and resources available for design and development activities, a different layer (or model) may be selected for use (Wedman & Tessmer, 1990). In situations of severe time and resource limitations, only the simplest layer might be used. For situations with more time and resources, a more in-depth layer may be selected.

As a guide to effective practice, ISD models should reflect the design context of the project needs. The Tessmer and Wedman (1995) contextual model outlines some context-sensitive design practices for designers to consider. In this model, the instructional or design context consists of the resources and constraints that affect the design effort in a particular project. Some design context factors indicated are time, money, designer expertise, client values, available technologies, and organizational culture. The design context affects how much time, energy, and resources are expended on various ISD tasks.

The design context also influences where the ISD activities are concentrated. For example, limited time may dictate that only one-to-one formative evaluations are used, or that only the macro-level instructional strategies are specified (leaving micro-level strategy decisions to the instructor). Or, client values may require that an exhaustive needs assessment be conducted, even at the expense of other ISD activities. Relevant design context factors affect the "size and shape" of design tasks in ISD projects (Tessmer & Wedman, 1995).

Though it lacks specificity, the contextual model is more aligned with design knowledge and experience. ISD models are becoming more holistic and visionary. Layered analysis, instructional scenarios, and prototyping allow several design activities to be performed concurrently (Tessmer and Wedman 1995). An emerging trend found in cross-disciplinary studies of the design process is that designers solve problems by envisioning solutions early in the design process and then use these images to further detail the design problem. The visioning process is consistent with what is understood about solving ill-structured problems. Studies of designer problem solving indicate that a solution model is envisioned early in the design process, with successive refinements as the model is further considered. This is discussed as an analysis by synthesis approach (Tessmer & Wedman, 1995).

The early solution, or prototype, is a synthesis of preliminary front-end analysis considerations and product features. To prototype is to develop an executable version of a product which incorporates key elements of the final version, but which is incomplete in terms of functionality, robustness, or exception handling. The purpose is to demonstrate

the conceptual structure of the product without incurring the expense of the full product development cycle. Rapid prototyping is the process of quickly building and evaluating a series of prototypes. The advantage of rapid prototyping is that the designer and client may experiment with, and evaluate a number of design approaches, before committing to one for further development (Jones, Li, & Merrill, 1992).

This solution is used to help generate further front-end information by providing the designer and client a prototype for stakeholder feedback and further refinement. For example, picturing how a training workshop might be implemented provides the designer guidance on the strategies, media, and content that may be effectively included. As a complex problem solving process, Instructional Systems Design is conducive to the visioning and prototyping process. In this respect, ISD is becoming a more holistic process, which is embedded in the project context rather than in an abstract model (Tessmer & Wedman, 1995).

Prototyping has been used to concurrently analyze, design, and evaluate multimedia. The use of concurrent design is another approach to adapting to the design context. In concurrent design, several ISD tasks are combined so that they may occur at more or less the same time, rather than sequentially. Using a concurrent design approach, it is possible to successfully design instructional materials and develop prototypes of instructional materials while still doing the task analysis activities (Tessmer & Wedman, 1995). The concept of concurrent design is also proposed in a model created to guide the design and development large military training systems, where hardware and software simulation devices are being created simultaneously with other multimedia instruction

(Hendrix and Moore, 1995). This model combines Systems Engineering (SE) concepts and phases with the traditional military ISD concepts and phases, proposing the ISD/SE Concurrent Engineering model. Hendrix and Moore (1995) believe that using such a model would allow Systems Engineers and IDs to work together to concurrently design and develop a comprehensive training system which supports progressive fidelity simulation and the optimization of learning critical, complex motor and cognitive skills. Further, the model is intended to avoid a common pitfall in such complex systems, that of a mismatch between simulation training devices and the supporting multimedia preparatory training. Concurrent design allows designers to adjust design activities while responding to time, resources, and other design context factors (Tessmer & Wedman, 1995).

Observations from practicing Instructional Designers support how "true to real life" these research findings are. There are a myriad of situational factors which contribute to, or inhibit, the success of ISD projects. Many times, important design decisions are not within the Instructional Designer's control (e.g., the media is pre-determined, such as web-based training, or video-based instruction). In addition, success of a project is determined by many more factors than just user acceptance and successful completion of course activities, tests, and skills performance examinations. Numerous levels of stakeholders are often involved. For example, a recent project involved a pre-determined requirement, that of producing full-motion video segments to be played on an operational use networked system. This requirement was insisted upon by a high level management stakeholder. A contextual analysis of the customer's networked computer system caused

the ISD team to think otherwise. They advised the stakeholder that in this situation, full-motion video was not required to ensure instructional effectiveness, and that its file size and performance requirements would likely stress the operational system, and result in overall poor product performance and poor operational use system performance. After the stakeholder refused to modify the product specifications, some prototype testing quickly showed that the customer's networked operational system could not support added full-motion video without serious system performance detriments. The testing of this prototype, built to customer specifications, was seen as a failure within the client organization. However, it did provided critical indications of an important decision that the corporation was facing, that of updating and enhancing their operational system, prior to implementing added instructional and performance support information to function on the same networked computer system. Was the project really a failure? Instructionally, the prototype contained several types of multimedia lessons and skill tests, and the end user feedback was very positive, regardless of the technical performance difficulties of running the system. The success of ISD projects probably has as many definitions as it does stakeholders (i.e., to the program manger, success is completing within budget, making adequate profits; to the graduate, success is enabled job performance; to the designer, success is a useable, accepted product, to the customer stakeholder above, success would have been full-motion video instruction on his current operational system, etc.).

Holcomb, Tessmer, and Wedman (1996) discuss problems of defining "success" in their study of ISD activities and project success. What they had considered to be clear-cut

was more problematic than expected. They had operationally defined "successful courses" as courses that "brought about changes in students' behavior and had a positive impact on the problem the training was designed to address". They found that designers' definitions of success are more complex, and may include somewhat peripheral, yet relevant issues such as the effects of the training on "organizational payoff" and "interpersonal relationships." The researchers suggest that providing multiple measures of project success from various perspectives may increase the likelihood that the more successful projects are differentiated from the less successful ones (Holcomb, et al, 1996).

Life Cycle Evaluation Activities in ISD

Most traditional evaluation and assessment procedures are limited to examining the relatively short-term learner outcomes (Richey, 1995). While learner outcomes are clearly one factor requiring evaluation to ensure project success, there are also many other factors, such as on-time and under-budget project completion, and the overall client satisfaction with the results of the instructional product. A continuing problem within research and corporate ISD practice, is the failure to adequately consider the life cycle of the instructional product, when determining factors such as success.

In two separate works, Rice (1984) and Johnston (1984) discuss the diffusion and characteristics of the new information technologies and special consideration for the evaluation of these technologies. Both authors note that while communication technologies such as electronic mail and computer conferencing are proliferating rapidly, summative evaluations of the technologies have been few. Typically, the technology need is evaluated at a formative stage, but then several variables (including funding) have

hampered the summative evaluation of these technologies. Rice (1984) suggests that new information technologies be evaluated from a diffusion framework, while Johnston (1984) suggests that naturalistic observations, case studies, and product testing may be appropriate methods of evaluation.

Contemporary military ISD models have incorporated life cycle evaluations within the overall process, and typically consider ISD and its internal evaluation as having formative, summative, and operational phases (Department of the Air Force, 1995). The eleven ISD activities that were used in the Wedman/Tessmer research indicate the pre-occupation of considering ISD as activities which would occur primarily in the formative stage of the instructional product's life cycle. Only the final activity assessed, that of conducting a follow-up evaluation after training, could be considered a summative evaluation activity, and although this also occurs in operational evaluation, there were no indications that the researchers considered such a possibility.

It has been suggested that ISD should include standards of development and that these standards should be generic in nature and flexible enough to incorporate the specific needs and requirements of the project (Lee, 1993). According to Lee (1993) standards should be developed before beginning a project and should be used to guide the quality of the product during development and the evaluation of the product during the formative and summative evaluation activities (Lee, 1993). While occasionally activities within the summative evaluation phase are mentioned within ISD literature, there is a sparsity of research which considers the operational evaluation phase of an instructional product. Richey (1995) discusses that ISD models now frequently address both formative and

summative evaluation, with these activities being enhanced and expanded. Private sector training is mandating increased emphasis on accountability for trainers and educators. Assessments are moving toward evaluating the application of knowledge and skills and whether the training is sufficient for proficient job performance, rather than only evaluating learner reactions to the instruction and basic knowledge acquisition. According to Richey (1995), concerns for more permanent and meaningful outcomes for education and training are reflected in the addition of "confirmative" evaluation to the ISD model. This type of evaluation determines the continuing competence of learners and the continuing effectiveness of the instructional materials (Richey, 1995). However, Richey's (1995) description of confirmative evaluation still does not fully address operational evaluation requirements. The Action Learning Design Model (Davies, cited in Tessmer and Wedman, 1995), proposes the consideration of three basic contextual aspects, that of the pre-instructional environment, the instructional environment, and the post-instructional environment. These three environmental contexts, discussed as influencing the analysis phase of ISD, do seem to correspond to the formative, summative, and operational evaluation phases of an Instructional Systems Design project.

What is particularly ironic about the failure to consider operational evaluation in ISD activities, is that the data required to provide answers for what many stakeholders really want to know (return-on investment, contributions to the corporate goals, etc.) cannot be obtained except during the operational phase of the instructional product's life cycle. This is especially clear when considering other evaluation models, such as Kirkpatrick's Four Levels of Evaluation. Kaufman, Keller, and Watkins (1996) discuss

contextual and situational considerations concerning Kirkpatrick's Four Levels of Evaluation model, which is congruent with the more recent ISD literature. What they failed to discuss is the limitations of the Kirkpatrick model in relationship to the stages of the product's life cycle. The following table has been generated to cross reference Kirkpatrick's Four Levels of Evaluation with the life cycle evaluation stages of the training products (formative, summative, and operational evaluations).

Kirkpatrick's Four Levels of Evaluation	**Formative Evaluation**	**Summative Evaluation**	**Operational Evaluation**
Level 1: Reaction. how learners feel about instruction.	data used for revisions prior to implementation	data used for course revisions and validation	data used to determine update/revision requirements
Level 2: Learning. learner performance on in-class tests.	data used for revisions prior to implementation	data used for course revisions and validation	data used to determine update/revision requirements
Level 3: Behavior. extent to which learners implement, or transfer, what they learned.	no data available	data used for course revisions and validation	data used to determine improved performance. contributions to job performance
Level 4: Results. organizational performance or return on investment derived from training.	no data available	preliminary data may provide some indications	data used to assess impact to overall organizational performance

Table 2.1 - Life Cycle Evaluation Matrix

Many client stakeholders and evaluation practitioners do not fully comprehend the data requirements that are inherent within the Four Levels of Evaluation. In the formative phase of the project, only valid data for Levels 1 and 2 can be obtained; "evidence" for Levels and 3 and 4 are not yet available.

Novice and Expert use of ISD Practices

Individual levels of ISD expertise may significantly affect the inclusion or exclusion of various ISD activities. In the Holcomb, et al (1996) study, the experience level of the

IDs was as little as one year of ISD experience and one training project completed. Instructional Designers with as little as one year experience and one project would still be considered as novices, and thus may include different sets of ISD process steps than would an expert, who may consider certain variables, without actually conducting the activity as a formal process. In some cases, the expert may quickly access what the needs and/or requirements are, and then move on to following considerations, without even consciously realizing that an "activity has just been completed". For example, the ISD expert may be very familiar with the target audience, having already designed/developed for that same audience, and thus may not even consciously consider that perhaps a target population analysis should be completed and that in this case, the target population analysis is not required.

The of the difference between novice and expert is similar to the discussion by Engle (1992) of "knowing that", "knowing how", and "knowing why". "Knowing that" requires knowledge of facts and a knowledge of skills, but "knowing why" also requires a rationale for explaining why some pieces of knowledge and some particular skills apply to the specific situation. Knowing how implies use of both what is known. Engle (1992) succinctly notes: "Theory (knowing that) can inform practice. Practice (knowing how) can inform theory. The relationship between them can be determined by sufficiency of reasoning each bring to the other (knowing why).

In Rowland's 1992 study, "What do Instructional Designers Actually Do? An Initial Investigation of Expert Practice," several areas to be studied in future research were identified in order to extend the work on design expertise. These included:

- the effects of content and context expertise on designing
- the effects of the designer's frame of reference or perspective (and the perspective of others involved) on designing
- the nature of development from novice to expert (e.g., the identification and description of stages)
- and the social aspects of designing

The objectives of the esurvey project address the effects of context on the inclusion and exclusion of ISD activities by both expert and novice designers. The results of this investigation can be expected to provide meaningful indications to contribute to defining the process of development from novice to expert in performing ISD activities.

The findings of Rowland's (1992) study supported the following heuristics concerning expert ISD practice.

Expert IDs:

- think about systems and performance; instruction is just one possible solution
- get help when they do not have content and context experience
- seek verification and don't believe everything they read or hear
- look for root causes rather than quick fixes
- generate possible solution ideas early but delay commitment to them
- consider how each decision will affect other decisions
- ask "What would happen if we tried this?" as well as "If this is the situation, then what solution is appropriate?"
- balance technique and artistry

Project Complexity and the Inclusion/Exclusion of ISD Practices

Although Holcomb, et al, (1996) did not report data concerning the size and scale of the completed ISD projects rated in their study, it can be assumed that this is variable, as required for each particular type of training project. One might expect that varying types of instruction may strongly influence the inclusion or exclusion of some ISD activities due to significant differences in instructional strategies and media selection. For example, if the instructional strategy included computerized adaptive testing, then an analysis of skills and characteristics, and the development of test items would be absolutely required and must be conducted jointly to identify and appropriately measure progressive skill levels.

Diversity of ISD Esurvey Respondents.

What is particularly interesting about the Holcomb, Tessmer, and Wedman (1996) problems concerning the operational definition of success, is that they were gathering/considering data from designers in only one particular corporation. All forty of the sample had undergone the same introductory ISD training, thus one might have expected to find more similar definitions of success than that from a larger and more heterogeneous sample of Instructional Designers (i.e., IDs from educational, government, and corporate environments, with more varied ISD training background).

The Use of Electronic Surveys in Social Science Research

Another purpose of the study was to examine the use of esurvey methodology as a possible technique to offset sampling limitations often seen in ISD survey research. Past discussion of computer technology as applied to surveys has focused almost exclusively on

sample selection and the statistical processing of data. While this is an important component of the survey research process, it is now possible for other components to be automated and integrated into a complete system. Since computer administration of surveys is a relatively new phenomenon, little research has been done comparing this method with other data collection methods. The most recent edition of The Survey Research Handbook (Alreck & Settle, 1995), makes no mention of the use of computers for survey research other than for statistical analysis and data presentation purposes. Other survey research handbooks likewise failed to mention the possibility of an electronic survey as a research tool (Handbook of Survey Research, edited by Rossi, Wright, & Anderson, 1983, includes a brief discussion of computer-assisted telephone interviewing; A Handbook of Social Science Methods, Quantitative Methods: Focused Survey Research and Causal Modeling, edited by Smith, 1985, does include using computers for sampling and causal modeling, as well as, data analysis; Survey Research Methods, by Fowler, 1988, includes a brief discussion of computer-assisted telephone interviewing; and Designing and Conducting Survey Research: A Comprehensive Guide, by Rea & Parker, 1992, discusses computer use for data analysis and data presentation). Even the recent guidelines from the Coalition for Advertising Supported Information and Entertainment (CASIE, 1995), which point out that data collection methods vary significantly, and may include "diaries, personal interviews, telephone recall/interview, and various types of electronic meters as fitting to the nature of the medium" (CASIE, 1995), fail to mention the possibility of using email, or other types of electronic surveys, to conduct research.

Although a few specific references were found for electronic surveys in general, more literature from related fields such as library science, information science, psycho-social research, and the military were discovered by searching the ERIC, Psychlit, and Sociofile databases. Several information and library science articles discuss the nature of email communications and electronic publishing in general. Tsai (1992) discussed email communications in research and education for a communication network in universities and colleges. He examined speed of message delivery and the message content. Tsai (1992) observed that prior knowledge about the email system operations, as well as, knowledge of the subject field, affects the degree of effectiveness for each email communication. Doty (1992), discussed electronic networks and their impact on social change in the sciences. He notes that the existing infrastructure in science is dependent upon print and that the long-term effects of the increasing reliance on networks in science, and its implications for the social infrastructure of research and scientific communication, must be researched. Significantly, Doty (1992) cautions that as researchers, we must "avoid the extremes of technophobia, which characterizes technology as a demon, and technophoria, which sees only an angel. Only then will electronic networks be able to achieve their full value." Schauder (1993) discussed the use of electronic publishing of professional articles. He noted that there are two conflicting ideologies within academia; one is the tradition of freely sharing academic knowledge and the other is the tradition of the prestige journal. Somewhat surprisingly, Schauder provides very positive conclusions concerning the future of electronic publishing and notes that from the academic viewpoint, it will provide greater diversity and choice among researchers. He also provides

recommendations to ensure that both ideologies are upheld and defended. Indeed, Lucia (1993) provides a brief description of a survey project where results were published on an Internet Gopher in order to facilitate the process of sharing the data with other university organizations.

In "Future Issues of Computer-Mediated Communication", Holden and Wedman (1993) found that although applications of computer-mediated communications (CMC) continue to evolve, that most colleges and universities have no plan to prepare for future development and that a vision of CMC needs to be formulated. Their research indicated that teachers envision CMC only as supporting common classroom activities such as sending and receiving assignments and distributing electronic handouts. Faculty resistance to CMC was identified as the major obstacle to the growth of a more extensive vision of CMC (Holden & Wedman, 1993).

A review of the limited literature related specifically to electronic email and surveys for research indicates that Sproull and Kiesler (Sproull & Kiesler, 1991; Kiesler & Sproull, 1986; Sproull, 1986; Kiesler, Siegel, and McGuire, 1984) have the most documented experiences using electronic surveys and email for data collection. Another electronic survey example used a software system (not email) developed for the Navy Personnel Research and Development Center (Doherty, 1985; Ripkin, 1985). The example closest to this researcher's personal vision of an electronic/email survey (esurvey) was reported by Sudmalis (1992). Sudmalis used an esurvey to gather data to describe the demographics of the BALT-L on-line discussion group. Data from the survey was exported as an ASCII file and imported into a statistical program in a fixed data format.

In another case, Schiller (1994) reports using an esurvey to investigate the teaching of Internet skills by librarians and computer center personnel; while the administration of this esurvey was similar to that proposed here, Schiller (1994) does not indicate that the resulting data set was electronically imported directly into the statistical program for data analysis.

Another esurvey was conducted in June 1994, as reported by Lucus (1994). In this case, the Texas Center for Educational Technology (TCET) was asked to provide information and documentation to support the requirement for telephones in K-12 classrooms. Since TCET did not have information on file concerning the use of telephones and telephone lines in education, the request for information was forwarded to educators worldwide via the Internet. Several educational listserves and conference groups on the Internet posted a request for comments, observations, and opinions from educators having experience with telephones in the classroom. Lucus (1994) notes that the email solicitation provided connections to content experts from around the world. Responses were received from large and small schools (public and private) and geographically, responses came from school districts all across the United States and from Australia.(Lucus, 1994).

Kiesler and Sproull (1986) suggest that one way to evaluate the electronic survey would be through a comparison of the nonsampling errors, with that of other survey methodologies. Beyond the obvious economic advantages, "the utility of the electronic survey will depend on its comparability to other methods of survey administration. This comparability is not obvious because the electronic survey both shares characteristics of

various other methods and has some unique features of its own" (Kiesler & Sproull, 1986). Nonsampling errors are frequently more difficult to understand and control than sampling errors. Nonsampling variability (or errors) can be subdivided into response or "measurement" variability, which are the effects or errors for answers that are obtained, but are in some sense "wrong"; and nonresponse variability (or errors) due to people who were left out of the frame, left out of the sample, or did not answer specific questions (Tanur, 1983). Some non-sampling errors are essentially random, for example copying errors. The magnitude of random errors can be controlled by selecting a sample that is sufficiently large. Random errors will tend to cancel out as the sample size increases, although the error will increase the variance of estimates (Tanur, 1983). Other nonsampling errors, such as memory errors and systematic coding errors, will tend to cumulate and cannot be decreased just by increasing the size of the sample (Tanur, 1983).

Three scholarly papers are of particular interest concerning research conducted via esurveys. One by Goree and Marszalek (1995) discussed ethical issues related to some of the disadvantages of an esurvey. Another, by Thach (1995), discussed overall advantages and disadvantages to be considered when using electronic mail to conduct survey research. The third paper, by Foster (1994) discussed advantages and disadvantages and on-line user reactions to an initial attempt at conducting an Internet email survey. The most obvious disadvantage is that not everyone has access to computers or are comfortable using them. For the most part, esurvey advantages and disadvantages can be categorized as design issues, sampling and implementation issues, and response findings (Goree and Marszalek, 1995).

Sampling Issues: Probability vs. Non-Probability Samples

The two most important factors affecting the final sample are the availability of funding and the availability of population frames (Frankel, 1983). These two factors will define a possible set of sample design alternatives. Fowler (1988) also says "within the limits of funding, the availability of sampling frames, and the objectives of the study it may not be possible to determine a single sampling design that is optimal to all the major study objectives." Usually the design of the study includes more than one basic objective. An adequate sample size depends on a number of factors, including the purposes of the survey and the characteristics of the population that is being sampled (Tanur, 1983). As researchers, we must consider the priority order and tolerable range of sampling errors, and their impact within the multiple objectives of the research. The advantages and limitations among various sample alternatives should be assessed with respect to the research objectives.

There is disagreement among survey researchers concerning the importance of probability sampling. "The federal government generally will not fund survey research efforts designed to make estimates of population characteristics that are not based on probability sampling techniques. Most academic survey organizations and many nonprofit research organizations have a similar approach to sampling" (Fowler, 1988). However, almost all major public opinion polling groups, political polling groups, and market research organizations rely solely on nonprobability sampling methods (Frankel, in Rossi, et al, 1983).

Probability samples are selected when the sample design explicitly gives each element in the population a known (calculable) nonzero probability of inclusion in the sample. This process may be accomplished through the use of a random numbers table or computer program. Adherence to probability sampling is intended to ensure that various techniques of statistical inference may be validly applied in the projection of sample results to larger population. When probability sampling was first introduced to survey research, many felt that although the method was scientifically sound, it was too costly and restrictive. Some researchers predicted that after a period of time, probability sampling would be discarded in favor of traditional quota or purposive (nonprobability) methods (Fowler, 1988).

Samples that do not qualify as probability samples are classified as nonprobability samples. Nonprobability is a selection approach that does not designate specific individuals and does not allow the calculation of response rates. Some examples of nonprobability sampling procedures include quota sampling and "random walk". Quota sampling sets specifications regarding the number of people of various kinds that must be interviewed; In random walk, the researcher starts at a randomly selected point in the district, then follows a route where houses are called upon at fixed intervals (Hoinville, 1978). Fowler (1988), discusses that although the assumptions of probability theory and sampling error do not apply to nonprobability sampling methods, these methods can produce cost savings for individual interview surveys and for telephone surveys (however, Fowler does not discuss mailed, nor email, surveys in relation to nonprobability sampling). He notes that the resulting samples often produce data that look similar to probability

sample data. Frankel (1983) also acknowledges that inferences drawn from nonprobability samples may have a good chance of being correct. He cautions that researchers must evaluate the sample's ability to produce reasonably accurate inferences.

Fowler (1988) advised that if a researcher decides to use a nonprobability sample, to explain how the sample was drawn, the fact that it likely is biased in the direction of availability and willingness to participate, and that the normal assumptions for calculating sampling errors do not apply. Frankel (1983) also notes that the use of nonprobability sampling does not necessarily guarantee that the use of the techniques of statistical inference will produce invalid conclusions.

Sampling Issues: The Internet Esurvey Sample

Although phenomenal growth of the Internet and its use are indicated, it is not possible to determine the exact size of the Internet, where hosts are located, or how many users there are (Internet Domain Survey, 1996). The results of the Internet Domain Survey (1995) indicate that the net continues to double in size approximately every 12-15 months. There is no way to determine how many users are on the net, besides making guesses and estimates. The researchers consider the numbers presented in the domain survey to be fairly good estimates of the minimum size of the Internet and they note that it is impossible to know if there are hosts or domains that could not be located (Internet Domain Survey, 1996).

The NOP Research Group (1995) has provided the first profile of Internet users. The survey was conducted face-to-face among a nationally representative sample of 5660 people, aged 15 and over, and was based upon the global information network in the

United Kingdom. According to the research team, use of the Internet for commercial purposes is being hampered by an absence of research into who is using the network. Although there has been a great deal of interest in the Internet as an advertising medium, it is difficult to justify its use without understanding the people it reaches. NOP's research findings are beginning to fill that gap in knowledge.

According to the latest survey from NOP Research Group (1995), almost one in five people who have bought a personal computer in the last year have used it to 'surf' the Internet, and a quarter expect to do so over the next twelve months. Almost sixty-five per cent of people who use the Internet are between the ages of 15-34, with 25-34 year olds accounting for 34% of all users. However, the young do not dominate the network. One third of Internet users are between the ages of 35-54 and six per cent are over the age of 55. The survey also reveals that roughly 35% earn over £25,000 per year and that one quarter of Internet users travel abroad on business. While it has been informally suggested that the Internet is almost exclusively a male domain, the NOP data reveals that about one third of Internet users are female.

The NOP Research Group (1995) findings show that use of the Internet has been largely confined to a technically-minded business audience who have ready access to PCs (personal computers). However, with 6% of individuals having bought a PC in the last twelve months and the same number expecting to buy one over the next year, combined with Internet usage growing by 10% per month, they conclude that the information network looks "poised to go mainstream" (NOP Research Group, 1995).

Kiesler and Sproull (1986) discuss that the sampling frame of an esurvey is restricted to members of organizations and populations who have access to computers and to people who feel comfortable using them. "Until such time as computers and networks spread throughout society the electronic survey will probably be infeasible for general surveys" (Kiesler & Sproull, 1986). At that time, more limited applications of electronic survey were being used. In 1973, Griest and Klien (in Sproull, 1985) used portable computers to collect diagnostic information directly from psychiatric patients. Researchers also use portable computers in shopping centers and convention centers to carry out market studies. Computers are also used in military bases and business firms to carry our personnel research, and in schools and government agencies to carry out program evaluations.

Schiller (1994) discusses the survey sample was one of convenience. The electronic survey was posted to four electronic discussion groups which were likely to contain members of the two desired populations of library staff and computer service center staff. Schiller discusses that the results of her study "provide an exploratory overview and comparison of the efforts being made by some members of the two groups of librarian and computer center staff, in the areas of Internet access and instruction." Schiller (1994) includes the caution that the results of the study "should not be taken as conclusive evidence about the nature and degree of Internet training offered in academic institutions." However, she does cite the benefits of the findings as "suggesting emerging service patterns, possible relationships between library and computing services staff, and ways of integrating and improving Internet training across the two campus units" (Schiller, 1994).

Research has supported that better educated persons are more likely than less educated persons to respond to mailed surveys without prompting (Fowler, 1988; Rossi, et al 1993). This finding is very similar to Kiesler and Sproull's (1986) description of the population of interest for an electronic survey, i.e., "the population will be a community or organization with access to and familiarity with computers or computer networks. These groups will tend to be relatively well-educated, urban, white-collar, and technologically sophisticated." Based upon these observations, an email study posted to relevant professional electronic discussion groups would probably result in a substantial response rate; however a problem concerns the use of probability or nonprobability sampling methods. The Sudmalis (1992) study calculated response rates based upon the average total number of member addresses active within the BALT-L electronic discussion group during three periodic measurement sessions; however, Schiller (1994) noted that it would be impossible to accurately determine the response rate of her electronic survey due to "agency or organizational" member addresses on the email mailing lists which provide access to numerous individuals. Schiller also mentioned that recipients of the email survey may forward the instrument to others and speculated that their response of 128 completed surveys probably represented a small fraction of the total membership of the four lists.

Although neither Schiller nor Sudmalis specifically described their sample as one of probability or nonprobability, clearly the Schiller study used nonprobability methods. The Sudmalis study attempted to calculate an estimated response rate, but survey respondents were self-selected in that they had to be active in the discussion group at that time and where not randomly selected from the entire list of subscribers. Some of the general

survey research handbooks (cited earlier; Alreck & Settle, 1995; Rossi, Wright, & Anderson, 1983; Smith, 1985; Fowler, 1988; and Rea & Parker, 1992) included a few brief paragraphs on nonprobability sampling. Nothing they addressed was analogous to an Internet esurvey situation. This issue of electronic nonprobability sampling deserves more investigation to determine the significant impacts expected from such a sample. The benefits may far outweigh the drawbacks when the population frame is appropriate to the Internet environment.

If feasible, a probability sample should be selected; this could be determined by using a methodology of activity measurements similar to that described by Sudmalis (1992). However, because the characteristics of the sample who are likely to respond would be similar to those of desired population (i.e., better educated and technologically literate) it may not be too bad of a trade-off to accept a nonprobability sample. It is very likely the type of respondents would be the same, regardless whether derived from a probability sample or a nonprobability sample. Therefore, a general posting to relevant discussion lists should solicit the type of respondent desired for the proposed study (i.e., an esurvey investigating the ISD activities included/excluded by practicing Instructional Designers, the expertise level of the designers, and any differences among respondent groups). Such a sampling approach would also take advantage of the optimal efficiency of the electronic survey (both quantitative and qualitative data can be assisted by electronic processing without hand-keying data).

Response Findings: Response Rates

A disadvantage of the esurvey is that it is not possible to know precisely whom one has reached with an electronic message. With mailed surveys, it is known in advance who receives the survey and it can be determined whether a response has been received from a particular individual. A researcher who uses a computer list server may or may not be able to get a list of the subscribers; one who uses a news group will not be able to know who receives the survey. Further, it is both possible and common for electronic messages to be forwarded or bounced to other email addresses. Therefore, even when a researcher limits a survey to subscribers of a particular list server, it is impossible to know for certain how many people have received the survey. Therefore, the return rate for an Internet esurvey is uncertain.

There is no agreed-upon standard for a minimum acceptable response rate (Fowler, 1988). The difficulties of getting the response rate to a reasonable level will depend on variables such as the nature of the sample, the nature of the study, how motivated people are, and how easy the task is for them. Generally, the response rate will be better if the sample is composed of motivated, well-educated individuals. However, Fowler (1988) also addresses that a consistent bias in mail surveys is that better-educated people generally send back mail surveys more quickly than those with less education. A mail study of a variable that is likely to be related to education will likely produce biased estimates unless steps are taken to achieve high overall response rates (Fowler, 1988).

Rossi, et al (1993) noted that mailed surveys work best with very specialized and highly motivated groups, such as members of professional organizations. Later, they note

that the self-administered survey "has the further appeal of possibly producing a higher response rate than could otherwise be obtained, when used to survey large groups of people simultaneously. Many more people can be reached than for individual, face-to-face interviews."

On the negative side, Fowler (1988) discusses that a generalization that holds up for most mail surveys is that people who have a particular interest in the subject matter or the research itself are more likely to return mail surveys than those who are less interested. In addition, most studies of the patterns of self-administered surveys shows that early returns are biased (Fowler, 1988). This would indicate that mail surveys with low response rates will almost always result in significant bias that is directly related to the purposes of the research.

Based upon the discussions of Rossi, et al (1993) and Fowler (1988), I would hypothesize that an esurvey would perform much like a mail survey in that the more educated would be more likely and quicker to respond to the esurvey. This is also supported by the findings of Kiesler and Sproull (1991) in their discussion of the esurvey sample characteristics. Since the population of interest for the proposed esurvey is one that would most likely be well educated, this type of bias may be advantageous to high response rates from the desired population.

Nonresponse is an important source of error in surveys. Even when a response rate can be calculated, it is usually not known what effect nonresponse had on the data because it is hard to learn much about nonrespondents. Fowler (1988) discusses that for mail surveys, bias due to nonresponse can be studied by comparing those who respond

immediately with those who respond after follow-up steps have been taken. To the extent that this approach is valid, such comparisons can be done just as well for esurveys (actually, the comparison process could be more easily conducted due to the ease of electronic data transport and manipulation for analysis). However, I would question (particularly in an esurvey) how closely "late responders" would actually compare to nonresponders. For the esurvey, basic impacts like Internet usage patterns (e.g., daily, weekly, weekends, etc.) may affect response rates more than any actual characteristics related to the survey objectives.

However, nonresponse to a sample survey may be related to the primary outcome variable. In studies of income or of alcohol consumption, potential respondents may not return what would have been socially undesirable answers. If nonresponse to a survey is related to the level of the outcome variable, then the sample mean of this outcome variable based on the respondents will generally be a biased estimate of the population mean (Glynn, Laird, and Rubin, in Wainer, 1986).

In Schiller's (1994) electronic survey concerning Internet training, the nonprobability sample was drawn from the electronic discussion groups. Although response rates could not be calculated, the researcher noted that with a response of one hundred and twenty-four surveys, the response rate probably only represented a small fraction of the total membership of the four electronic discussion lists. However, Schiller also noted that the people in the targeted groups who responded to the survey probably represented those more heavily involved in Internet training and support (Schiller, 1994).

Doherty (1985) reported that the computer terminal used to administer the surveys in the military project was perceived as interesting and involved the participants in the task. Doherty speculated that the identified sample would be more likely to agree to respond to a computer delivered survey. However, these subjects were military personnel who were required to provide the data by completing the computer delivered survey.

Sudmalis (1992) reported a response rate of 14.34 percent from two listserves receiving the esurvey. There were also eight responses from unknown subjects, which represented cascading redistributions of the esurvey.

Response Findings: Response Effects

Response effect is the tendency of the respondent to give inaccurate or incorrect responses. These are potential sources of error and are primarily addressed in the context of an interview survey by Borg and Gall (1989) and Tanur (1983). However, Doherty (1985) and Kiesler and Sproull (1986) discuss response effects in the non-interview context. According to Kiesler and Sproull (1986), every survey administration introduces or encourages response effects. They report that face-to-face and telephone interviews increase respondents' desire to please the researcher more than in self-administered paper surveys. However, interviews may increase the quantity and detail of responses, while also increasing the over-reporting of socially desirable attributes or attitudes. In contrast, self-administered surveys are relatively anonymous compared to interview, and tend to reduce respondents' concern for presenting themselves in a good light. Therefore, Kiesler and Sproull (1986) suggest that while self-administered surveys may reduce the volume and detail of data, they should increase the accuracy of reporting negative information and attitudes.

Kiesler and Sproull (1986) note that like the telephone and face-to-face interview, the electronic survey is interactive. They speculate that interactive features such as computer prompts might increase the respondent's perceived control and attention, and result in increasing their involvement beyond that of a paper survey. Kiesler and Sproull (1985) also state "because the essence of both an electronic survey and the self-administered paper survey is answering questions presented via printed text, we expect responses to electronic surveys to be much like responses to a paper survey".

Doherty (1985) discusses research on response effects and concludes that "most sources of variation in the quality of survey responses may be attributed to what Orne (1969, in Doherty, 1985) originally referred to as the 'demand characteristics of the situation'. Doherty also cites Bradburn (1983, in Doherty, 1985) that "the characteristics of the task are the major source of response effects and are, in general, much larger than effects due to interviewer or respondent characteristics". The Sudman and Bradburn (1974, in Doherty, 1985) studies of the task characteristics in traditional paper and pencil surveys indicate there are few differences in the variability or quality of responses for different methods of presentation for all types of questions. Doherty (1985) again proposes that the use of the computer would allow researchers to systematically study the effects of situational variables.

Implementation Issues: Non-Intrusiveness and Privacy

The history of media research has been shaped in part by the need to keep searching for methods which interfere least with the respondents' usual behavior and ask as little as possible of the respondent. This is for two reasons: non-intrusive methods are less likely to bias behavior and/or reporting (less response error), and they are likely to gain higher cooperation and therefore less non-response error. The principle of non-intrusiveness rests upon voluntary, informed consent. Respondents, while perhaps not being told the entire purpose or the sponsor of the study (to avoid bias), must be told the kinds of information which are being collected about them, and they must be permitted to opt out of such data collection (CASIE, 1995).

Another implementation issue for the esurvey is that truly anonymous responses are not possible. The header which appears on the computer screen identifies the email address of the respondent. The sense of anonymity which encourages lengthy and honest answers on electronic surveys is, in fact, a myth (Goree and Marszalek, 1995). The CASIE principles also discuss that "privacy" in the age of electronic data banks, increased telemarketing, and direct mail, is a major issue for the government, for manufacturers, and for researchers. Many of the interactive media have the capacity, or potential capacity, to identify some or all of those accessing their medium. Particular care needs to be taken in such circumstances that user identities be kept secure, and that the user/respondents' privacy be respected by no more contact than is necessary for proper production and maintenance of accurate user estimates (CASIE, 1995).

Implementation Issues: The Bottom Line

The use of electronic surveys can revolutionize the process of data collection. Until recently, gathering quality information has been tedious and expensive, with paper questionnaires to print, distribute and collect, data to be captured, followed by the long wait for the final report. Several new esurvey software products have been developed to facilitate the data collection process via email. Some of these include Decisive Survey, Survey Tracker, and PinPoint Survey . Each of these commercial esurvey products were examined and some strengths and weaknesses common to all three were identified. The intended target audience for these products appears to be that of large corporations and/or agencies with an "Intranet" LAN or WAN, which is Windows based. This focus is apparent in information provided by PinPoint E-Surveys (1995), that PinPoint "is an integrated and deadly effective business tool which unleashes the full power of your email system. Without leaving your desk you can gather information across your entire network". The esurvey products are designed to be compatible with VIM and MAPI command language email systems, which include Microsoft Mail and Lotus cc:Mail. They are not however, entirely compatible with other more traditional Internet email programs such as Pegasus, Eudora, and Pine, which appear to be more likely used within the university research environments. Many corporate and university Internet email programs are still being accessed via a UNIX mainframe system. Many school systems access Internet email via a MacIntosh based system. While at least one of the esurvey software programs examined did provide an undocumented, and somewhat awkward and time consuming work-around for use with non-VIM and non-MAPI command language email programs, respondent email data could not be directly processed within the esurvey

system as intended in the product design. Due to the constraints and difficulties anticipated by using one of these commercial esurvey products (including costs, with a low of about five hundred dollars, to the highest cost of over seven thousand dollars), I have determined that for this particular esurvey research project, that a standard esurvey, designed within a typical email "envelope" will be used.

The overall advantage of an esurvey would be the ultimate time and cost savings obtained during administration, data transcription, and data analysis. An esurvey would facilitate the sending/receiving process, the prompting/reminding requirements, and returning/receiving of the surveys. The electronic data can be stored efficiently, accessed easily, and transcribed electronically (i.e., text and numerics can be converted to ASCII files to import into word processing or statistical programs). Reports can also be electronically generated and transmitted via email. Even the design and development process can be facilitated by email communications and feedback.

The following quotation is attributed to an Information Technology manager from a leading pharmaceutical company: "As a European IT support group, we regard the service we provide to our internal customers as paramount. In order to assess the level of service, we used PinPoint E-Surveys for our '95 pan-European customer satisfaction survey across 14 countries, to 1200 respondents via our worldwide MS Mail network. We achieved a 60% response rate with no reminder notices. The project was completed within 2 weeks - 3 to 4 times faster than conventional methods" (PinPoint, 1995). Yet, while the esurvey has great efficiency potential in the current age of budget constraints, some significant special considerations should also be examined.

Advantages and Disadvantages: A Summary of the Literature

The following table provides a summary of the overall advantages and disadvantages of an esurvey.

Advantages and Disadvantages of Electronic Mail Surveys	
Advantages	**Disadvantages**
Cost-savings: Less expensive to send questionnaires over on-line network than to pay postage for paper questionnaires or interviewers' salaries.	**Sample demographic limitations:** Population and sample are limited to those with access to a computer, on-line network, and Internet email.
Ease of editing/analysis: Simpler to make changes to questionnaire after pretesting and easier to copy and sort data, since it doesn't have to be re-typed.	**Lower levels of confidentiality:** Due to the open nature of most on-line networks, it is difficult to guarantee anonymity and confidentiality. Also, email contains the sender identification.
Faster transmission time: Questionnaires can be delivered to recipient in virtually seconds, rather than days as with traditional mail.	**Layout and presentation issues:** Constructing the format of a computer questionnaire can be more difficult the first few times, due to lack of experience for some researchers.
Easy use of preletters (invitations): Invitations to participate can be sent and responded to in a very short time, thus providing the researcher with an estimate of the participation level.	**Additional orientation/instructions:** Extra instructions and even orientation to the computer and on-line system may be necessary in order for respondents to complete the questionnaire on-line.
Higher response rate: Research shows that response rates on private networks are higher with electronic surveys than with paper surveys.	**Potential technical problems with hardware and software.** Although this can be a problem, it can be managed to not impact results.
More candid responses: Research shows that respondents will answer more honestly with electronic surveys than with paper surveys or in interviews.	**The esurvey population cannot be strictly controlled**. Email if often forwarded to others, thus causing cascading sample growth.
Potentially quicker response time with wider magnitude of coverage: Due to the speed of on-line networks, participants can answer in virtually minutes or hours, and coverage can be global.	
	Adapted from Thach, 1995

Table 2.2 - Esurvey Advantages and Disadvantages

Advantages and Disadvantages: What does it all mean?

Evaluations of survey design and errors should be within the context of whether or not the compromises made were the best ones, the intelligent ones, and the ones that would produce data appropriate to the intended purpose of the study (Fowler, 1988).

Although it seems clear that the esurvey has economic advantages in costs, labor, and time, there are problematic areas. Sample issues must be carefully considered. Are the trade-offs in accepting a nonprobability sample acceptable for this sort of "exploratory research"? Would it be possible to locate acceptable sample frames where potential sample members would have equal access to their email accounts? It is obvious that an esurvey methodology is appropriate only for those populations characterized by reasonably high use and access to electronic communications via local networks, wide-area networks, and/or the Internet. However, I do believe that the esurvey is worth developing as additional research tool for the arsenal. As Eisner (1992) so saliently reminds us:

Don't forget that the conduct of research is an artistic activity and the writing up of a research study an aesthetic problem. Scientific research, in the end, is a construction, and the more artistic in character, the better (Eisner, 1992).

Chapter 3

Research Methodology

An esurvey containing 36 items was constructed and delivered via the Internet by posting the instrument to a group of previously identified professional discussion groups. The esurvey was designed to follow the advise and cautions provided by Rossi, et al (1983) in the following quote: "In general, self-administered surveys should be kept as simple, short, and self-explanatory as possible. Instructions should be brief and clear, answer categories unambiguous, and the line of questioning should avoid complicated skip patterns. Even when a survey is carefully designed to meet the research objectives, the accuracy and completeness of the data it produces are far from guaranteed. Respondents may misunderstand the question, they may reject the premises on which the questions are based, or they simply may refuse to answer. Worse, they may lie or attempt to conceal their actual behavior or attitudes. Questions may also be so far above their understanding and experience, that they answer at random rather than confess their ignorance" (Rossi, et al, 1983).

While some of the respondent problems discussed above were expected, the esurvey was designed to be as concise as possible, so as not be tedious or confusing to the respondents. Rating instructions with examples were provided in a brief, but clear format. Each section of questions were grouped logically by category and by type of rating or response required, with the categorical selection items placed first in the survey, then the rated ISD activity items, and ending with the open ended qualitative item. The esurvey

had no "skip" pattern as often seen. The actual esurvey instrument remained as concise as possible yet adequately addressed the objectives of the research study.

The Esurvey Instrument

The following sections discuss the actual esurvey instrument, its development procedures, its measurement purposes, and the esurvey data gathering efforts.

Development of the Instrument

A preliminary draft of the esurvey instrument was created and tested as an individual trial with a knowledgeable subject matter expert via Internet email (see Appendix A). Based upon the feedback from this trial, and further review feedback from a panel of expert advisors, some minor modifications in item wording, item group ordering, and in one case, item group rating scheme, were made. This version of the esurvey was then piloted (see Appendix B). The piloted version of the esurvey instrument also included three additional comment items which were not included in the initial draft, nor in the final draft. These additional items were intended to solicit feedback from the pilot participants concerning ease of use and email program compatibility of the esurvey instrument. The following items were included in the instrument pilot only:

- Please tell me what type of email system you are using (for example, Eudora, Pegasus, CC Mail, Pine, etc.).
- Did you have any problems with the "sentence wrap" in your email system (i.e., were some lines too long for your screen and appeared to be broken, etc.)?
- Did you have any difficulties understanding how to respond to the esurvey? If so, please briefly describe.

The pilot esurvey instrument was sent via Internet email to a select sample of those who would be representative of the intended sampling frame. Ten individuals with the appropriate ISD background and known Internet email addresses were selected to participate in the pilot study. In addition, five non-sampling frame individuals, but with known email software systems, were selected to participate. This was done in order to test the esurvey instrument across a broader sample of differing email software programs. Feedback from the expected sampling frame participants was in general very positive and no modification requirements were identified by any of the participants. All of the pilot respondents completed the esurvey instrument appropriately, as did most of the non-sampling frame participants of the esurvey. Therefore, the esurvey instrument was finalized and posted to the identified Internet listserve groups (see Appendix C for the actual esurvey instrument).

Esurvey Instrument Items

The breakdown and measurement intent of the final esurvey instrument will now be discussed. The first three items in the esurvey instrument concern the ISD project complexity level. These items were used to group the respondent data into the three Project Complexity Levels for portions of the subsequent data analysis procedures.

Items 1 to 3:

Please indicate the complexity level of most of your ISD projects. Select the level which best fits your situation. Type an 'x' in the space before your selection.

1. I work mostly on low complexity level projects.
   (e.g., mostly paper-based and/or instructor led materials, 1-2 hours of instruction)

2. I work mostly on medium complexity level projects.
   (e.g., some multimedia, several topics, more than 1-2 hours of instruction)
3. I work mostly on highly complex projects.
   (e.g., multimedia, multiple topics, numerous hours of instruction)

Items 4 to 13 are designed to indicate respondent ISD educational experience. These items provide categories for respondent selection to describe their educational and training backgrounds. This information is intended to provide indications which may be useful to define the esurvey sample population.

Items 4 to 13:

In the following sections, please type an 'x' in the space before the item(s) that best describe you.

ISD Experience Level (you may select all that apply):

4. Current ISD graduate student
5. Work experience in ISD, no formal training
6. ISD technical training (corporate, military, etc.)
7. Bachelor degree in education or related field
8. Practicing teacher without any ISD training
9. Practicing teacher with some ISD training
10. Masters degree in education or related field
11. Masters degree in ISD or closely related field
12. Doctoral degree in education or related field
13. Doctoral degree in ISD or closely related field

Items 14 to 18 are designed to provide data to distinguish novice vs. expert response differences as related to the objectives of the study. The preliminary operational definition of novice and expert was determined by responses to this set of items. Novices

were defined as the "0 to six months " category or the "6 months to less than 2 years" category. Experts were identified as the "more than ten years" category.

Items 14 to 18:

How long have you been working with ISD projects?
(select one item only; type an 'x' in the space in front of your answer)

14. 0 to 6 months
15. 6 months to less than 2 years
16. 2 to five years
17. 5 to 10 years
18. more than 10 years

The main body of the esurvey instrument is based upon the eleven ISD activities which have been used in previous research (Items 19-27, 32, and 33). The items have been slightly reordered to better fit the expected flow of ISD activities, and to incorporate new items constructed to more completely assess involvement with life cycle evaluation activities (Items 28 to 31, 34, and 35). Items 32 and 33, which also assess evaluation activities, were included in the original eleven items. All Items 19 to 35 are rated using the anchored Likert scale according to the esurvey instructions.

Please use the following scale to rate Items 19 through 35 below:
(Hint: You may want to print or jot down the rating scale for easy reference.)

1 = Strongly Disagree; Not at all
2 = Moderately Disagree; Not enough or to a limited extent
3 = Moderately Agree; For the most part
4 = Strongly Agree; In practically every respect

To mark your answers, type the corresponding number in the blank space before each item number: For example:

I almost always:

2 I1. Conduct a task analysis
4 I2. Write learning objectives

Explanation: The rating of '2' for I1 (Item 1) indicates that you Moderately Disagree that you almost always conduct a task analysis and that it is not done enough or is done only to a limited extent; The rating of '4' for I2 (Item 2) indicates that you Strongly Agree that you almost always write learning objectives, in practically every respect, for every project.

Now please rate Items 19 through 35:

When working on ISD projects, I almost always:

I19. Conduct a needs assessment
I20. Determine if the need can be solved by training
I21. Conduct a task analysis
I22. Assess the trainee's entry level skills and characteristics
I23. Establish learning objectives
I24 Identify the types of learning outcomes
I25. Develop test items
I26. Select instructional strategies
I27. Select instructional media
I28. Conduct ISD reviews during instructional development
I29. Ensure Subject-Matter Expert reviews are conducted during development

I30. Conduct individual (one-to-one) trials of instruction before completion
I31. Conduct small group trials of instruction before completion
I32. Pilot test instruction before completion
I33. Conduct a follow-up evaluation after training
I34. Conduct evaluations to determine update/revision requirements
I35. Conduct evaluations to determine possible training system deterioration

The final item in the esurvey instrument is an unnumbered, open ended qualitative item. This item concludes the esurvey by soliciting respondent comments and observations and asking for explanations of low and high ratings. This item was expected to produce a rich abundance of qualitative data which may provide additional indications related to each of the survey objectives.

Comment Item:

Now, please provide any comments or observations that you have concerning the inclusion or non-inclusion of the ISD practices you just rated. We are especially interested in your comments for any activities which were rated low (1 or 2) or very high (4). Enter your response here:>

Electronic Data Transfer

The only open ended item was deliberately placed at the end of the esurvey instrument. This design was intended to facilitate the electronic transfer of the esurvey data into an electronic database. However, the esurvey respondents foiled the attempt to allow an automated survey data transfer design by placing their comments throughout the esurvey instrument. Although the design of the esurvey greatly enhanced the electronic transfer of data, it was not as efficient as originally intended. This problem in esurvey

respondent placement of the data, though anticipated for only a few samples, was so pervasive as to require that almost all numerical data be hand input in order to ensure the accuracy of placement into the proper database fields. In addition, the comment data had to be "cut" out of the body of the esurvey response document in those cases where respondents placed meaningful comments in places other than the intended area. It was interesting to note that not one of the respondents in the pilot study misplaced the data as did the actual respondents. Therefore, although it was anticipated that a few respondents would not completely follow the esurvey instructions (a problem also noted by Sudmalis, 1992) the extent of the creative respondent data input was totally unexpected. It seems that perhaps the pilot study respondents were more motivated to carefully follow instructions than were the actual esurvey respondents. In most cases, it does appear that the respondents were trying to be helpful with their creative input, not realizing that the data was intended to be exported into a meaningful ASCII fixed-data format. So much of the good intentions of thoughtful design. Other electronic media can allow the design of an esurvey where such diverse data input would not be allowed (e.g., specific data fields in an esurvey on the world wide web). However, the current limitations of the more common Internet email technology does not allow such restrictions in creative user data input.

Sampling Procedures

Following the pilot study, the esurvey instrument was posted to the following listserves which had been previously identified as appropriate to solicit respondents from the required sampling frame of practicing Instructional Designers.

AECT-L Assoc. for Educational Communications and Tech. (wvnvm.wvnet.edu)

ADLTED-L Canadian Adult Education Network (uregina1.uregina.ca)

ALTLEARN Alternative Approaches to Learning Discussion (sjuvm.stjohns.edu)

EDTECH Educational Technology (msu.edu)

DEOS-L Distance Education On-line Symposium (psuvm.psu.edu)

NEWEDU-L New Patterns in Education List (uhccvm.uhcc.hawaii.edu)

STLHE-L Forum for Teaching & Learning in Higher Education (hermes.csd.unb.ca)

TRDEV-L Training and Development List (psuvm.psu.edu)

WWWDEV WWW Developers List (LISTSERV.UNB.CA)

First, Second, and Third Rounds of the Esurvey Solicitation

The first round of the esurvey was posted on December 17, 1996. This solicitation provided 97 usable esurvey responses. The following message was posted as an introduction to the esurvey instrument:

Greetings to All:

I am conducting a research project using the esurvey (email + survey) methodology. The esurvey instrument is designed to investigate Instructional Systems Design (ISD) practices. If you are an Instructional Designer or Developer, or if you participate in conducting instructional design and development activities, I would appreciate your participation as an esurvey respondent. All respondents will be provided a summary report, via email, of the research results and discussion of the findings.

Please complete the following esurvey and return it to me at:

jhendrix@telepath.com

(please be careful not to post responses to the Listserver)

Thank you for your participation. Please contact me if you desire further information.

Joan E. Hendrix
ABD, Instructional Psychology & Technology
The University of Oklahoma
jhendrix@telepath.com
(405) 329-4816

The second round of the esurvey was posted on January 31, 1997. This solicitation produced 33 usable esurvey responses. This time the solicitation was modified as follows. Please note that the contact information remained the same as in the first solicitation and is therefore not reproduced here.

Greetings...I want to thank those of you who have participated in my ISD esurvey research project. I have received some wonderful data and look forward to the final crunching/analysis to see how the results look. In the mean time, I would like to invite others of you who may be new to the list to also participate in the esurvey. Also, some of you may know others in the ISD field who would like to participate, so I am including the esurvey instrument at the end of this message. I plan to gather data until the end of February 1997 and should have the report summary ready to send to respondents (and others who have requested a copy) by March 17, 1997. Thank you for your participation. Please contact me if you desire further information.

The final round of the esurvey was posted on February 19, 1997, and provided the remaining 42 usable responses for a total of 172 respondents in the esurvey database.

Greetings to All:

Now that we are back from conferencing and are preparing for Spring Break, I am posting one last call for Instructional Systems Design Esurvey participants. If you have not responded to the ISD Esurvey, this will be your last chance prior to data analysis and preparing the final report. Thanks to all of you who have provided a rich array of responses thus far. I am looking forward to seeing the final results. Remember, all participants will receive a summary of the results and discussion. The esurvey instrument is provided below. Please contact me if you desire further information.

Measurements and Data Analysis

As recommended by Jaeger (1984), a three column cross-reference matrix was developed and is indexed by the research objectives in column one, by esurvey items in column two, and by the data tables and statistical analyses in column three. This matrix provides a complete check on the internal consistency of the esurvey by showing the research objectives and the esurvey items designed to provide data to investigate each objective. Each research objective is referenced to data sources (items) in the esurvey instrument and to the associated statistical analyses that were used to provide answers to the research questions. This ensures that each statistical analysis is being conducted to answer at least one research question and that associated sources of data that will permit the analysis to be completed. The following matrix shows the relationship of the research objectives, the esurvey items, and the statistical analysis procedures conducted.

Research Objectives	Measurements	Data Analysis
Analyze the inclusion and exclusion of ISD activities during Instructional Systems Design and Development projects.	Items 19 to 27, 32 & 33 (original 11 items)	Descriptive Statistics, ANOVA, Newman-Keuls, Qualitative Indications
Explore the use of life cycle evaluation activities in ISD projects and ISD practice.	Items 28 to 35	Descriptive Statistics, ANOVA, Newman-Keuls, Qualitative Indications
Analyze differences between novice and expert use of ISD practices.	Items 19 to 35 grouped by Items 14-18	Descriptive Statistics, ANOVA, Newman-Keuls, Qualitative Indications
Explore the relationship between project complexity and inclusion/exclusion of ISD practices.	Items 19 to 35 grouped by Items 1 to 3	Descriptive Statistics, ANOVA, Newman-Keuls, Qualitative Indications
Explore the diversity of ISD esurvey respondents.	Items 4 to 18	Descriptive Statistics, Chi-square, Qualitative Indications

Table 3.1 - Objectives, Measurements, & Data Analyses Matrix

Statistical Procedures for Item 4 through Item 18

Crosstabulations of the education and training background data and the years experience data were constructed. To test that there is no relationship between the row and column classifications in the crosstabulation, the chi-square statistic was calculated. This statistic compares the sample counts with the expected counts. The difference between each sample count and its corresponding expected count are determined, and those values are squared, then divided by the expected count, and summed over all entries. The null hypothesis to be tested is that the row and column classifications are independent or that the row classification proportions for the groups are all equal. There are two different models for generating crosstabulations which lead to the same analysis of two-way count data. In the model used for this analysis, the independent variables (Education Items 4 to 13) are compared where each sample is classified according to a categorical variable (Years Experience). According the null hypothesis, there would be no relationship between the column variable and row variable. The chi-square significance test is used to determine whether the patterns seen are evidence for concluding that there is an association in the population.

Statistical Procedures for Items 19 through 35

Summary statistics for items 19 through 35 are reported on several variables (sample size, mean, standard deviation, minimum, maximum, and standard error of the mean). Also reported for each of the items 19 through 35 are the means, standard deviations, and counts for each of the groupings (i.e., the Years Experience groups and the Project Complexity groups).

Typically, ANOVA procedures are used to test hypotheses about population means using data obtained through random sampling of those populations. As noted earlier, this study did not employ random sampling procedures, but rather participants were "self-selected" respondents who responded to the professional Internet listserve esurvey announcement. (However, all surveys are in a sense, completed by "self-selected" respondents. This phenomena is generally discussed in the survey literature in terms of the "non-respondents", rather than the affirmative direction, that those who do respond, even in a random sample, are choosing to respond, rather than not.) As discussed by Moore and McCabe (1989, p. 719), "A purist could argue that using ANOVA for the situation described (sic, non-random samples) is inappropriate. ... Judgments such as the suitability of the sample to the statistical procedure must be made by experts who are knowledgeable about such matters. They are inferences that are beyond the realm of statistical inference." In support of the expanded use of such statistical procedures for non-randomly derived and non-parametric data, Harris (1985, p. 326) states, "The most fundamental reason for this willingness to apply multivariate statistical techniques to such data, despite the warning of Stevens and his associates, is the fact that the validity of statistical conclusions depends only on whether the numbers to which they are applied meet the *distributional* assumptions (usually multivariate normality and homogeneity of covariance matrices from group to group) used to derive them, and *not* on the scaling procedures used to obtain the numbers. In other words, statistical tests are 'blind' as to how the number 'fed' them were generated. Moreover, we have such strong mathematical and empirical evidence of the robustness of statistical

procedures under violation of normality or homogeneity of variance assumptions that the burden of proof must be presumed to be on the shoulders of those who claim that a particular set of data can be analyzed only through 'nonparametric' (a better phrase would be 'distribution free') statistical techniques." Therefore, in agreement with the observations and advice of the Harris (1985) textbook, ANOVA tables and Newman-Keuls Multiple Comparison Test results are reported for each of the Items 19 through 35.

Two sets of one-way ANOVAs were performed for each of the items measuring the inclusion or non-inclusion of ISD activities (Items 19 through 35). This esurvey data set was analyzed by using two distinct groupings. First, an ANOVA was performed for each ISD activity item as grouped by the Number of Years Experience categories. The three groups in this category include the Novice group (0 to less than 2 years, Item 14 and Item 15), the Intermediate group (2 to 10 years, Item 16 and Item 17) and the Expert group (more than 10 years, Item 18).

The second grouping factor used for ANOVA procedures is Project Complexity, Items 1, 2, and 3, with responses to Item 1 indicating Low Level Complexity, responses to Item 2 indicate Medium Level Complexity, and Item 3 represents High Level Complexity.

The general model used to examine data for an overall pattern and its deviations is expressed as DATA = FIT + RESIDUAL. This model provides a way to summarize the assumptions that are the foundation for the analysis (Moore & McCabe, 1989).

The information for each analysis of variance is organized in an ANOVA table. The rows are labeled Total, Treatment, and Error. The Total row corresponds to the DATA term in the DATA = FIT + Residual framework. The row labeled Treatment corresponds the identified groups and to what is often called Model in other statistical programs, where this row in the table would correspond to the FIT term in the DATA = FIT + Residual way of thinking,. It gives information related to the variation among group means. The term "error" provides information related to the variation within groups. For the social sciences error is often due to the fact that not all subjects are the same. This sort of variation is not really error and is more appropriately described as "residual" (Moore & McCabe, 1989) .

The columns of the table are labeled Source, SS (sum of squares), DF (degrees of freedom), MS (Mean Square), F value, and P value. The sum of squares is a sum of squared deviations for the Total, Treatment, and Error columns. The degrees of freedom column is associated with the sum of squares and is found by examining the deviations that make up the sum of squares (Elliott, 1995; Moore & McCabe, 1989).

Degrees of freedom represent the number of terms that are free to vary independently of the other terms in the sum of square. The sums of squares in general all grow larger as the number of terms in the sums I creases. The degrees of freedom supply a number by which to divide a sum of squares to yield a measure of the average variation (Elliott, 1995; Moore & McCabe, 1989).

In summary, in the on-way ANOVA there are three sources of variation: groups, error, and total. The sums of squares represent variation present in the data. They are

calculated by summing squared deviations. For each source of variation, the mean square is the ratio of the sum of squares and the degrees of freedom (Elliott, 1995; Moore & McCabe, 1989).

The ANOVA F test gives a general answer to the general question, "Are the differences among observed group means significant?". The results of the one-way ANOVA test are summarized in the p-value. A large p-value (greater than the significance level, e.g., 0.05) is interpreted to mean that there is no significant difference in the means (i.e., the null hypothesis of equal means is not rejected). That is, there is not enough evidence to conclude that the average use of each ISD activity is significantly different from among the groups. A small p-value (e.g., less than 0.05) means that there is a statistically significant difference between groups. This is typically taken to indicate evidence of a real difference among groups that is not due to chance. Exploratory data analysis seeks patterns in the data that suggest novel conclusions or questions for further study. However, exploratory analysis alone can rarely provide convincing evidence for its conclusions, since striking patterns in data can arise from many sources (Moore & McCabe, 1989). The probablility of Type I error is the probability of rejecting the null hypothesis when it is really true. In exploratory analysis, the rejection of the null hypothesis simply indicates that something other than chance fluctuatuon is generating the differences among the group means (Harris, 1985). The critical value of the significance level of the test at level 0.05 means that sample outcomes this extreme will occur with probability 0.05 when the null hypothesis is true.

Although a small P-value indicates that the group means are different, it does not indicate specifically which means differ from each other. The plotting and inspection of the means provide an indication of where the differences lie. Side-by-side Mean and Error Bar Comparison charts help illustrate the within-group variation and provides a general summary of the data in each group to show the largeness or smallness of the within-group variation. Mean and Error Bar Comparison charts (the mean +- the standard error of the mean) are provided for Items 19 through 35, for both the Years Experience grouping and the Complexity grouping. These charts provide a visual comparison of differences across groups. Although most of the differences are not so great as to be statistically significant, indicating homogenous groupings, the Mean and Error Bar Comparison charts do show interesting "patterns" within the response data.

Since the ANOVA procedure only indicates whether there is a difference among the groups, in order to find out which groups may be significantly different from which others, the Newman-Keuls multiple comparison test was performed. This test describes which of the means are significantly different from which others at the 0.05 significance level. In the Newman-Keuls multiple comparison test, the group numbers are reported in increasing order of the value of their group means. At the 0.05 significance level, the means of any two groups underscored by the same line are not significantly different (Elliott, 1995).

Chapter 4

Results

This chapter is organized with a brief overview of general respondent sample characteristics, followed by sections of the specific data results for each group of esurvey items. Out of the 172 total ISD esurvey respondent sample, 120 (70%) included explanatory comments concerning ISD, their experiences in implementing the ISD activities, and their ratings of the esurvey items. Responses were received from at least five countries other than the United States. Since not all of the esurvey replies could be identified concerning their origin, there may have been more from other countries. Of those that could be definitively identified, twelve were received from Canada, four from Australia, two from the United Kingdom, one from the Netherlands, and one from Korea. The majority of the responses could be identified as coming from businesses and universities within the United States, although many of the esurvey responses contained no specific identification information except for the email address.

Respondents from at least six of the listserves could be identified, and at least five responses which had been forwarded to non-list members could be identified. From the DEOS-L discussion list, fifteen responses were identified. At least six responses could be identified as coming from the TRDEV-L discussion list, and four each were identified from the WWWDEV and AECT-L discussion lists. Another two responses were identified from the EDTECH list and one from the STLHE-L discussion list. Overall, only 18% of the responses could be identified according to the list post to which they were responding.

Project Complexity (Item 1 to Item 3)

The first three items included in the ISD esurvey were designed to indicate the level of complexity of the projects typically worked on by the respondents. The intent of these three items was to determine if the level of project complexity might have an effect on the use or non-use of the ISD activities. Although participants were asked to select only one category, a few respondents indicated two categories and 3 respondents did not complete this section of the esurvey. In the cases where more than one level of project complexity was indicated, both levels were coded into the database for those respondent records (none selected all three levels of complexity). Those respondents who did not complete this section were simply coded as missing data. Below is the actual item the respondents were asked to complete:

Please indicate the complexity level of most of your ISD projects. Select the level which best fits your situation. Type an 'x' in the space before your selection.

1. *work mostly on low complexity level projects.*
   e.g., mostly paper-based and/or instructor led materials, 1-2 hours of instruction)
2. *I work mostly on medium complexity level projects.*
   (e.g., some multimedia, several topics, more than 1-2 hours of instruction)
3. *I work mostly on highly complex projects.*
   (e.g., multimedia, multiple topics, numerous hours of instruction)

A frequency table for the complexity levels clearly shows that the majority of the respondents (56.21%) typically work on highly complex projects. Slightly over a third of the respondents indicated that they work mainly on medium level complexity projects (37.28%), and only 6.51 percent indicated low level complexity projects.

COMPLEXITY Frequency Table				
Level	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	11	6.51	11	6.51
2	63	37.28	74	43.79
3	95	56.21	169	100.00

Table 4.1 - Complexity Frequency Table

The pie chart on the following page was created from the Complexity frequencies in order to provide a visual display of the categorical information . It shows how the total data set is divided up into the specific categorical groups for Low Level (Group 1), Medium Level (Group 2), and High Level (Group 3) complexity.

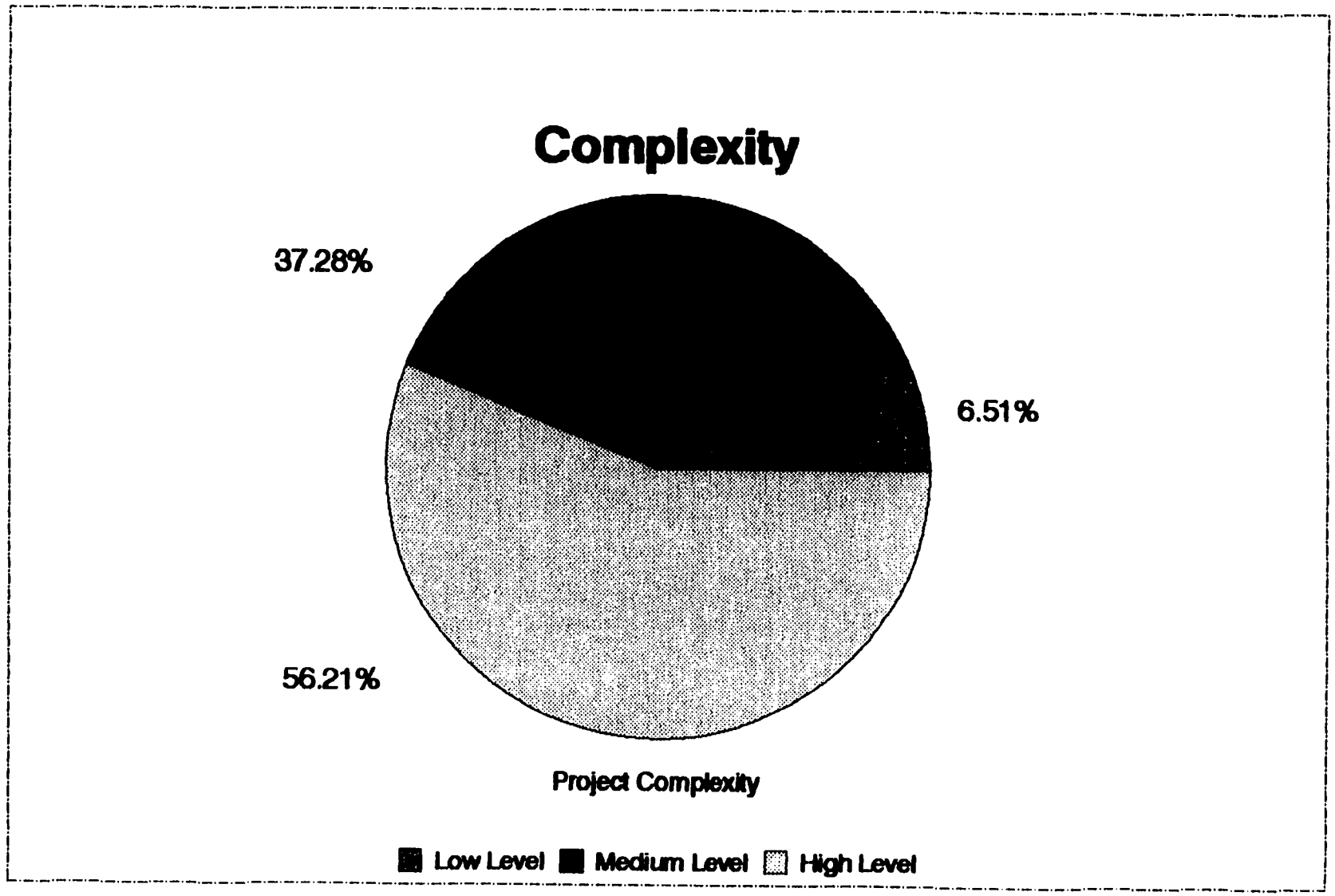

Figure 4.1 - Project Complexity Pie Chart

Education (Item 4 to Item 13)

Items 4 through 13 are descriptive categories of the expected types and levels of actual education and training experience in ISD theory, models, and practices. These categories were derived based upon observations of the backgrounds of practicing IDs from several different organizations. Although rather broad in nature, such education and training background provides a descriptive look at the esurvey respondents' educational background. Those respondents who indicated that they were ABD were coded in the appropriate doctoral degree category (either Item 12 or 13). Below is the actual item wording from the esurvey and a count table of the respondent choices, as ranked from high to low.

In the following sections, please type an 'x' in the space before the item(s) that best describe you.
ISD Experience Level (you may select all that apply):

Count	ISD Experience/Education Category
57	Masters degree in ISD or closely related field (Item 11)
42	Masters degree in education or related field (Item 10)
40	Work experience in ISD, no formal training (Item 5)
34	Bachelor degree in education or related field (Item 7)
30	ISD technical training (corporate, military, etc.) (Item 6)
27	Current ISD graduate student (Item 4)
19	Doctoral degree in ISD or closely related field (Item 13)
16	Doctoral degree in education or related field (Item 12)
15	Practicing teacher with some ISD training (Item 9)
7	Practicing teacher without any ISD training (Item 8)

Table 4.2 - Education Category Counts

Note that since respondents could select more than one item in these categories, the total number of responses (287) is far greater than the total number of respondents (172), and indicates that most respondents selected more than one category. Also, a few respondents did not complete this section of the esurvey. A masters level degree was by far the most common with a total of 99 responses for these two items (Item 10 and 11). Perhaps not so surprisingly, the third most frequently indicated category was Item 5, Work experience in ISD, no formal training. Doctoral degrees (Items 12 and 13), Bachelor degrees (Item 7), ISD technical training (Item 6), and Current ISD graduate student (Item 4) categories were fairly evenly represented with total counts of 35, 34, 30, and 27 responses respectively. Least indicated were practicing teachers with or without ISD training (Items 8 and 9), with a total count of 22 responses. The frequencies of these categories as crosstabulated with the Years Experience categories will be discussed in a following section.

Several respondents provided additional comments concerning their education and training background. Two felt that the esurvey categories were not complete enough.

"None of your working levels are applicable, as I am an ABD with masters degrees in instructional technology and business administration. I have 20 years experience working in industry, and another 10 years working for the Air Force. I am currently president of a consulting firm. In addition I have taught at both Indiana University and New York Institute of Technology, and am currently negotiating to teach at another university. In addition to DISC, I have been on the AECT Board and the board of ITED. I've also been the President of the Federal Educational Technology Association, and have just been elected for another term as president of that organization (with an eight year

break in between). Fit that in to your groupings however you'd like. I have been working with ISD projects for over ten years." However, based upon the above comment, the appropriate codes were input into the database record for this respondent (i.e., Item 13, Doctoral degree in ISD or closely related field and Item 18, more than 10 years experience, the latter being discussed in the following section concerning the number of years experience in ISD).

"Your question concerning ISD background was a little short and biased toward formal academia. Between the American Society for Training and Development and the various professional seminars I have attended, I probably have more than the equivalent of an MS in ISD. I realize that in our credentials-driven society, formal academic achievement is highly regarded, but that is no reason to overlook the contributions of professional societies." This respondent record was coded as Item 6, ISD technical training (corporate, military, etc.).

The items in the education and training experience category were not intended to specifically support the requirement for formal educational ISD achievements, and in contrast to the above comment, one respondent provided an illustrative discourse on how additional graduate education has broadened his ISD foundation. "My previous instructional design experience was primarily in the military. Since starting on my Ph.D. in training and development with a concentration in instructional design, I have become much better educated about the evolving facets of ISD particularly cognitivism, and constructivism and their implications for design of technology mediated learning experiences. I also use and recommend the use of some of the new automated instructional design tools particularly for subject matter experts without ISD experience."

Two respondents elaborated upon their lack of formal training in ISD:

"The training that I design, develop, and deliver is usually a one woman show. I do not have the help of a design team. Nor do I have formal training in ISD. I do have peers that I can call on for help when needed and I spend a good bit of time researching the topics that I am not highly knowledgeable in myself."

"I suppose the reason for this (sic, low ratings for analysis items) is that I did not have formal training in instructional design. I do ensure that I have learning objectives, and focus on transfer of training issues, especially post training. However, I think I could be even more effective if I analyze more prior to the training."

Also supporting the non-specific mix of educational backgrounds in ISD, another respondent states, "With the exception of one of my staff, everyone else (10 others) are trained and experienced instructional designers - we apply what we believe is the right way to design instruction."

Another indicates how it happened that he become an Instructional Designer. "I started work as a instructional designer in a small multimedia company after my university teaching contract ran out (as of a few months I am now doing contract work with a university). I initially was hired as a developer because I knew Authorware, but became the instructional designer because I was widely read in education and science communication and had lots of teaching experience."

Only one comment clearly indicated that the respondent was a full-time student rather than an ISD "practitioner". "I must indicate that I am not a practicing instructional designer full-time. I am a full-time student and my design experience has mostly been project work in the context of a class." Of course it was expected that some respondents would be ISD graduate students with little actual work experience.

Years Experience (Item 14 to Item 18)

The Years Experience categories were constructed to provide an initial framework for examining possible Novice vs. Expert differences concerning the inclusion or non-inclusion of ISD practices. The item categories were presented to the esurvey respondents as follows:

How long have you been working with ISD projects?

(select one item only; type an 'x' in the space in front of your answer)

14. 0 to 6 months

15. 6 months to less than 2 years

16. 2 to five years

17. 5 to 10 years

18. more than 10 years

The item selections were then collapsed and delineated to separate the respondents into three distinct groups concerning the number of years experience in ISD. Responses to Items 14 and 15 were combined to provide the Novice group of respondents. All in this group must have less than 2 years experience in ISD. Responses to Item 18 (more than ten years) comprised the Expert group, with the remaining responses to Items 16 and 17 making up the Intermediate group, containing a broad span of ISD experience (2 to 10 years). The categories were deliberately not identified as Novice, Expert, and Intermediate in the esurvey instrument in order to avoid possible undesired response bias. It was expected that there would be noticeable differences in the responses of the Novice vs. the Expert groups on the actual ISD activity items (Items 19 through 35), yet only one item indicated significant differences as expected. This specific finding of statistical significance for Item 20 (Determines if the need can be solved by training) will be further described in the section for that specific item.

Only two comments specifically referring to expertise were provided by the esurvey respondents.

"I would consider myself to be a non-orthodox user of the ISD model anyway - it is a system of 'reflection' and not one of prescription anyway so while it appears to be 'mechanistic' upon first use, it allows the novice designer an integrated and confidence-building way to approach the complex design task inherent in instructional development, yet allows the more experienced practitioner a grounding upon which to grow and become more flexible in design solutions. I have used it (initially) for 'stand alone' and traditional paper-based courses. But I have also found it to be critical for client-consultant

confidence-building in that it is an overt 'transparent' technology which can be readily agreed-upon because of its consultative nature - with many built-in points for revisions and inputs. It is both a process and an artifact as to the history of the project. I am (still) using it as the core tool for the analysis phases of multimedia (with full-motion video) (CD-ROM) training projects."

The other comment related in this area concerned the respondent's status as an ISD Expert: "Perhaps Walter Dick and Lou Carey ('The Systematic Design of Instruction') would not recognize the elastic versions of the System in some of my projects but I am fairly sure that they would appreciate the spirit and rationale for the elasticity inherent in these complex multimedia interactive training module which have been produced in the spirit of the systems design technique. I suppose in the spirit of the 'expert' I have internalized the principles and heuristics found in ISD and have become confident enough and experienced enough to attempt to expand and continue the search for flexible design models. In my studies I am staying up-to-date with the changing paradigms and philosophies related to the design of instruction. And, no, ISD didn't answer all my questions. What kind of a designer would be happy with that? But it freed me as a designer (eventually) to really listen, observe, be available to the needs, and above all learn to be humble and patient in the asking of questions (the main activity of ISD)."

The following table shows the frequencies, percents, and cumulative frequencies and percents for each group, where Group 1 represents the Novice, Group 2 is the Intermediate, and Group 3, the Experts. These group identification numbers will remain consistent and are used throughout the reporting and discussion of the esurvey findings. Note that 3 individual respondents did not complete this category of information, thus the total of the three Years Experience groups equals 169 rather than that of the 172 total esurvey respondents. This is reflected as missing data in the further data analysis based upon these groupings.

YEARS EXPERIENCE

Frequency Table

Group	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	29	17.16	29	17.16
2	84	49.70	113	66.86
3	56	33.14	169	100.00

Table 4.3 - Years Experience Frequency Table

In order to provide a visual display of the Years Experience categorical information, the pie chart on the following page was created. It shows how the total data set is divided up into the categorical groups of Novices (Group 1), Intermediates (Group 2), and Experts (Group 3).

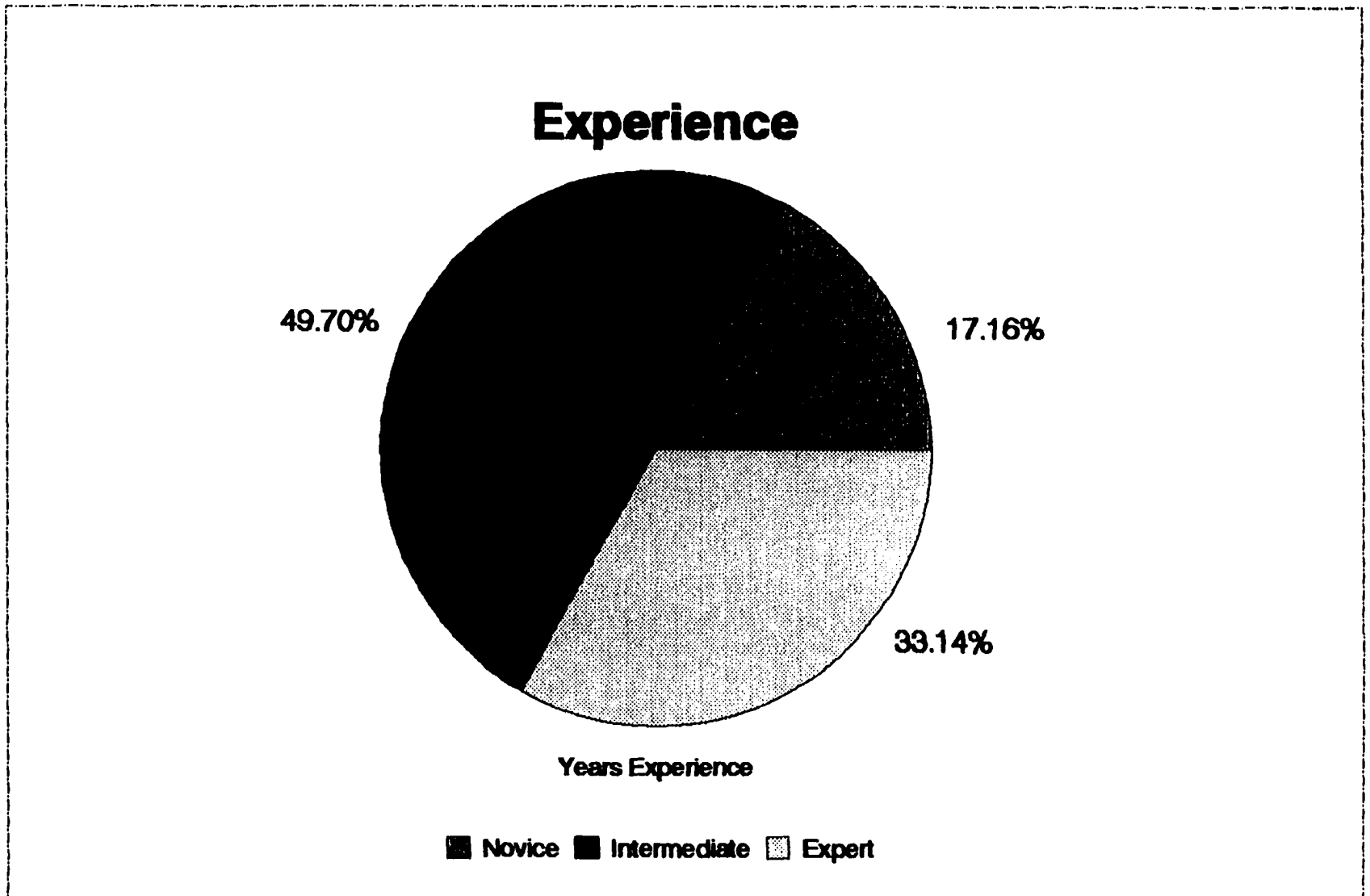

Figure 4.3 - Years Experience Pie Chart

Education by Experience

For the categorical data, Education by Years Experience, crosstabulations indicating frequencies are reported. Two-way tables are constructed that displays the number of counts for each Education category (Items 4 through 13), as grouped by the Years Experience categories of Novice (Group 1), Intermediate (Group 2), and Expert (Group 3).

Contingency Table Analysis

2-Way Contingency Tables:

EXPERIENCE by ITEM 4 (Current ISD graduate student)

Group/	Freq/	Total
1	8	8
2	17	17
3	2	2
TOTAL		27

EXPERIENCE by ITEM 5 (Work experience in ISD, no formal training)

Group/	Freq/	Total
1	5	5
2	23	23
3	11	11
TOTAL		39

EXPERIENCE by ITEM 6 (ISD technical training - corporate, military, etc.)

Group	Freq	Total
1	3	3
2	13	13
3	14	14
TOTAL		30

EXPERIENCE by ITEM 7 (Bachelor degree in education or related field)

Group	Freq	Total
1	6	6
2	13	13
3	15	15
TOTAL		34

EXPERIENCE by ITEM 8 (Practicing teacher without any ISD training)

Group	Freq	Total
1	2	2
2	4	4
3	1	1
TOTAL		7

EXPERIENCE by ITEM 9 (Practicing teacher with some ISD training)

Group	Freq	Total
1	2	2
2	8	8
3	5	5
TOTAL		15

EXPERIENCE by ITEM 10 (Masters degree in education or related field)

Group/	Freq/	Total
1	3	3
2	26	26
3	13	13
TOTAL		42

EXPERIENCE by ITEM 11 (Masters degree in ISD or closely related field)

Group/	Freq/	Total
1	14	14
2	25	25
3	18	18
TOTAL		57

EXPERIENCE by ITEM 12 (Doctoral degree in education or related field)

Group/	Freq/	Total
1	1	1
2	5	5
3	9	9
TOTAL		15

EXPERIENCE by ITEM 13 (Doctoral degree in ISD or closely related field)

Group/	Freq/	Total
1	0	0
2	8	8
3	11	11
TOTAL		19

Table 4.4 - Contingency Table Analysis

Although there appears to be no clear pattern to report in the relationships between these categorical variables (Education and Years Experience), some interesting observations can be made. As we might expect, no Novices indicated that they held a doctoral degree in ISD or a closely related field, and only one Novice indicated a doctoral degree in the education or related field category. Yet over half the Novice sample (58%) indicated one of the two masters degree categories (Items 10 and 11). In fact, the percentage of masters degrees for all three groups were similar (Novice, 58%; Intermediate, 60%; Expert, 55%). As respondents were allowed to select more than one educational experience category, a check of the esurvey database indicated that no respondents marked both items indicating masters degrees, so the percentages reported are accurate representations of the esurvey sample.

To test that there is no relationship between the row and column classifications, the chi-square statistic was calculated. This statistic compares the sample counts with the expected counts. The statistical software program used has indicated that the chi-square statistic may not be valid, however, this is of no particular concern for this group of data and merely illustrates the observed lack of any obvious response pattern in the crosstabulations.

However, the test results are reported in support of these observations.

WARNING - Some Expected values less than 5. Chi-square may not be valid.

Statistic	DF	Value	p-value
Chi-Square	1	0.768	0.381

Table 4.5 - Education by Experience Chi Square

Items 19 through 35

These items represent the ISD activities under investigation concerning their inclusion or non-inclusion by practicing Instructional Designers. The following instructions were provided in the esurvey instrument for the completion and rating of these items.

Please use the following scale to rate Items 19 through 35 below:

(Hint: You may want to print or jot down the rating scale for easy reference.)

1 = Strongly Disagree; Not at all

2 = Moderately Disagree; Not enough or to a limited extent

3 = Moderately Agree; For the most part

4 = Strongly Agree; In practically every respect

To mark your answers, type the corresponding number in the blank space before each item number. For example:

Our instructional development team almost always:

2 E1. Conducts a task analysis

4 E2. Writes learning objectives

Explanation: The rating of '2' for E1 (Example 1) indicates that you Moderately Disagree that your ISD team almost always conducts a task analysis and that it is not done enough or is done only to a limited extent; The rating of '4' for E2 (Example 2) indicates that you Strongly Agree that your ISD team almost always writes learning objectives, in practically every respect, for every project.

Now please rate Items 19 through 35:

Immediately following Items 19 through 35, the esurvey instrument solicited respondent comments concerning the inclusion or non-inclusion of the rated ISD activities.

Now, please provide any comments or observations that you have concerning the inclusion or non-inclusion of the ISD practices you just rated. We are especially interested in your comments for any activities which were rated low (1 or 2) or very high (4). Enter your response here:>

The results of the comment data will be reported and discussed along with the corresponding numerical data for each item.

The following table provides a summary of the mean results for Items 19 through 35. This table breaks out the mean ratings as less than 2.5, 2.5 or greater but not more than 3.0, and greater than 3.0. Note that only Item 35, Conducts evaluations to determine possible training system deterioration, resulted in a mean rating less than 2.5.

Item	ISD Activity	Mean < 2.5	Mean 2.5 - 3.0	Mean > 3.0
19	Conducts a needs assessment		2.82	
20	Determines if the need can be solved by training		2.67	
21	Conducts a Task Analysis		2.71	
22	Assesses the trainee's entry level skills and characteristics		2.82	
23	Establishes learning objectives			3.59
24	Identifies the types of learning outcomes			3.24
25	Develops test items			3.02
26	Selects instructional strategies			3.44
27	Selects instructional media			3.33
28	Conducts ISD reviews during instructional development		2.83	
29	Ensures SME reviews are conducted during development			3.36
30	Conducts individual trials of instruction before completion		2.53	
31	Conducts small group trials of instruction before completion		2.63	
32	Pilot tests instruction before completion		2.73	
33	Conducts a follow-up evaluation after training		2.89	
34	Conducts evaluations to determine update/revision requirements		2.81	
35	Conducts evaluations to determine training system deterioration	2.19		

Table 4.6 - ISD Item Mean Summary

As discussed in Chapter 3, Research Methodology, descriptive statistics are reported for each of the Items 19 through 35. In the three cases where statistically significance differences were found among groups, the descriptive statistics are followed by an ANOVA table and the Newman-Keuls Multiple Comparison test results. The ANOVA tables and the Newman-Keuls Multiple Comparison test results for all other items are provided in Appendix D. Please note that some cases of non-significant, yet interesting observed patterns, will be briefly discussed in each section of the Appendix D data, as applicable.

Item 19

When working on ISD projects, our instructional development team almost always:

I19. Conducts a needs assessment

Descriptive Statistics Variable Name is ITEM 19			
N = 171		Missing =	1
Mean =	2.82456	St. Dev (n-1) =	0.90338
Median =	3.00000	St. Dev (n) =	0.90074
Minimum =	1.00000	S.E.M. =	0.06908
Maximum =	4.00000	Variance =	0.81610

Table 4.7 - Item 19 Descriptive Statistics

For Item 19, none of the statistical tests indicated significant differences among groups.

Respondent Comments

Three common threads emerged from the respondent comments for Item 19. The first of these were supportive of needs assessment, the second indicated that the needs were often pre-determined, and the third thread discussed problems with conducting needs assessments.

Support for Needs Assessment

"Needs Assessment is critical to verify needs and ISD parameters."

"I am responsible for results. I like to verify my client's 'feeling' before proceeding or I may get into trouble."

"We also have close links with various industry and liaison closely with them to produce the types of courses and training they need."

"Currently the assessment for the need of training came from a survey (I call it a wish list) sent out to Deputy Directors. Deputies are about 4 levels of management. above the people actually receiving the training. However, we are currently in a process of developing career ladders which are essentially a marriage of a real needs assessment with our performance and appraisal system."

"I work in a regulated pharmaceutical environment. Much of our material is developed for training staff on new procedures. The 'need' is a given in these situations. If we are asked to develop training that is not for regulated procedures, then we always do a needs assessment to pinpoint areas of concern."

Predetermined Needs Assessment

"The 'needs assessment' is still often a decision made by a manager or stakeholder, and the ID responsibility is to then to develop what has been decided is needed."

"Our customers, primarily military, contract us having (a) done their own TNA/TA work."

"I'm part of a service team which responds to academic units requests to work on pre-determined courses so we don't conduct the needs assessments, they do prior to approaching us."

"One comment I would like to add is that I work in a higher-education environment. Needs assessment and task analysis have often been done by the SME for departmental approval purposes before I get involved."

"Most projects I have worked with are funded by an external funded (government agency). A need is already determined by the funded."

"We do not do as much front end work because we manage a government training academy. Most of the training we do is mandated by regulations or HQ offices."

"We only deal with problems that require training. Often, the needs analysis has been determined by the client before we are called in to develop the training."

"We do not focus on needs assessment because of institutional requirements that instruction should be more technology oriented."

Problems With Needs Assessment

The first three of this set of respondent comments concern the academic environment and special problems within this realm.

"In an academic environment course development is often political and may not be determined by educational and training practices. Little or no analysis may be done before development."

"Well, the needs assessment/trainee assessment is often overlooked in the educational sector, for two reasons. Often a grant opportunity appears and you grab it, then worry about justifying."

"We are a research university so research is more important than pedagogy. Usually, they resent a formal needs analysis. They feel that their observations as a professor are sufficient. They may combine that with end of semester student reviews."

"We need to do more thorough needs assessment to determine actual needs not just to develop a training program."

"Usually done, but seldom done at the very start of the process; project starts because of some 'known' need, hits some snag, then assessment is done to sort out what is 'really' needed."

"They've decided it's needed when they come to me. But very often they've not really examined what the real problem is; they're too close. In my experience, closely looking at the 'problem' often turns up quite a different problem (hence solution) than they thought was there. And it's usually the most valuable service I provide, in my opinion, since all the rest loses effectiveness if aimed at the wrong target. As it often is. Industry is bad here. 'Our operators don't know how to...' And that's true, but usually half the problem. Management's ignorance and consequent failure to do what the operators may need is often of greater significance."

"We never pick our projects; they are decided on political grounds. Hence, no needs assessment."

"In general, I would say that we seldom conduct a thorough needs assessment and frequently need to react to assumptions about the learner and his/her need."

Item 20

When working on ISD projects, our instructional development team almost always:

I20. Determines if the need can be solved by training

Descriptive Statistics Variable Name is ITEM 20			
N =	167	Missing =	5
Mean =	2.67665	St. Dev (n-1) =	1.03126
Median =	3.00000	St. Dev (n) =	1.02816
Minimum =	1.00000	S.E.M. =	0.07980
Maximum =	4.00000	Variance =	1.06349

Table 4.8 - Item 20 Descriptive Statistics

The following table provides an the independent group analysis summary for Item 20.

Independent Group Analysis Summary

Grouping variable is EXPERIENCE
Analysis variable is ITEM 20

Group Means and Standard Deviations Missing cases removed = 8

1: mean= 2.142857 s.d.= .9315175 n= 28
2: mean= 2.759036 s.d.= .9701692 n= 83
3: mean= 2.792453 s.d.= 1.098224 n= 53

Analysis of Variance Table

Source	S.S.	DF	MS	F	Appx P
Total	172.55	163			
Treatment	9.23	2	4.61	4.55	0.012
Error	163.33	161	1.01		

Error term used for comparisons = 1.01 with 161 d.f.

Newman-Keuls Multiple Comp.	Difference	P	Critical q Q	(.05)
Mean(3) -Mean(1) =	0.6496	3	3.904	3.351 *
Mean(3) -Mean(2) =	0.0334	2	0.267	2.797
Mean(2) -Mean(1) =	0.6162	2	3.959	2.797 *

Homogeneous Populations, groups ranked

Gp Gp Gp
1 2 3

This is a graphical representation of the Newman-Keuls multiple comparisons test. At the 0.05 significance level, the means of any two groups underscored by the same line are not significantly different.

Table 4.9 - Item 20 Independent Group Analysis Summary

Statistically significant differences were found between the Novice mean and the means for both the Intermediate and Expert groups. As illustrated by the mean and error bar chart below, the Novice group rated Item 20 significantly lower than did the Intermediate and Expert Groups.

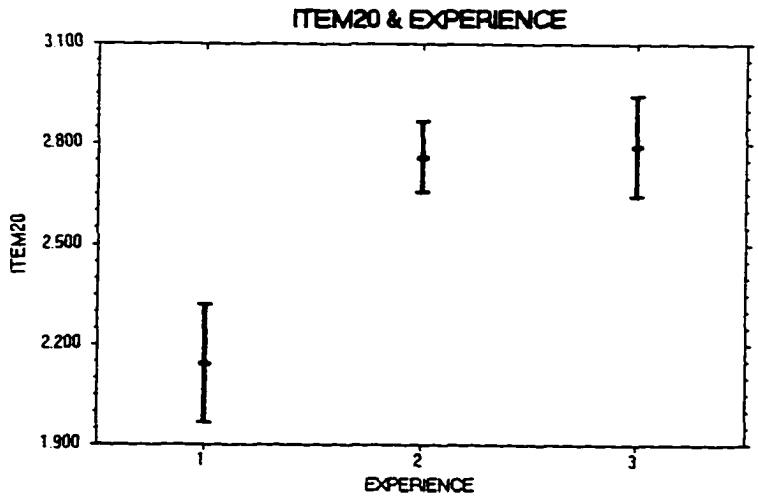

Figure 4.3 - Item 20 Mean and Error Bar Chart

Respondent Comments

The respondent comments which were specifically directed toward this item indicate two major themes in this area. The first relates problems with either always considering everything as a training need and/or not considering other performance support alternatives. The second theme is that the training need is a predetermined ISD activity.

Problems with Training Needs

The first two comments reported in this area are clearly referring to the theme introduced earlier concerning the special concerns of implementing ISD within the academic and university environments. The remaining comments appear to be related to other environments.

"In our venue, a community college Media Services dept., we are most often approached by faculty who have a pre-determined solution to their instructional problems. It is a constant educational process for us to help them determine whether or not it is indeed an instructional problem, and if so, what approaches might be used to meet their instructional needs. Sometimes we succeed; often we don't."

"If its an educational institution (they _assume_ they can solve the world's problems; my thesis committee couldn't see me raising this question at all, all being profs, until I pointed out how industry was delighted to use job aids, work simplification, etc. Educators have their hammers, so all problems look like nails."

"Identifying and therefore resolving non-training issues a key component of ISD - we have difficulty with this."

"I also am a 'one person band wagon' about the exact problem that we think training is going to address, and several others, including some senior managers, are now beginning to address issues that previously were just labeled a training issue, so we're making progress. (Slowly, though!)"

"We worked very hard to help managers and supervisors understand that training is not the appropriate response in every situation."

"There are some needs which are not training-related, perhaps limited resources, etc."

"Task analyses are involved, yet the question of whether or not training is the correct answer is seldom asked, just assumed. And when it is assumed it is almost always a sit-down classroom class. Other options such as OJT, Job Aids, etc. are often left aside."

"So far, there has always been a training need, but not always the one identified by the client."

Predetermined ISD Activity

"The contract says that we will provide training."

"CESL pre-determines that the needs are solved by training because the students enroll in the school program."

"This is somehow usually 'given' before we ever see the project."

"Sometimes the clients do not have time for us to conduct a full-blown needs assessment etc. but they determine on their own that training is the only answer."

In addition to the two themes above, one respondent observes that this part of ISD does not apply to their situation as they work on a performance support project: "My

work mostly deals with the design and development of electronic performance support systems (EPSS). Determining if the need can be solved by training is not what EPSS is all about, instead it provides just in time training in order to improve performance." However, most likely at some point, the exact "performance support needs" had to be identified; it could be argued that the "training need" may be even more critical for such "just in time" training products. If the "just is time training" is not on target, it cannot be meeting the performance support need.

Item 21

When working on ISD projects, our instructional development team almost always:

I21. Conducts a task analysis

Descriptive Statistics Variable Name is ITEM 21			
N =	169	Missing =	3
Mean =	2.71006	St. Dev (n-1) =	1.02002
Median =	3.00000	St. Dev (n) =	1.01699
Minimum =	1.00000	S.E.M. =	0.07846
Maximum =	4.00000	Variance =	1.04043

Table 4.10 - Item 21 Descriptive Statistics

None of the statistical tests indicated differences of significance among groups for Item 21.

Respondent Comments

The respondent comments which relate specifically to this item generally spoke of problems conducting Task Analysis or the importance of this ISD activity.

Problems with Task Analysis

"As far as doing a pure Task Analysis, Needs Assessment, etc., we always TRY to do it up front, but our clients usually don't want to pay for it (so we can't do it formally). They think they know everything already (but usually they don't)."

"In a sense it's usually done, but I gave it a 2 because what is done is often nowhere near complete enough."

"Items that I rated with a 3 are activities that in my past experience the teams I have worked with have sometimes conducted formally; but most often these activities have been handled in a very informal way--perhaps too informal (e.g., team discussion of needs and tasks as opposed to actually collecting data from a sample of the target population)."

"The timing of our being brought into some distance training projects precludes us doing some of the early ISD items."

Importance of Task Analysis

"The subject matter deals with Government contracting to Government contracting personnel. Since there are many legal and regulatory aspects to contracting, the information must be accurate and fully cover the task."

"In my own analysis of my answers - the 4s seem to be linked in accountability to the client and the learner. In ISD you have to know the task, the objectives, know and be able to measure the outcomes and make certain the client feels 'ownership' in the project."

"The team usually starts at the task analysis stage."

Item 22

When working on ISD projects, our instructional development team almost always:

I22. Assesses the trainee's entry level skills and characteristics

Descriptive Statistics Variable Name is ITEM 22			
N =	170	Missing =	2
Mean =	2.82941	St. Dev (n-1) =	0.90381
Median =	3.00000	St. Dev (n) =	0.90115
Minimum =	1.00000	S.E.M. =	0.06932
Maximum =	4.00000	Variance =	0.81688

Table 4.11 - Item 22 Descriptive Statistics

None of the statistical procedures indicated significance differences among groups for Item 22.

Respondent Comments

This group of respondent comments again tended to indicate themes of either the importance or some other positive aspect of this ISD activity, or problems with implementing this activity. The first positive comment reported tends to somewhat assuage flames of some of the previous comments concerning problems using ISD within an academic environment. However, in contrast, the first comment in the problems category again berates the academic environment.

Positive Aspect of Assessing Training Entry Level

"Drawing a profile of the learners and determining their needs seems to me to be the most crucial part of the development of any form of training or instruction. I find that determining who the learners are is most difficult (I design university level courses) because as we incorporate more learning technologies, our market is and will continue to

change in ways that are not yet clear, yet there seems to be so little money available to do ongoing research that looks at how the market is changing and what it is we need to do to respond to those changes."

"I am particularly interested in knowing who my learner is when designing instruction. Many of the subsequent decisions I make about strategies, media, assessment, etc. will be directly affected by learner characteristics."

"The knowledge base and skill level of my audience is quite varied. I have few ways of selecting them other than specifying prerequisites for the class. These are problems which are addressed as a regular part of the class. Determining the entry level of the class participants through introductions and warm-ups, I can begin at the lowest common denominator and work up to the level that the group as a whole can handle. I do have assistants to help the participants during class so that no one falls behind and instruction can move along successfully."

"Primarily focused on their entry level skills and related work experience, but not on characteristics (assuming you mean age, sex, ethnic group, etc.), except for a physical disability which required reasonable accommodation."

"Teachers are also given the option of individually testing each person in class with a pre-test to make sure the class is somewhat tailored to individual needs. What some teachers do is center on what the group needs are. There are 8 to 10 students in each class, so classes are somewhat homogeneous. Tutoring is also available (at extra cost to the students) to help student stay on class level."

"Well, I develop learning environments. It's not quite ISD as you mean it; for example, while we identify the target learners, we don't 'assess trainees'."

Problems with Assessing Trainee Entry Level

"Educ. institutions are most likely to self-delude by drinking their own bathwater; instructors often (not always) draw on own knowledge, with tame advisory committees to bless general curricula outlines. After recommending stronger industry input once, I was told by a key instructor 'I've been teaching this for 20 years, so I know what the students need.' He was miffed when I pointed out that meant he was 20 years out of working in industry."

"In general, I would say that we seldom conduct a thorough needs assessment and frequently need to react to assumptions about the learner and his/her need."

"We do not control who is sent to training or what their background is. We may state that it would be beneficial if the students had these skills prior to coming to class, but we are charged with being able to work with (and have to succeed) anyone who walks through the door."

"To be specific, we've been training a fairly large audience on successive builds of software. We've not been able to isolate the target audience to a specific group of students. As a result, we wind up providing training for some, but not all the same students on each build of software. We, therefore, cannot determine to what I would consider an adequate degree how valid or effective our training has been."

Item 23

When working on ISD projects, our instructional development team almost always:

I23. Establishes learning objectives

Descriptive Statistics Variable Name is ITEM 23			
N = 171		Missing =	1
Mean =	3.59649	St. Dev (n-1) =	0.76373
Median =	4.00000	St. Dev (n) =	0.76149
Minimum =	1.00000	S.E.M. =	0.05840
Maximum =	4.00000	Variance =	0.58328

Table 4.12 - Item 23 Descriptive Statistics

The statistical procedures did not indicate findings of significance for Item 23.

Respondent Comments

All but one of the specific comments for Item 23 were overwhelming positive in support of developing learning objectives. These respondent comments strongly support that this item received the highest overall mean rating (Mean = 3.59).

Support for Establishing Learning Objectives

"In no case would I proceed without clear objectives. It's a necessary step in the consultation process. 'If your employee could do [fill in the blank], would you be satisfied?'"

"I believe I23 is imperative. Without it, there is no clear vision to the goal."

"In ISD you have to know the task, the objectives, know and be able to measure the outcomes and make certain the client feels "ownership" in the project."

"We always establish objectives..."

"But on the plus side several ISD practices are also mandated such as the use of objectives, etc. We are audited on these processes. Helps keep us long termers honest."

"The establishment of learning objectives and development of test items is strongly emphasized in our graduate classes."

"We are particularly good at goals/objectives and outcomes."

"We consider 23 and 24 as absolutely essential."

Lone Problem with Objectives

"Textbooks are chosen by the director and the director also hands out a list of objectives that need to be covered in each subject matter and level. Although the teachers are supposed to address these objects, they are allowed only one photo copy per student per day, which makes it somewhat difficult. So most of the objectives have to be supported from the assigned text, or taught verbally, with very little photo-copying. There are, however, computer labs, videos, and supplemental texts available. So if the teacher takes time to explore the learning center, he/she can make sure the objectives are met."

Item 24

When working on ISD projects, our instructional development team almost always:

I24. Identifies the types of learning outcomes

Descriptive Statistics Variable Name is ITEM 24			
N =	169	Missing =	3
Mean =	3.24260	St. Dev (n-1) =	0.92277
Median =	4.00000	St. Dev (n) =	0.92004
Minimum =	1.00000	S.E.M. =	0.07098
Maximum =	4.00000	Variance =	0.85151

Table 4.13 - Item 24 Descriptive Statistics

The statistical procedures did not indicate significant differences among groups for Item 24.

Respondent Comments

Several respondent comments discussed objectives and outcomes together, another indicated confusion concerning the meaning of this ISD area and one related outcomes to more general business outcomes rather than learning outcomes. However, most of the comments were positive in nature and supportive of the relatively high mean rating for this item (3.24). In addition, one comment specifically mentions the special concerns of the academic environment for this item; however, this particular comment is not especially negative in tone as have been many others concerning ISD in the academic environment.

Objectives and Outcomes

"I equate learning objectives with learning outcomes."

"In my own analysis of my answers --the 4s seem to be linked in accountability to the client and the learner. In ISD you have to know the task, the objectives, know and be able to measure the outcomes and make certain the client feels "ownership" in the project."

"We are particularly good at goals/objectives and outcomes."

"Our team usually generates learning outcomes based on the needs assessment and review of training currently being conducted. Without the establishment of learning outcomes, it is very difficult to predict or duplicate successful training."

"In undergraduate work, the behaviorist approach is prevalent. In post graduate, learning outcomes are made explicit, but their context and detail is more open."

Business Outcomes

"Anyhow, the complete preparation in accordance with the business strategy and outcome strategy is most important, so my organization is all the time looking for the training should result in a business outcomes, of which evaluation methods would be so simple that, if the outcomes does not match the business outcomes, then those training would not be successful. Sometimes, those training would be evaluated by the outcome of job-performance. However, for those of management development training, any kind of ISD should be focused on a specific training purpose such as building the mindset, vision, business strategy, seeing is believing, communication skills, etc."

Needs Clarification

This particular respondent indicated the need for clarification for the meaning of this ISD activity as stated: "I am unsure of what you meant by determines learning outcomes. If you mean do you check for understanding and ensure (through training exercises, activities, games, etc.) whether or not the knowledge is being comprehended, then my answer is 4." As this item was carried over from the original Zemke research (1985), it was included in the esurvey with modification.

Academic Environment

"I work in higher education rather than training. Therefore many outcomes for example, are not so rigorous. Students often determine outcomes rather than teachers. As an instructional designer, I do offer a systems approach, where appropriate. However, it is often inappropriate."

Item 25

When working on ISD projects, our instructional development team almost always:

I25. Develops test items

Descriptive Statistics Variable Name is ITEM 25			
N = 170		Missing =	2
Mean =	3.02353	St. Dev (n-1) =	1.07115
Median =	3.00000	St. Dev (n) =	1.06800
Minimum =	1.00000	S.E.M. =	0.08215
Maximum =	4.00000	Variance =	1.14737

Table 4.14 - Item 25 Descriptive Statistics

The statistical tests conducted for Item 25 did not indicate findings of significance.

Respondent Comments

This group of respondent comments appear rather mixed in that some strongly support testing, others indicate alternative evaluation of performance, and yet others indicate that testing in not their responsibility. Only one comment indicates problems with testing. However, in spite of inconsistency within the comments, the overall mean rating for this item was still fairly high at 3.02.

Positive Use of Testing and Alternatives

"#23 & #25 The establishment of learning objectives and development of test items is strongly emphasized in our graduate classes."

"We have designed an interactive knowledge base for an advanced level high-school Biology course for Grade 11. This base is quite extensive with 1.5 MB of text and

about 600 images, diagrams and animations. We have an extensive formation evaluation quiz system as well as summative tests all corrected by C++ program in cgi-bin."

"For item #25, we always develop some sort of performance/assessment/ evaluation items, but they are rarely ever test, as we stress performance based outcomes."

"Most of our learning outcomes are performance-based. 'Test' = 'observe person performing procedure according to. . . .(predetermined requirements)'."

"Similarly, I focus on complex cognitive skills, so the 'test items' aren't rigorous. I use an 'action research' approach, so there's lots of user testing, but it's not formal, but very iterative."

Test Items not Their Responsibility

"I design/conduct informal training for the military; therefore, I do not follow formal procedures. Also, there are no tests."

"Within the project the instructor determines the assessment types (i.e. quizzes, assignments)."

"We have another group of designers who work almost exclusively on test items using the objectives developed at the team level."

"Currently, there is no testing requirement. We develop orientation level seminars for the public."

Often the edict is handed down 'Thou shall NOT test'."

Test Problems

"We have seen the results of some testing; however, the test itself created sufficient problems that I believe it obviated any meaningful assessment of the training provided."

Item 26

When working on ISD projects, our instructional development team almost always:

I26. Selects instructional strategies

Descriptive Statistics Variable Name is ITEM 26			
N = 171		Missing =	1
Mean =	3.44444	St. Dev (n-1) =	0.80521
Median =	4.00000	St. Dev (n) =	0.80285
Minimum =	1.00000	S.E.M. =	0.06158
Maximum =	4.00000	Variance =	0.64837

Table 4.15 - Item 26 Descriptive Statistics

The following table provides the independent group analysis summary for Item 26.

Independent Group Analysis Summary

Grouping variable is COMPLEXITY
Analysis variable is ITEM 26

Group Means and Standard Deviations Missing cases removed = 4

1: mean= 3.363636 s.d.= .6741999 n= 11
2: mean= 3.253968 s.d.= .9666746 n= 63
3: mean= 3.585106 s.d.= .6785433 n= 94

Analysis of Variance Table

Source	S.S.	DF	MS	F	Appx P
Total	109.52	167			
Treatment	4.22	2	2.11	3.30	0.039
Error	105.30	165	0.64		

Error term used for comparisons = 0.64 with 165 d.f.

Newman-Keuls Multiple Comp.	Difference	P	Q	Critical q (.05)
Mean(3) -Mean(2) =	0.3311	3	3.600	3.351 *
Mean(3) -Mean(1) =	0.2215	2	1.230	2.796
Mean(1) -Mean(2) =	0.1097	2	0.594	2.796

Homogeneous Populations, groups ranked

Gp Gp Gp
2 1 3
——
——

This is a graphical representation of the Newman-Keuls multiple comparisons test. At the 0.05 significance level, the means of any two groups underscored by the same line are not significantly different.

Table 4.16 - Item 26 Independent Group Analysis Summary

The Newman-Keuls multiple comparisons test indicates that the High Level Complexity group responded significantly differently than did the Medium Level Complexity group. Yet the means between the Medium Level Complexity group and the Low Level Complexity group are not significantly different, nor are the means between the Low Level Complexity group and the High Level Complexity group significantly different. The Mean and Error Bar Chart below provides a graphical representation of the responses for these groups.

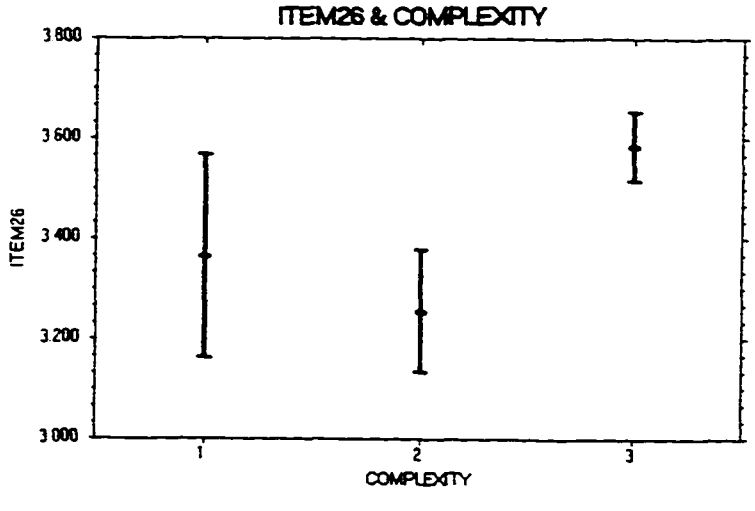

Figure 4.4 - Item 26 Mean and Error Bar Chart

Respondent Comments

Several of the respondents providing specific comments for this item discussed the selection of strategies and media together. Four comments stress the importance of this ISD activity, yet one of these indicates problems in this area. The remaining four comments clearly indicate problems encountered in selecting instructional strategies. The mixed nature of the comments and the problems noted do not seem entirely consistent with the mean rating of 3.44 for this item.

Importance of Selecting Instructional Strategies

"How could you NOT select strategies or media?"

"I'm not sure I would know how to proceed without this."

"Being mainly for distance education, there is a real need for the consideration of teaching strategies (and other aspects of curriculum design) to be appropriate for a diversity of student needs and learning styles. On the other hand, the situation of learning in a more independent manner does require a measure of explicit direction to provide a mechanism for developing self confidence. Student support by teaching staff is essential and its design is an important part of the design process."

"Selection of Instructional Strategies is key before deciding on media but many people jump to the technology and then start creating the course."

Problems with Selecting Strategies

"The concepts of instructional strategy selection and media selection are difficult to reconcile in the real world. They are difficult to conduct far into the ISD process - as the models would have us do, after

outcome and assessments are designed. To make a project work many decisions have to be made much earlier in order to provide resources - e.g.,. a decision to use multimedia or distance education may not be the initial instructional choice but this was decided because of other factors."

"Frequently, our audience/sponsor advises us of the strategy they think is most appropriate - which usually means they have experienced a strategy and were pleased with it, and therefore would like us to use it again. The price we pay is that they are not always open to new strategies unless we take a 'risk' and try them out."

"My experience is that I am called into projects and while I (or the ed design consultants) would recommend the systematic approach your questions imply, normally the clients (public or private) start at stage I26. Thus they have determined that they will do a CD-ROM or have Stand-up lecture or something and then seek to arrange the content that must fill the CD-ROM or the lecture. The result is that we then have a solution in search of a problem. The creation of the educational context in which the developed solution may work is then begun."

"We're always hiring new people - often times I am either not consulted on recruiting criteria or not apprised if the established criteria was adhered to during the hiring practice. This makes _designing the approach_ (i.e., strategies) extremely difficult; but as I am the only one here with any ISD training, a very difficult point to prove."

Item 27

When working on ISD projects, our instructional development team almost always:

I27. Selects instructional media

Descriptive Statistics Variable Name is ITEM 27			
N = 171		Missing =	1
Mean =	3.33918	St. Dev (n-1) =	0.88227
Median =	4.00000	St. Dev (n) =	0.87968
Minimum =	1.00000	S.E.M. =	0.06747
Maximum =	4.00000	Variance =	0.77840

Table 4.17 - Item 27 Descriptive Statistics

Statistical tests did not indicate findings of significance for Item 27.

Respondent Comments

As noted for the Item 26 comments, media selection is again discussed in conjunction with the selection of instructional strategies. Most of the comments indicate that media selection is a predetermined ISD activity which is not within the scope of the respondent's responsibilities. One comments indicates a bias against multimedia, and one provides a more general statement concerning media selection as based on needs analysis. Again, these somewhat mixed comments do not seem to clearly support the fairly high overall mean rating for this item (3.33).

Predetermined Media Selection

"Even in areas as seemingly automatic such as the selection of instructional strategies and media, all to often the client predetermines the medium, not by what is right, but by what they feel is 'in', 'current', or 'standard' within their firm."

"In the case of the low rating on instructional media, frequently the constraint is placed on the situation by the client....they WANT a multimedia production, or a videotape, or a manual. They come in with a specific media already in mind."

"They want to make a video and that's what we do."

"Instructional media, i.e. video, multimedia, web-based, etc., is usually selected by the customer.'

'Our customers, primarily military, contract us having decided CBT is the solution for them."

"We are involved in developing instructional projects for faculty, who have already established that they want to use the WWW to deliver instruction (or any other medium)."

"Sometimes I inherit a media solution. Current project includes 10 TV broadcasts 'cause the funding was found with that emphasis; I'd not bother with the programs myself. Have had clients say 'We've just bought XX, what can we do with it?' or 'We need to be seen using the hot new trendy stuff'."

Dislikes Using Multimedia

"(We are the subject-matter experts, too.) I do almost no work with multimedia because I don't much like it for teaching. It seems to me less effective in promoting active learning. (See Rosanne Potter's article in the latest issue of _Computers and the Humanities_ [30:2].) See the article by Havholm & Stewart in the same issue for a description of our work on which my answers to this questionnaire are based."

Based on Analysis

"Analysis needs to be delivered in specific ways to be effective, and I believe delivery media selection is an ID function based on this analysis."

Item 28

When working on ISD projects, our instructional development team almost always:

I28. Conducts ISD reviews during instructional development

Descriptive Statistics Variable Name is ITEM 28			
N =	167	Missing =	5
Mean =	2.83832	St. Dev (n-1) =	0.95260
Median =	3.00000	St. Dev (n) =	0.94974
Minimum =	1.00000	S.E.M. =	0.07371
Maximum =	4.00000	Variance =	0.90744

Table 4.18 - Item 28 Descriptive Statistics

The statistical tests did not indicate findings of significance for Item 28.

Respondent Comments

A somewhat surprising finding was the attitude toward ISD reviews during the actual development of the instruction. This area received the fewest specific comments overall with only four respondents specifically mentioning this activity. Yet the sparse comments do not seem to indicate poor ratings, as the overall mean, though below 3.0, was still a fairly healthy value of 2.83.

"Again, it's usually done, but seldom really thoroughly."

"I'm not sure what you mean by this. Reviews by colleagues? If so, yes. Clients are most likely to skip, short-change, or resist."

"28 is probably a function of available time."

"As a single person it is often difficult to find SME and test subject much less to get someone to work on a ISD review -what a luxury!"

Item 29

When working on ISD projects, our instructional development team almost always:

I29. Ensures Subject-Matter Expert reviews are conducted during development

Descriptive Statistics Variable Name is ITEM 29			
N =	169	Missing =	3
Mean =	3.36095	St. Dev (n-1) =	0.88298
Median =	4.00000	St. Dev (n) =	0.88037
Minimum =	1.00000	S.E.M. =	0.06792
Maximum =	4.00000	Variance =	0.77966

Table 4.19 - Item 29 Descriptive Statistics

None of the statistical procedures found indications of significance for Item 28.

Respondent Comments

The only of the evaluation items (Items 28 to 35) to attain a mean rating that was over 3.0 (Mean Rating 3.36), the comments for this item provide strong support for the high rating, yet also indicate some problems of SME availability.

Importance of SME Reviews

"IDs are not SMEs, and thus constant SME review is crucial to staying on task(s)."

"We ALWAYS get a SME to review and sign off on everything we do. If we don't, then we always get stuck fixing the content for free after they change their mind several times (which stinks!)"

"I come from outside the organization. This is a must."

"I'm the subject matter specialist as well as the developer so this occurs concurrently."

SME Availability and Other Problems

"Also, we deal with new, short term projects on a regular basis so there is no SME available..."

"Since I am alone and the Instructional designer - I have control over the original design - but not over the continued evaluation after the training material have been turned over to the client. As a single person it is often difficult to find SME and test subject much less to get someone to work on a ISD review -what a luxury!"

"29 not always feasible."

"We work in a technical field that is in constant flux-the Internet (we're an ISP). As such, even though we have SMEs on hand in house, they often don't understand *why* we have to come pick their brains. In other instances, due to time constraints, SMEs just aren't an option. Instead, designers have to learn/absorb an entire body of knowledge in order to construct said instruction."

"I know most instructional designers here do not work the way that I do, in that I do most of the actual writing, whereas they leave that to the subject matter experts (SMEs). SMEs, however, are often quite bad at including all of the information that a beginner needs, which is why I prefer to learn the subject and write it myself. Most of my work has been on quite technical subjects where the completeness of the argument is critical to the learner's comprehension."

"I often work with subject specialists during development, and material is then shown to others, usually not at arm's length. You haven't lived until your subject experts start to argue with each other about a word's meaning or, more likely, 'best practice'. There's also the inevitable battle over whether to insist on promoting the new way (and ignoring the old), or to accommodate the old. A good example in Canada is the metric system. All pesticides are in metric, but we can't make farmers stop thinking in acres, so a 'bilingual' approach must be taken."

"I didn't know what you meant by 'Subject-Matter Expert Reviews' - we use SMEs to write our material. Do you mean peer review?"

Item 30

When working on ISD projects, our instructional development team almost always:

I30. Conducts individual (one-to-one) trials of instruction before completion

Descriptive Statistics Variable Name is ITEM 30			
N =	171	Missing =	1
Mean =	2.53216	St. Dev (n-1) =	1.05878
Median =	3.00000	St. Dev (n) =	1.05568
Minimum =	1.00000	S.E.M. =	0.08097
Maximum =	4.00000	Variance =	1.12102

Table 4.20 - Item 30 Descriptive Statistics

The following table provides an independent group analysis summary for Item 30.

Independent Group Analysis Summary

Grouping variable is COMPLEXITY
Analysis variable is ITEM 30

Group Means and Standard Deviations Missing cases removed = 4

1: mean= 1.818182 s.d.= .9816498 n= 11
2: mean= 2.476191 s.d.= .9976932 n= 63
3: mean= 2.670213 s.d.= 1.081499 n= 94

Analysis of Variance Table

Source	S.S.	DF	MS	F	Appx P
Total	187.71	167			
Treatment	7.58	2	3.79	3.47	0.033
Error	180.13	165	1.09		

Error term used for comparisons = 1.09 with 165 d.f.

Newman-Keuls Multiple Comp.	Difference	P	Critical q Q	(.05)
Mean(3) -Mean(1) =	0.8520	3	3.619	3.351 *
Mean(3) -Mean(2) =	0.1940	2	1.613	2.796
Mean(2) -Mean(1) =	0.6580	2	2.726	2.796

Homogeneous Populations, groups ranked

Gp Gp Gp
1 2 3

This is a graphical representation of the Newman-Keuls multiple comparisons test. At the 0.05 significance level, the means of any two groups underscored by the same line are not significantly different.

Table 4.21 - Item 30 Independent Group Analysis Summary

The Newman-Keuls multiple comparisons tests indicates that when grouped by Project Complexity Levels, the responses to Item 30 are statistically significant between the Low Level Complexity group and the High Level Complexity group. This is the third statistically significant finding from the ISD esurvey study. The Mean and Error Bar chart below provides a graphical representation of the responses for these Complexity Level groups.

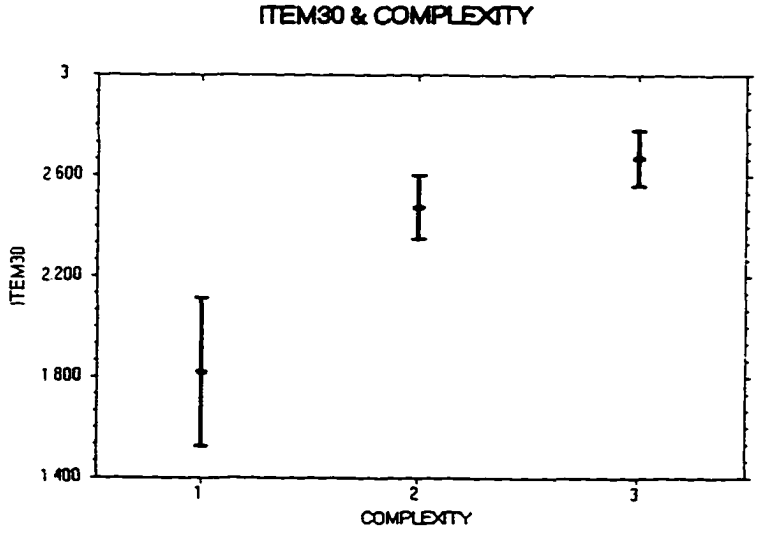

Figure 4.5 - Item 30 Mean and Error Bar Chart

Respondent Comments

These comments indicate differing perspectives on the practice of Individual trials of the instruction.

"I get I30 done often by giving material to a non-expert reader or editor to review for clarity."

"Basically, I don't have a pool of individuals to use."

"We believe that items #130, 131, 132 are important, but (as is many times the case) had to make choices based on the lack of adequate development time. The deadlines were not ours but were mandated by leadership in Washington. And yes, we understood the many arguments in favor of completing these three steps."

"Items 30 and 31 - The development schedule is so tight, we barely have time for the pilot test. This is one of the problems with the Rapid Update Cycle development model."

"Attention to all levels of piloting from individual to group very key and not something we currently do very well."

"Companies or other sponsors rarely spend much energy on evaluation."

"When necessary, we attribute the need for formative evaluation of the project/product to the need for 'technology effectiveness' testing."

"Faculty often do not want to test the instruction with students before using it. They feel that they are professionals and know what the students need. Often the traditional ISD process is not followed for lack of time or interest."

"(For items 130-135, it should be noted that we do these things routinely as teachers, whether or not we've developed anything special to teach the course. Therefore,

we also do these things for any technology we have introduced into a course.) Please see Havholm & Stewart, "Computer Modeling and Critical Theory." _Computers and the Humanities_ (30:2) 1996."

"I usually prefer a larger test group since time is usually limited."

"Lecturing staff feel they have a close assessment of who the students are so one-to-one trialing is not necessary. Evaluation is an on-going aspect of the teaching."

"Also, the short turn-around needs or the lack of understanding for the importance of pre-trials and pilot testing of instructional projects by the principal stakeholders doesn't permit those tasks to be planned, either. Our 'clients' are academicians or researchers who think they know the instructional processes."

"Formative evaluation 'takes too much time' and once the project is developed, our clients see our role as finished."

"I am working in a large university, helping to develop materials for undergraduate science instruction. When we do work for publishers (CD-based exercises as companions to printed textbooks), we do what pleases the authors and editors. What works with real people in the real world is secondary and expensive to investigate - so we do relatively little testing of the materials with a live audience."

"When we do multimedia materials for on-campus classes, we have a captive audience. We do fairly extensive checking of our designs with students -but again it is the smile on the instructor/SMEs face that we look for, not so much the students', because it is primarily the instructor who is going to say yea or nay to using the piece of software."

"Because of time constraints not much testing is done before the pilot."

"30 was a 2 because we mostly do 31."

"The "field trial" components above are really a view of each class being a field trial - most good instructors never "finish" a course - each semester they make some adjustments. So, it's a view that we keep learning about our students - which, frankly, is the only workable view in this situation. Faculty would not be likely to conduct field tests before a semester!"

"The reason my answers seem extreme is because we have set procedures and ways of doing course development that are always done or not done. (i.e. we always establish objectives, never have time or money for one-to-one trials)."

"The degree of individual verses small group evaluation is highly dependent on the type of instruction under development. Furthermore, the ISD practices are all addressed in development of the instructional design--they are however, adapted to serve as a tool rather than strictly following a preselected ISD model."

Item 31

When working on ISD projects, our instructional development team almost always:

I31. Conducts small group trials of instruction before completion

Descriptive Statistics Variable Name is ITEM 31			
N = 171		Missing =	1
Mean =	2.63158	St. Dev (n-1) =	1.01108
Median =	3.00000	St. Dev (n) =	1.00812
Minimum =	1.00000	S.E.M. =	0.07732
Maximum =	4.00000	Variance =	1.02229

Table 4.22 - Item 31 Descriptive Statistics

The statistical tests did not indicate findings of significance for Item 31.

Respondent Comments

Although there were no significant statistical findings for Item 31, similar to the respondent comments concerning individual trials of the developmental instruction, this group of comments indicates various perspectives. Note that individual trials and small group trials are frequently discussed together by the respondents.

"When we do multimedia materials for on-campus classes, we have a captive audience. We do fairly extensive checking of our designs with students -but again it is the smile on the instructor/SME's face that we look for, not so much the students', because it is primarily the instructor who is going to say yea or nay to using the piece of software."

"#31 & #32 - usually one or the other is done, seldom both."

"My low ranking indicates not that it's undesirable, but rather that it's the most likely to be cut due to time/budget limits."

"31 and 32 are also not always feasible, we consider them desirable but not essential." "Small group trials have not been very practical at the center. But the evaluations every six week help the instructors to focus on improvement of instruction. Also, the instructors, as mentioned before are encouraged to listen to their students learning preferences in a weekly evaluation, and are encouraged to adapt their teaching according to the preferences."

"Also, the short turn-around needs or the lack of understanding for the importance of pre-trials and pilot testing of instructional projects by the principal stakeholders doesn't permit those tasks to be planned, either. Our 'clients' are academicians or researchers who think they know the instructional processes."

"I am working in a large university, helping to develop materials for undergraduate science instruction. When we do work for publishers (CD-based exercises as companions to printed textbooks), we do what pleases the authors and editors. What works with real people in the real world is secondary and expensive to investigate - so we do relatively little testing of the materials with a live audience."

"Because of time constraints not much testing is done before the pilot."

Item 32

When working on ISD projects, our instructional development team almost always:

I32. Pilot tests instruction before completion

Descriptive Statistics Variable Name is ITEM 32			
N = 171		Missing =	1
Mean =	2.73684	St. Dev (n-1) =	1.04925
Median =	3.00000	St. Dev (n) =	1.04618
Minimum =	1.00000	S.E.M. =	0.08024
Maximum =	4.00000	Variance =	1.10093

Table 4.23 - Item 32 Descriptive Statistics

Statistical procedures did not find significant indications for Item 32.

Respondent Comments

Both support for pilot testing and problems with pilot testing are indicated by the respondent comments relating to this item.

Support for Pilot Testing

"Pilot tests instruction before completion; I can't leave a customer without a thoroughly tested product."

"Testing prior to release is critical, for technical as well as pedagogical concerns."

"However, I have prioritized many of them and we almost always pilot test and evaluate, even if we do nothing else."

"Given the corporate MIS environment of "get it done" there is a tendency to not take the time to test thoroughly the ISD of a given project. There is some pilot testing, but no serious quantitative study for the establishment of metrics. We only provide technology training for internal audiences of internally developed systems, and the attitude is often - get it done and get it out there." students passing in a certifiable manner."

"It has been a battle to get management to support adequate pilot testing and revision before training is released. But we are making headway. One way we are dealing with is the development of our own Instructional Design Model (HIDM) or Hittem' (ha). It seems to be a good way to first define our processes and hold to them during development."

Problems with Pilot Testing

"Pilot testing and evaluation often remains undone due to time constraints. We put a lot of time into developing products, and despite the fact that schooling and theory teaches us the necessity of piloting and evaluating, the real world often works against these tasks. Budget issue confound the matter too, as does handing off a product to a client who may or may not follow through with evaluation and revision recommendations."

"Also, my experience is that people don't know what pilots are. The process used is more prototyping, I guess -- but the try this here, try that there and compare results is normally not done."

"Also, the short turn-around needs or the lack of understanding for the importance of pre-trials and pilot testing of instructional projects by the principal stakeholders doesn't permit those tasks to be planned, either. Our 'clients' are academicians or researchers who think they know the instructional processes."

"We not been very 'good' as an institution in conducting pilots or in evaluating the "systems" we have developed. We are improving, but it is slow progress, indeed."

"However, we don't perhaps do as much as we should on pilot testing and evaluation. Seems a little incongruous, doesn't it. However, since we are under a tight schedule, something has to give and that seems to be the area."

"My responses reflect a combination of the minimum I expect to be done (Items rated 4) and the realities that usually are involved working with a client. Many clients are unwilling (or too far behind schedule) to tolerate a great deal of pilot testing. Most have a low interest in evaluation, but will accept level one or two evaluation."

"The 'field trial' components above are really a view of each class being a field trial - most good instructors never 'finish' a course - each semester they make some adjustments. So, it's a view that we keep learning about our students - which, frankly, is the only workable view in this situation. Faculty would not be likely to conduct field tests before a semester!"

Item 33

When working on ISD projects, our instructional development team almost always:

I33. Conducts a follow-up evaluation after training

Descriptive Statistics Variable Name is ITEM 33			
N =	168	Missing =	4
Mean =	2.89881	St. Dev (n-1) =	1.01273
Median =	3.00000	St. Dev (n) =	1.00971
Minimum =	1.00000	S.E.M. =	0.07813
Maximum =	4.00000	Variance =	1.02563

Table 4.24 - Item 33 Descriptive Statistics

The statistical procedures for Item 33 did not indicate findings of significance.

Respondent Comments

These respondent comments both supported follow-up evaluations and identified problems with these activities.

Support for Follow-up Evaluation

"33, 34, 35 are also considered essential."

"This is planned, but has not yet been done."

"Follow-up is essential to validate efficacy of delivery."

"At the end of the project an outside evaluator performs a formative and sometime summative evaluation."

"The amount of formal formative evaluation that happens during development varies between disciplines, but all programs do #133/134 after the first offering of a course."

"We put a major emphasis on quality assurance and also on evaluation and follow-up through student surveys, peer reviews and individual interviews with students and staff."

Problems with Follow-up Evaluations

"The reason I've rated the last three points lower, is because most of my projects have been very 'stand alone'. I've never had a follow-up on one of these projects, although I recognize the necessity of these activities."

"We need to do 133 routinely but currently are not (due to time constraints)."

"We also do not do enough follow up to determine how effective the instruction was."

"We have also not been afforded the opportunity to go back to the students to conduct post training surveys to determine the effectiveness of our training." the necessity of these activities."

"As a firm of consultants, instructional designers, and authors of multimedia, we are often constrained by the practices of our clients. As much as we might like, for example to say a strong yes to 33, 34 and 35, it is quite simply not possible since few, if any of our clients are prepared to give us a long term revolving contract."

"I33 - I35 Most projects are undertaken only when problems become serious enough, so there's usually an urgency to get a 'fix' in place ASAP. Clients are relieved to

get a project off their shoulders so they can turn to the next alligator chewing at their rump. Few take the time to evaluate existing programs until obvious problems arise. It's a 'If no one complains it's broke, I won't have to fix it' reality. Worse, evaluation faces opposition from those who are comfortable in their rut (this tends to apply to public educational settings far more than private training) so evaluation/revision can't begin until a crisis is very apparent, thus ensuring the problem to be tackled has grown to major proportions with an urgency to 'fix' it soon but without upsetting anyone or changing anything."

"The same holds for true for the need to maintain some kind of direct contact with the learners as they work through their courses. Trial runs of the material are a dream of mine! We do revise all materials after the first offering, but by then I find I am caught up in new projects....While the course is running that first time, contact with the instructors is very helpful, of course, but instructional designers (like myself) need more direct feedback. Luckily, many studies and research support the need for more and varied kinds of testing and evaluation, and the institution I work for has begun to help ensure I get the kind of learner feedback I need. Surveys such as this one help as well."

"We could certainly do more follow-up and evaluation after the curriculum has been in place for three years to see if indeed it did accomplish the objective that were set forth. - We in the 4-H Cooperative Curriculum System are truly interested in how to measure the impact of life skill development."

"Regarding follow-up evaluations - clients rarely want to pay for anything past the final deliverable. Many clients do not even want to pilot test. Most are concerned only with students passing in a certifiable manner."

"Formative evaluation 'takes too much time' and once the project is developed, our clients see our role as finished."

"We develop CBT Training on software products (primarily) for off the shelf sales; follow up evaluation data is not normally available. Many companies consider this proprietary data."

"Unfortunately I run a one person show so I do not do a thorough job on follow-up. I know I should though!"

"My company is completely driven by deadlines, which usually doesn't allow for incorporation of all the components of proper design. Regardless of how important we feel that follow-up assessment is, they consider it a 'nicety' and are already into the next deadline."

Item 34

When working on ISD projects, our instructional development team almost always:

I34. Conducts evaluations to determine update/revision requirements

Descriptive Statistics Variable Name is ITEM 34			
N =	171	Missing =	1
Mean =	2.81871	St. Dev (n-1) =	0.96217
Median =	3.00000	St. Dev (n) =	0.95935
Minimum =	1.00000	S.E.M. =	0.07358
Maximum =	4.00000	Variance =	0.92577

Table 4.25 - Item 34 Descriptive Statistics

Statistical tests did not indicate significant differences among groups for Item 34.

Respondent Comments

The respondent comments in this area tended to either support this evaluation activity, indicate non-responsibility for this activity, or discuss problems implementing this evaluation activity.

Support for Evaluation to Determine Revisions

"CESL is strong on evaluation. They do weekly informal evaluations with the students about what is too difficult, too easy, enjoyable, non-enjoyable, what they would like to learn that they are not learning, etc. Every six weeks formal written evaluations are given by the students."

"Either it does not work and people complain and you fix it, or it works and you attract volume to the training. The proof of effectiveness is by tracking how many people do it and how many questions you get. It is sort of a free market approach rather than a bean counter approach. Things look great so far."

"The amount of formal formative evaluation that happens during development varies between disciplines, but all programs do #133/134 after the first offering of a course."

"In my context, I revise and develop materials annually in response to student feedback, the students learning and to altered outcomes and objectives of the program. I am not able to do the trials. I use the full class for the trials and then do the program evaluation afterwards."

Not Responsible for Revisions

"I marked a '1' on number 34 because I have not been involved in any projects that have been going long enough to require update/revision, although I feel that this kind of evaluation would be essential."

"#34 & #35: Completed programs have not been in place long enough to require this."

"Re #34 and 35: since we do contract custom work, we are rarely involved after the beta test and revisions are done (although we do recommend that third party evaluations be done)."

"Conducts evaluations to determine update/revision requirements Not usually in the contract."

Problems with Evaluation for Revision

"In short, we are left with observing how effective our training is by using some small groups and individuals as they are provided 'update' training. We attempt to use this information to make modifications to our training in an effort to improve its quality."

"In conjunction with that, our faculty are not particularly interested in our participation in evaluation processes."

"And little evaluation is done other than right after the training."

Item 35

When working on ISD projects, our instructional development team almost always:

I35. Conducts evaluations to determine possible training system deterioration

Descriptive Statistics Variable Name is ITEM 35			
N = 168		Missing =	4
Mean =	2.19048	St. Dev (n-1) =	1.04939
Median =	2.00000	St. Dev (n) =	1.04627
Minimum =	1.00000	S.E.M. =	0.08096
Maximum =	4.00000	Variance =	1.10123

Table 4.26 - Item 35 Descriptive Statistics

Statistical procedures indicated no significance differences among groups for Item 35.

Respondent Comments

Most respondent comments indicated that this evaluation activity is seldom performed. This is supportive of the low overall mean rating for this item; however, not all comments were negative in nature.

Support for Evaluations of System Deterioration

"The training systems are commercial software products, therefore I35 leads to upgrades ;-)"

"#35 - training system deterioration - often neglected but important part of the process to ensure learning."

Evaluations of System Deterioration not Done

"In 135 - we are rarely involved after handing over (signing off) the project."

"Never been asked to."

"Unfortunately, #135 almost never happens."

"35 was a 2 because we mostly do 34."

"#35 - seldom deemed necessary because #34 was needed & done instead."

"I marked a "1" on the last item because I'm not sure what you mean by 'training system deterioration'."

"Evaluations to determine the extent of training system deterioration would only be performed in conjunction with a long-term relationship with a specific customer, considering that most of the projects I have worked on were turned over to customers that closed their relationship with us."

"I30 - I35 are most likely to be skipped because of the inevitable budget and time constraints."

Chapter 5

Discussion and Conclusions

Overall, the results of the ISD esurvey were encouraging, in that they support the existing knowledge base of the use of ISD activities as described in the previous work by Tessmer, Wedman, and their associates (Holcomb, Tessmer, and Wedman, 1996; Tessmer and Wedman, 1995; Tessmer & Wedman, 1990; Wedman & Tessmer, 1993; Zemke, 1985). ISD is not dead, nor is it always impossible, excessive, and "past its prime" with the increasingly complex designs required for performance support options, such as EPSSs and "expert systems". When ISD is employed, there is generally an accepted model within the organization which supports its intended function. Although not always perfectly applied, the esurvey results indicate that the ISD process can be effectively used.

Most of the problems commented on by the esurvey participants concerning the actual conduct of the identified ISD activities concerned the front-end analysis stage (Item 19 through Item 22) and the evaluation items (Item 28 through Item 35). The design activities (Item 23 to Item 27) were less frequently commented on. Respondent comments were more likely to note the criticality of these design activities, rather than difficulty with the implementation of the activities.

These conclusions from the comment data were supported by specific detailed comments, as well as, more general confirmatory statements. For example, one respondent notes: "Most of the problems with ISD are associated with the first and last steps of the Systems Approach to Training: Analysis and Validation. For example, it is

typically difficult to convince clients that time should be allocated to conduct a task analysis, or to validate the training offered."

Another respondent states: "As to why, in most cases it is a contractual issue. The government keeps certain tasks to themselves, and deliver the 'results' to the contractor. This is especially true of both the front end analysis and the post evaluation. They don't think it is our business. Of course, the problem is that they are doing it with untrained and unmotivated personnel, and the results are frequently suspect. Immaterial. The contract must go on. Contractually, you are expected primarily to do steps 126-129, and to actually produce the media materials, and the course of instruction, but not to deliver it to the students. That again is the domain of the government. That is changing, especially in the Air Force, which has contracted for a whole range of services to include analyses and evaluation. Unfortunately the companies I had been with did not desire to get that business (too labor intensive and therefore unprofitable)."

As noted by a respondent, "This lack of pre-design / post development involvement is a source of some frustration to us instructional designers. Some of the problems inherent in this situation are smoothed out by developing prototypes of the courseware at an early stage."

Another ID responded: "It makes me realize all the things I am not doing, which I should be! I need to focus more on a thorough front-end analysis, and conducting some type of pilot project. I suppose the reason for this is that I did not have formal training in instructional design. I do ensure that I have learning objectives, and focus on transfer of

training issues, especially post training. However, I think I could be even more effective if I analyze more prior to the training."

The Use of Models

In a recent paper by Walter Dick (1997), he wrote: "It can be argued that our models have been quite useful to us in terms of summarizing the research and procedures of many contributors to our field. Our theory, as represented in our models, can be seen as a succession of "if-then" statements. For example, if you are in the possession of well-written instructional objectives, you will be able to write appropriate assessments. Likewise, it can be hypothesized that, if you begin with an instructional goal and follow the sequence of steps in the model, then you will produce effective instruction....It is often observed that simply using the model may not produce perfect instruction. Does this mean that the theory is incorrect or that designers have been ineffective in their use of theory? It is possible that both situations will be present in any given project."

There were many comments concerning why ISD could not be conducted according to traditional models; however, when used, respondents frequently commented that they follow a specific model which supports their activities. Some specific examples of the use of various ISD models are noted below:

"It has been a battle to get management to support adequate pilot testing and revision before training is released. But we are making headway. One way we are dealing with it is the development of our own Instructional Design Model (HIDM) or Hittem' (ha). It seems to be a good way to first define our processes and hold to them during development."

"Our company (sic, company name deleted) has a highly structured process for instructional design and development (CBT, some forms of interactive multimedia). Since we are (sic) a highly diversified corporation and have many training organizations worldwide, we pretty closely follow the ISD process."

"We have a standard instructional design methodology which we follow."

"We perform our ISD work for corporate and government clients. The detailed strategy is described in a statement of work which is written to conform to ISD practices."

"I am limited to the software the campus provides. I develop all Design Documents and follow the Dick and Carey Design layout ISBN:0-673-38772-0."

"It seems idealistic but when designing, I always try to follow the specific design model that I learned working with at the University of Twente, in Enschede, The Netherlands. All the points rated 4 are included in that model."

"Our industry, nuclear research and development for the U.S. Department of Energy, is highly regulated and involves significant safety issues. As such, by policy, the approach to training is highly regulated and requires consistency and that it be systematic and auditable. Analysis, design, development and evaluation practices are defined in a system of handbooks for technical training. These practices are regularly assessed and refined. One organization serves as a focal point for this effort and serves in a consulting role to all DOE facilities at all locations. This organization is answerable to DOE Headquarters and to the senior DOE organizational elements. While fluctuating funding can influence the depth of this activity, the content of the program and the rigor with which it is applied is not sacrificed. This has proven to be an effective training program

that has yielded measurable results in the areas of safety, efficiency, and operational effectiveness." .

"Items that I rated with a 4 are activities for which we have usually followed formal procedures, most often resulting in printed documents (e.g., statement of objectives, test items and problem-solving situations directly linked to objectives, formative and summative evaluations, product review and evaluation by SMEs, and formal reports to a project funding agency). I didn't rate any of the items as a 1 or 2 because we actually did all of these activities in one form or another, although we could certainly improve our ISD performance in many areas."

"All training developed now is done using the ISD process. Most all is CBT development and the SME is included in the pre, creation, and post development phases. There is an alpha testing (done by the development team), beta testing (done by other SME and select groups), and then the final approval by management."

"We have a model that we follow for instructional design which the 4's will illustrate but we tender jobs out after the design document is complete and although we monitor testing and evaluation ... the contracted party is responsible for alpha and beta testing of product and documentation to support it. I rated the 2's to reflect this process."

Why not? Constraints, Problems, Excuses, and Reality...

Tessmer and Richey (1997) discuss the role of context in learning and how that context affects planning and developing the learning environments, as well as the transfer of learning. They mention such things as social, political, and physical space influences, which may lead to an environment that is inhibiting, or one of environmental favorability

where the context facilitates learning and transfer. They note that: "Context has often been construed as a set of constraints upon an individual. For example, behavioral research has predominately focused upon inhibiting contextual factors such as lack of information, support, or supplies. From this obstructionists perspective, contextual factors such as time, money and resources are obstacles that must be neutralized or minimized. However, a more complete view of context also incorporates the contextual factors that facilitate learning, motivation, and performance (Tessmer & Richey, 1997)."

The additional contextual factors that Tessmer and Richey (1997) discuss take place within a realm of ISD which seems closely related to the requirements to know about your learners, their knowledge and experience backgrounds, and additional characteristics such as learning styles, disabilities, etc.. While these researchers point out that the contextual analysis of the learning environment is a critical and often not considered part of the ISD process, this may not actually be a separate "additional" phase of ISD. Since ISD is the process or "models in action" of interpreting relevant supporting theories, this aspect of the learning (and creating of materials to facilitate learning) could be considered as an expansion of "assessing the target audience" and "understanding the learner and his needs" and "understanding the organizational environment". It would be logical to include an assessment of that learner's context concurrently with other learner need assessments. The contextual slice that seems more relevant to the "layers of necessity" model of ISD, and more strongly supported by the esurvey respondent comments, is that of the actual analysis and subsequent design and development activities themselves. Certainly the comment results of this study support that it is this environment

that impacts the inclusion or non-inclusion of ISD activities during the creation of instruction. Although the notion of the criticality of learner and customer needs were also supported by some of the comments, pertinent observations from many of the respondents more clearly identified the constraining factors such as time, money, and perhaps some not fully informed customer demands. The reality is that the favorable environment or obstructive environment of these resource and customer demand issues may have a more direct impact upon the subsequent instructional product. That is, implementing ISD procedures within the context of reality may have a much greater ultimate impact than skimming on the contextual analysis of the learner and the expected skills transfer. For example, consider the following esurvey respondent comments:

"The low ratings can be explained by the fact that we are only just beginning (within the past year) to apply formal principles of ISD to our training materials."

"Generally the work of the ISD program is effective, though disjointed. Decisions are left up to the instructor as to whether these items will be followed to the degree that they should be followed."

"The whole range of training elements (on-line help, cbt, ilt) need to be better coordinated and not treated as a after-thought."

"The items which I rated either '1' or '2' were (I realize) those which I had little or no 'say' or 'control' (as a consultant). These are the areas which are traditionally, in this education 'business' the proprietary areas of the client: media choice, needs determination, training/problem identification/attribution. So these areas within the ISD model or paradigm are, for me (as for most instructional designers?) not an available part of the

dynamic ISD model. And as such I suppose they bring the integrity of the model as used (by me and others) into question."

"In my organization, it seems very little time and attention is paid to any kind of evaluation before the instruction tool has been created. Also, most of the entire ISD process is entirely undocumented, leaving little guidance for evaluation or for others to capitalize on for their own projects."

Time and Money

Numerous respondent comments mentioned the difficulty of implementing all activities within the ISD process due to the constraints of "time and money".

"Although we understand the "correct" way to develop effective instructional materials, our time lines don't usually allow for enough time."

"Time constraints, along with the values and experience level of management put practical constraints upon corporate instructional developers and prevent us from following 'best practices' or textbook ISD models."

"There is often a discrepancy between what should happen as 'best practices ISD' and what a client is willing to pay for. This is particularly true when it comes to field trials and on-going evaluation activities."

"My responses reflect the ad hoc nature of our IT development activities. I'm a one-man band, so to speak; therefore, I spend far more time on development and implementation than analysis of results and evaluation. I believe assessment and evaluation of current practice to be important, I just don't have time to implement."

"All items are critical to a quality training process; however, I work in a very low budget environment which doesn't permit all items to be carried through to completion -- so we shortcut in many areas (though personally I do not believe in that practice)."

"There seems always to be a difficulty getting time and funding support for evaluation, pilots, trials, revisions, etc. People (developers) go through so much when they first experience subject development -- even when they are well warned -- they get tired and don't go through the evaluative work they originally agreed to. Administrative staff think that so much money has gone into the production that it must be good, so just fly with it. No one wants to assign a short 'shelf life' to the product, so once it goes out the door, it never gets called back for re-development. (Most humans need a facelift after a while...why not electronic media?)

"We constantly recommend the steps above, but normally funding agencies or clients are most unwilling to follow it. We then spend most of our time doing clean up."

"In some instances, project milestones and deadlines make adherence to the ISD process (or, actually portions of the process) impossible. In these instances, we are forced to rely on our knowledge of the process, the material we've developed, the system we are using, and the target audience to make decisions concerning how we design, develop and implement our training. Fortunately, we've been able to 'muddle through' most of the problem areas thus far."

"One of the issues I have with your survey is the outlook on reality, especially within profit or non-profit organizations. For instance, when budgets are cut (or shortened) some of the items listed in the esurvey are not achievable as corporations move

to multimedia and interactive approaches to performance based learning and training, you may have a range of responses to the esurvey you have posted."

"I feel that all of the above practices are important. The way that I rated them reflects current practices on projects that I've been involved with but because of limited team members (often times I'm the only member - I develop CAI for a small Division of Medical Technology school) and lack of resources and funding to carry out all aspects of ISD, I am unable to apply all of these practices."

"Though I find every step as outlined above essential, some contexts make it difficult to apply. For example, a client may not put any importance on the analysis or evaluation phases and not allow us, as consultants the resources (time and money) to do so. It is our responsibility, however to keep trying to integrate these phases in the process with all of our clients."

"I do not create training products and performance interventions for co-workers in-house. I am an instructional designer in a contract shop. Our clients pay us to do what they want. We advise them strongly on best practices, including needs assessment, task analysis, and levels of evaluation, but these are often bypassed due to their constraints in time and money. Moreover, our services will change to meet the needs of changing clients. So on some projects we are able to and on others we are not. That's the real world fellas; it never matches the book. I whole heartedly believe in the ADDIE phases of instructional design and development and try to at least educate my customers in best practices. With some clients we can do more, with others less. Often times, the most

impact I can have is in getting to know the audience, crafting reachable learning objectives, and building rapport with SMEs."

"These items demonstrate good instructional practice. Many times managers do not want analysis, and a large part of the beginning is about coming to a decision about the assessment and analysis that the sponsor will support. I also believe that many organizations are not willing to invest the cost in time and resources required to evaluate training at levels 3 and 4. Training projects so often are one-offs and there is not much motivation from the organization to review an existing course regularly, as suggested by numbers 34 and 35."

"Items 23, 24, 28, 29, and 32 - With the tight schedules we work with, the decision (good or bad) was made to concentrate in these areas."

"Our ISD department is very overloaded now. They do the minimum to get the projects up and running. For the most part they are competent well meaning individuals."

"We never pick our projects; they are decided on political grounds. Hence, no needs assessment. Our projects are also created according to tight deadlines (more politics) so our scrutiny isn't as good as it could be. Once the project is in our hands we are as rigorous as we can be, however, evaluating and testing constantly."

"The reason my answers seem extreme is because we have set procedures and ways of doing course development that are always done or not done (i.e. we always establish objectives, never have time or money for one-to-one trials)."

Serendipitous Finding -The Academic Environment

Perhaps a "serendipitous" finding from this esurvey study was the relatively strong theme brought out by those Instructional Designers who find themselves within an academic or university context. "Practice what we teach" may not hold true for this population. Although the overall sample of respondents who clearly identified themselves as working within the academic environment was relatively small (i.e., 7), the rich quality of their comment data cannot be ignored. Indeed, the problem of ISD adequately meeting the needs of practitioners was a common theme throughout the Annual AECT Conference, February 12-16, 1997, in Albuquerque, New Mexico. This concern was strongly addressed by Allison Rossett in her Keynote Address, "Academic Instructional Design and the Field: Mirror or Mirage" (AECT, 1997).

To illustrate this theme are comment responses provided by members of the academic and the university environment. Although the first comment reported here indicates general acceptance of the Instructional Designer role within academia, the remaining comments discuss problems within this particular environment. These comments were provided by individual respondents as indicated (i.e., this is not the same respondent repeating the same message over and over).

"Evaluation is an on-going aspect of the teaching. Many of these appraisal roles are based in faculty who determine course content, needs, design curriculum etc. IDs then come in with a post eventum curriculum and pre-production role of submitting planning to date to critical appraisal. Faculty accept the value of that role, adjustments are made."

"In conjunction with that, our faculty are not particularly interested in our participation in evaluation processes. Formative evaluation 'takes too much time' and once the project is developed, our clients see our role as finished. That's not to say that we haven't made progress--but traditionally, faculty viewed our department as a place where a technician used a machine to make overhead transparencies. The fact that our staff of five includes two instructional designers with advanced degrees in ISD is still 'sinking in'."

"As an ID person, I spend a lot of time in coaching the teachers to develop their skills in instructional design and development, much more than the real time spent in the design work."

"I work for a University in a newly created position as the instructional designer. The faculty who know I'm here at this point (I've been here 7 mos.) are utilizing my skills to a limited extent. There is no current top administrative support for following ISD practices."

"I work in a University environment with many faculty members who believe that they know how and what to teach without any of that 'Ridiculous' extra effort required by thorough ISD. Prerequisites are determined before the faculty member is assigned to teach a class, and the fact that education and/or training is the need is a well established 'fact' in this environment. However, when a faculty member comes to the Technology Teaching and Learning Center to develop a project, we attempt to use the ISD process as much as possible."

"This is a university instructional development center, and we develop courses that are given to us from graduate or under-graduate departments and follow a general model. That's why we don't do everything that I know we should according to the ISD model."

Additional respondent comments concerning difficulties in using ISD activities within the academic and university environment are discussed with each specific ISD activity item (Items 19 through 35).

Respondent Feedback about the Esurvey Instrument

Several respondents provided feedback on various aspects of the esurvey instrument.

"This is where I have a difficulty - I do not find 4 or 2 very high or very low. I guess it is because there was not really a middle ground option as you would have with a 1 - 5 rating scale. The survey would have been easier for me to answer if you had used a frequency scale rather that a disagree scale."

"Different projects have different characteristics and team so it is difficult to generalize."

"Of course, you are aware that surveys in which recipients are self-selected are statistically invalid, right?"

Criticisms of the ISD Items

"Your version of ISD seems to be based on Dick and Carey's or Smith and Ragan's models. These older, linear versions of ISD are usually inadequate for the development of complex interventions such as performance support systems incorporating both EPSS and off-line components. If you are not familiar with criticism of these "3rd-generation"

models of ISD, you may want to see Foshay and Tennyson's work on 4th generation ISD. If you haven't seen it, you may also want to review Tessmer and Wedman's work on the Layers of Necessity ISD model, which your survey seems to replicate. Further, the 3rd-generation models tend to be better suited for providing procedural training. They are inadequate for creating cutting-edge instructional applications, such as the application of a cognitive apprenticeship instructional strategy delivered via CBT to provide situated training in skills and knowledge to knowledge workers."

"You've omitted a few steps:

- assess situation's limiting and enabling factors (available infra-structure and people, existing usable materials, attitudes, culture, budget, time, distance, etc.)
- preparation for implementation (instructor training, etc.)
- cost/benefit analysis at key points along the way (is it worthwhile to put money into further analysis/design/evaluation/revision)"

"What I miss in your list is the continuing attention for implementation from the start of the design cycle."

"Note that you left out the value of the evaluation to reinforce learning of the material."

"You omit all mention of newer software engineering methodologies (such as James Martin's Rapid Application Development (RAD) that employ a development process based on collaborative analysis and design, iterative and rapid prototyping, small development teams comprised of specialists with advanced tool sets, and project

management based on group prioritization. Development models from software engineering, manufacturing, and product design have much to teach us about producing better interventions--the first time."

Concluding Remarks

As the use of the Internet continues to expand, it is reasonable that research should attempt to maximize the characteristics inherent in such technology. Not only did the esurvey project allow access to a large, more heterogeneous population of practicing Instructional Designers, it provided additional contacts with the listserve population of professionals within the education and training environments. Numerous requests for copies of the esurvey results were received via email, as well as several specific questions concerning esurvey and ISD research. In addition to Internet use for email data gathering and information exchange, the statistical program, Kwikstat (1995) was downloaded from the Internet, and used for the majority of the statistical analyses for the study.

Three general themes were identified within the esurvey comment data. The respondents indicated that when ISD is successfully used, they generally have an accepted model or procedures of conducting ISD which are used to guide the process. The respondents also clearly indicated that the barriers to successful implementation of the ISD activities included contextual and resource issues such as client and management support, sufficient time, and adequate funding. An additional theme was indicated concerning the use of ISD activities within the academic and university environments. Although not specifically asked to identify this type of environment, a group of respondents provided pertinent information concerning special concerns and problems with the practice of ISD

in the academic context. Even though many contextual issues have been discussed as impediments, and models are seen to be useful for the implementation of ISD activities, it still appears that much work needs to be accomplished in the area of front-end analysis and in the overall area of life cycle evaluation activities. Indeed, the evaluation aspects suggested by the respondents should be assessed for incorporation within the structure and rubric of life cycle evaluation activities.

In addition, the use of the esurvey as a broad methodological tool has indicated three specific areas which require more in-depth research. Although exploratory in nature, statistically significant differences were found between the Novice mean and the means for both the Intermediate and Expert groups for the ISD activity, "Determines if the need can be solved by training"; the Novice group rated this item significantly lower than did the Intermediate and Expert Groups. For the ISD item, "Selects instructional strategies", the High Level Complexity group responded significantly differently than did the Medium Level Complexity group, with this activity receiving higher ratings by the High Level Complexity group. Also when grouped by Project Complexity Levels, the mean responses to the ISD item, "Conducts individual trials of instruction before completion" were found to be statistically significant between the Low Level Complexity group and the High Level Complexity group. These findings should be investigated by a more detailed methodology, such as the "think aloud" protocol for representative subjects from each group (i.e., years experience and project complexity levels). Such research may provide a better understanding of why such indications of significance occurred by providing more sensitive measures than allowed via the esurvey methodology.

That the majority of the respondents indicated working primarily with highly complex multimedia type projects may correlate with their Internet email access and listserve participation. Perhaps designers working with more complex multimedia products have more access and knowledge of Internet email usage, and therefore would be more likely to respond to the email solicitation. However, while this may indicate a bias to keep in consideration, it is not necessarily a limitation of the study. Evolving ISD literature is constantly incorporating information about the newer and emerging technologies and their use in education and in training. These respondents actually working with such technologies are more likely to provide the feedback required to continue to build upon and shape our ISD foundations of theory, models, and practice. Indeed, the ISD activities within the esurvey instrument were criticized as "omitting all the newer models for new technologies". However, since exploration of new models was not a goal of this study, this is not viewed as a limitation of the study, but rather as an insightful addition to the vivid picture portrayed by the esurvey respondents.

While it appears that traditional ISD activities are being fairly well utilized overall, there is still a good deal of growth and expansion required in the field. The esurvey data indicates that the practice of ISD is not static, nor are its models and supporting theory all integrated. As the practice of ISD develops, its models will continue to evolve, incorporating new media, technologies, research, and techniques. Not only is it important to know what works, and how it works, it is important to know why it works in particular situations, but perhaps not in others. Continuing research in Instructional Systems Design models and practice should be conducted in the spirit of process improvement. The esurvey may become a very practical tool for conducting research across a broader range of subjects than has typically been available to the ISD field.

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Appendix A

Esurvey Draft 1 - Individual Trial

>Hello Dr. Smith...This is a draft and test of the esurvey instrument.
>Additional info will have been previously sent in email invitations and
>instructions. I tried to structure this for easy electronic data output.
>jhendrix.
>.....
>
>Please use the following scale to rate Items 1 through 20 below:
>(Hint: You may want to print or jot down the rating scale for easy reference.)
>
> 1 = Strongly Disagree: Not at all
> 2 = Moderately Disagree: Not enough or to a limited extent
> 3 = Moderately Agree: For the most part
> 4 = Strongly Agree: In practically every respect
>
>To mark your answers, type the corresponding number in the blank space
>before each item number: For example:
>
> I almost always:
>
> 2 I1. Conduct a task analysis
> 4 I2. Write learning objectives
>
>Explanation: The rating of '2' for I1 (Item 1) indicates that you
>Moderately Disagree that you almost always conduct a task analysis and that
>it is not done enough or is done only to a limited extent; The rating of
>'4' for I2 (Item 2) indicates that you Strongly Agree that you almost always
>write learning objectives, in practically every respect, for every project.
>
>Now please rate Items 1 through 20:
>
> When working on ISD projects, I almost always:
>
>2 I1. Conduct a needs assessment
>4 I2. Determine if the need can be solved by training
>4 I3. Conduct a task analysis
>4 I4. Assess the trainee's entry level skills and characteristics
>4 I5. Establish learning objectives
>4 I6 Identify the types of learning outcomes
>4 I7. Develop test items
>4 I8. Select instructional strategies
>3 I9. Select instructional media
>3 I10. Conduct ISD reviews during instructional development
>2 I11. Ensure SME reviews are conducted during development
>4 I12. Conduct individual trials of instruction before completion
>4 I13. Conduct small group trials of instruction before completion
>4 I14. Pilot test instruction before completion
>4 I15. Conduct a follow-up evaluation after training
>3 I16. Conduct evaluations to determine update/revision requirements

>2 I17. Conduct evaluations to determine training system deterioration
>2 I18. Work on highly complex projects
> (e.g., multimedia, multiple topics, numerous hours of instruction)
>4 I19. Work on medium complexity level projects
> (e.g., some multimedia, several topics, more than 1-2 hours training)
>3 I20. Work on low level complexity projects
> (e.g., mostly paper/instructor-based materials, 1-2 hours training)
>
>In the following sections, please type an 'x' in the space before the
>item(s) that best describe you.
>
>ISD Experience Level (you may select all that apply):
>
>x 21. ISD graduate student
> 22. Work experience in ISD, no formal training
23. ISD technical training (corporate, military, etc.)
> 24. Bachelor degree in education or related field
> 25. Practicing teacher without any ISD training
> 26. Practicing teacher with some ISD training
> 27. Masters degree in education or related field
>x 28. Masters degree in ISD or closely related field
> 29. Doctoral degree in education or related field
>x 30. Doctoral degree in ISD or closely related field
>
>How long have you been working with ISD projects?
> (type an 'x' in the space in front of your answer)
>
> 31. 0 to 6 months
> 32. 6 months to less than 2 years
> 33. 2 to five years
> 34. 5 to 10 years
>x 35. more than 10 years
>
>Thank you for participating in this esurvey. Now, please provide any comments
>or observations that you have concerning the inclusion or non-inclusion of
>the ISD practices you just rated. We are especially interested in your
>comments for any activities which were rated low (1 or 2) or very high (4).
>Enter your responses here:>
>
>My 2 & 3s result because I work for clients who often do these tasks or
>request, in some instances, that I not do them (time, cost, etc.). The
>ones marked 4 I consider "minimum" activity and will not agree to
>participate in a project unless it is agreed that they will be done.
>
>Joan E. Hendrix

Joan, I found the survey fairly easy to take. The only problem was with some definitions (e.g., "conduct ISD reviews" "?") and with the "thinking" I had to do to do the survey by e-mail (e.g., placing cursor) as opposed to simple paper and pencil surveys. All-in-all not a bad experience. When we read the prospectus I may have (Committee may have) more comments on the survey. As this was a "test," I believe the procedure will work.

Jay S.

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Appendix B

Esurvey Draft 2 - Piloted Instrument

Hello to all:

I am working on my dissertation and am "piloting" the esurvey data collection instrument. Because of your background (and because I know you), you have been selected to participate in this formative activity. Please take 10 to 15 minutes to complete the following esurvey (actual respondents will have previously received an email invitation to participate). Thank you. Hope you have a Happy Holiday Season.

Joan E. Hendrix

Please indicate the complexity level of most of your ISD projects. Select the level which best fits your situation. Type an 'x' in the space before your selection.

1. I work mostly on low complexity level projects.
   (e.g., mostly paper-based and/or instructor led materials.
   1-2 hours of instruction)
2. I work mostly on medium complexity level projects.
   (e.g., some multimedia, several topics,
   more than 1-2 hours of instruction)
3. I work mostly on highly complex projects.
   (e.g., multimedia, multiple topics,
   numerous hours of instruction)

In the following sections, please type an 'x' in the space before the item(s) that best describe you.

ISD Experience Level (you may select all that apply):

4. Current ISD graduate student
5. Work experience in ISD, no formal training
6. ISD technical training (corporate, military, etc.)
7. Bachelor degree in education or related field
8. Practicing teacher without any ISD training
9. Practicing teacher with some ISD training
10. Masters degree in education or related field
11. Masters degree in ISD or closely related field
12. Doctoral degree in education or related field
13. Doctoral degree in ISD or closely related field

How long have you been working with ISD projects?
(select one item only; type an 'x' in the space in front of your answer)

14. 0 to 6 months
15. 6 months to less than 2 years
16. 2 to five years
17. 5 to 10 years
18. more than 10 years

Please use the following scale to rate Items 19 through 35 below:
(Hint: You may want to print or jot down the rating scale for easy reference.)

1 = Strongly Disagree: Not at all
2 = Moderately Disagree: Not enough or to a limited extent
3 = Moderately Agree: For the most part
4 = Strongly Agree: In practically every respect

To mark your answers, type the corresponding number in the blank space before each item number. For example:

Our instructional development team almost always:

2 E1. Conducts a task analysis
4 E2. Writes learning objectives

Explanation: The rating of '2' for E1 (Example 1) indicates that you Moderately Disagree that your ISD team almost always conducts a task analysis and that it is not done enough or is done only to a limited extent; The rating of '4' for E2 (Example 2) indicates that you Strongly Agree that your ISD team almost always writes learning objectives, in practically every respect, for every project.

Now please rate Items 19 through 35:

When working on ISD projects, our instructional development team almost always:

I19. Conducts a needs assessment
I20. Determines if the need can be solved by training
I21. Conducts a task analysis
I22. Assesses the trainee's entry level skills and characteristics
I23. Establishes learning objectives
I24. Identifies the types of learning outcomes
I25. Develops test items
I26. Selects instructional strategies
I27. Selects instructional media
I28. Conducts ISD reviews during instructional development
I29. Ensures Subject-Matter Expert reviews are conducted during development
I30. Conducts individual (one-to-one) trials of instruction before completion
I31. Conducts small group trials of instruction before completion
I32. Pilot tests instruction before completion
I33. Conducts a follow-up evaluation after training
I34. Conducts evaluations to determine update/revision requirements
I35. Conducts evaluations to determine possible training system deterioration

Now, please provide any comments or observations that you have concerning the inclusion or non-inclusion of the ISD practices you just rated. We are especially interested in your comments for any activities which were rated low (1 or 2) or very high (4). Enter your response here:>

Thank you participating in this esurvey. You may invite your ISD peers to also participate by forwarding them a copy of the esurvey or by contacting me at jhendrix@telepath.com.

For the instrument pilot only:

Please tell me what type of email system you are using (for example. Eudora. Pegasus. CC Mail. Pine. etc.).

Did you have any problems with the "sentence wrap" in your email system (i.e.. were some lines too long for your screen and appeared to be broken. etc.)?

Did you have any difficulties understanding how to respond to the esurvey? If so. please briefly describe.

Appendix C

Implemented Esurvey Instrument

Greetings to All:

I am conducting a research project using the esurvey (email + survey) methodology. The esurvey instrument is designed to investigate Instructional Systems Design (ISD) practices. If you are an Instructional Designer or Developer, or if you participate in conducting instructional design and development activities, I would appreciate your participation as an esurvey respondent. All respondents will be provided a summary report, via email, of the research results and discussion of the findings.

Please complete the following esurvey and return it to me at:
jhendrix@telepath.com

(please be careful not to post responses to the Listserver)

Thank you for your participation. Please contact me if you desire further information.

Joan E. Hendrix
ABD, Instructional Psychology & Technology
The University of Oklahoma
jhendrix@telepath.com
(405) 329-4816

Please indicate the complexity level of most of your ISD projects. Select the level which best fits your situation. Type an 'x' in the space before your selection.

1. I work mostly on low complexity level projects.
   (e.g., mostly paper-based and/or instructor led materials.
   1-2 hours of instruction)
2. I work mostly on medium complexity level projects.
   (e.g., some multimedia, several topics,
   more than 1-2 hours of instruction)
3. I work mostly on highly complex projects.
   (e.g., multimedia, multiple topics,
   numerous hours of instruction)

In the following sections, please type an 'x' in the space before the item(s) that best describe you.

ISD Experience Level (you may select all that apply):

4. Current ISD graduate student
5. Work experience in ISD, no formal training
6. ISD technical training (corporate, military, etc.)
7. Bachelor degree in education or related field
8. Practicing teacher without any ISD training
9. Practicing teacher with some ISD training
10. Masters degree in education or related field
11. Masters degree in ISD or closely related field
12. Doctoral degree in education or related field
13. Doctoral degree in ISD or closely related field

How long have you been working with ISD projects?
(select one item only: type an 'x' in the space in front of your answer)

14. 0 to 6 months
15. 6 months to less than 2 years
16. 2 to five years
17. 5 to 10 years
18. more than 10 years

Please use the following scale to rate Items 19 through 35 below:
(Hint: You may want to print or jot down the rating scale for easy reference.)

1 = Strongly Disagree: Not at all
2 = Moderately Disagree: Not enough or to a limited extent
3 = Moderately Agree: For the most part
4 = Strongly Agree: In practically every respect

To mark your answers, type the corresponding number in the blank space before each item number. For example:

Our instructional development team almost always:

2 E1. Conducts a task analysis
4 E2. Writes learning objectives

Explanation: The rating of '2' for E1 (Example 1) indicates that you Moderately Disagree that your ISD team almost always conducts a task analysis and that it is not done enough or is done only to a limited extent. The rating of '4' for E2 (Example 2) indicates that you Strongly Agree that your ISD team almost always writes learning objectives, in practically every respect, for every project.

Now please rate Items 19 through 35:

When working on ISD projects, our instructional development team almost always:

19. Conducts a needs assessment
20. Determines if the need can be solved by training
21. Conducts a task analysis
22. Assesses the trainee's entry level skills and characteristics
23. Establishes learning objectives
24. Identifies the types of learning outcomes
25. Develops test items
26. Selects instructional strategies
27. Selects instructional media
28. Conducts ISD reviews during instructional development
29. Ensures Subject-Matter Expert reviews are conducted during development
30. Conducts individual (one-to-one) trials of instruction before completion
31. Conducts small group trials of instruction before completion
32. Pilot tests instruction before completion
33. Conducts a follow-up evaluation after training

I34. Conducts evaluations to determine update/revision requirements
I35. Conducts evaluations to determine possible training system deterioration

Now, please provide any comments or observations that you have concerning the inclusion or non-inclusion of the ISD practices you just rated. We are especially interested in your comments for any activities which were rated low (1 or 2) or very high (4). Enter your response here:>

Thank you participating in this esurvey. You may invite your ISD peers to also participate by forwarding them a copy of the esurvey or by contacting me at jhendrix@telepath.com.

Appendix D

Statistical Test Results

Non-Significant Findings

Item 19

When working on ISD projects, our instructional development team almost always:

I19. Conducts a needs assessment

Independent Group Analysis Summary

Grouping variable is EXPERIENCE
Analysis variable is ITEM 19

Group Means and Standard Deviations Missing cases removed = 4

1: mean= 2.655172	s.d.= .9737946	n= 29
2: mean= 2.773809	s.d.= .8691665	n= 84
3: mean= 2.963636	s.d.= .9222283	n= 55

Analysis of Variance Table

Source	S.S.	DF	MS	F	Appx P
Total	137.28	167			
Treatment	2.10	2	1.05	1.28	0.281
Error	135.18	165	0.82		

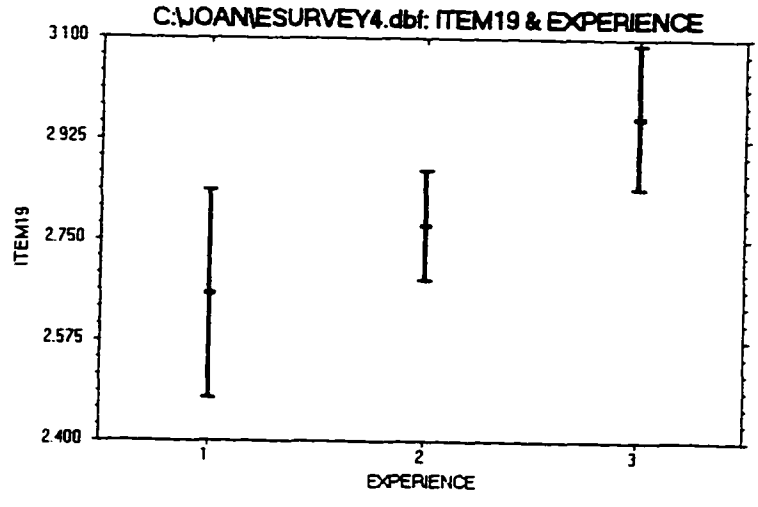
Error term used for comparisons = 0.82 with 165 d.f.

Newman-Keuls Multiple Comp.	Difference	P	Critical q Q	(.05)
Mean(3) -Mean(1) =	0.3085	3	2.100	3.351
Mean(3) -Mean(2) =	0.1898	(Do not test)		
Mean(2) -Mean(1) =	0.1186	(Do not test)		

Homogeneous Populations. groups ranked

Gp Gp Gp
1 2 3

This is a graphical representation of the Newman-Keuls multiple comparisons test. At the 0.05 significance level. the means of any two groups underscored by the same line are not significantly different.



Although the Years Experience group mean differences were not statistically significant, the Mean and Error Bar Chart indicates that overall, the item ratings tended to rise in accordance with the group experience levels, i.e., more experienced respondents tended to rate Item 19 higher than did less experienced respondents.

Independent Group Analysis Summary

Grouping variable is COMPLEXITY
Analysis variable is ITEM 19

Group Means and Standard Deviations Missing cases removed = 4

1: mean= 2.818182	s.d.= .7507572	n= 11
2: mean= 2.873016	s.d.= .8326418	n= 63
3: mean= 2.797872	s.d.= .9569192	n= 94

Analysis of Variance Table

Source	S.S.	DF	MS	F	Appx P
Total	133.99	167			
Treatment	0.21	2	0.11	0.13	0.876
Error	133.78	165	0.81		

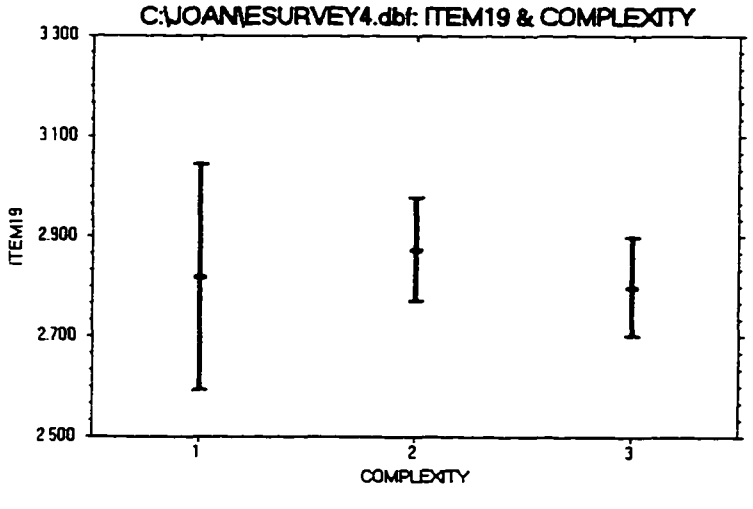
Error term used for comparisons = 0.81 with 165 d.f.

Newman-Keuls Multiple Comp.	Critical q Difference	P	Q	(.05)
Mean(2) -Mean(3) =	0.0751	3	0.725	3.351
Mean(2) -Mean(1) =	0.0548	(Do not test)		
Mean(1) -Mean(3) =	0.0203	(Do not test)		

Homogeneous Populations, groups ranked

Gp	Gp	Gp
3	1	2

This is a graphical representation of the Newman-Keuls multiple comparisons test. At the 0.05 significance level, the means of any two groups underscored by the same line are not significantly different.



Although the Complexity group mean differences were not statistically significant for Item 19, the Mean and Error Bar Chart indicates that overall, the item ratings are very similar, with the Low Level Complexity group (Group 1) having the broadest ranging error bars.

Item 20

When working on ISD projects, our instructional development team almost always:

I20. Determines if the need can be solved by training

Independent Group Analysis Summary

Grouping variable is COMPLEXITY
Analysis variable is ITEM 20

Group Means and Standard Deviations Missing cases removed = 8

1: mean= 2	s.d.= 1.183216	n= 11
2: mean= 2.737705	s.d.= .9291867	n= 61
3: mean= 2.717391	s.d.= 1.062095	n= 92

Analysis of Variance Table

Source	S.S.	DF	MS	F	Appx P
Total	173.87	163			
Treatment	5.42	2	2.71	2.59	0.078
Error	168.46	161	1.05		

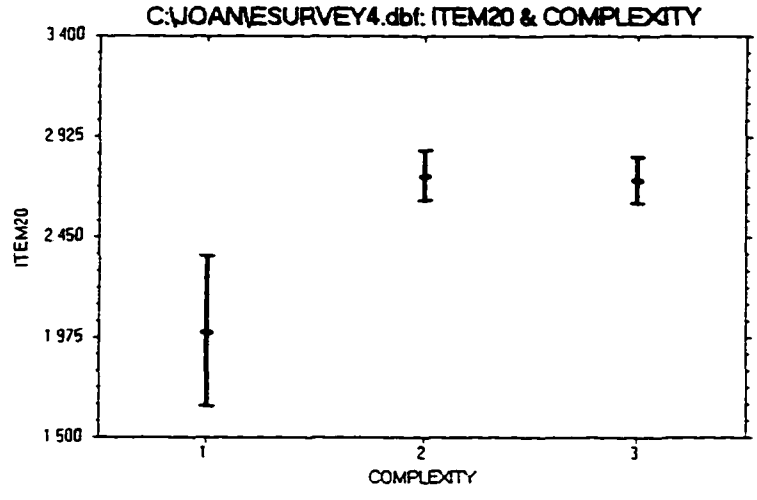
Error term used for comparisons = 1.05 with 161 d.f.

Newman-Keuls Multiple Comp.	Difference	P	Q	Critical q (.05)
Mean(2) -Mean(1) =	0.7377	3	3.114	3.351
Mean(2) -Mean(3) =	0.0203	(Do not test)		
Mean(3) -Mean(1) =	0.7174	(Do not test)		

Homogeneous Populations, groups ranked

Gp 1	Gp 3	Gp 2
———		

This is a graphical representation of the Newman-Keuls multiple comparisons test. At the 0.05 significance level, the means of any two groups underscored by the same line are not significantly different.



While not statistically significant as was found for the Years Experience groupings, the Item 20 ratings as grouped by project complexity indicate a broader range of error and an overall lower mean rating for the Low Level Complexity group than for the Medium and High Level Complexity groups.

Item 21

When working on ISD projects, our instructional development team almost always:

I21. Conducts a task analysis

Independent Group Analysis Summary

Grouping variable is EXPERIENCE
Analysis variable is ITEM 21

Group Means and Standard Deviations Missing cases removed = 6

1: mean= 2.655172	s.d.= .9737946	n= 29
2: mean= 2.797619	s.d.= 1.038764	n= 84
3: mean= 2.566038	s.d.= 1.009749	n= 53

Analysis of Variance Table

Source	S.S.	DF	MS	F	Appx P
Total	170.94	165			
Treatment	1.81	2	0.90	0.87	0.420
Error	169.13	163	1.04		

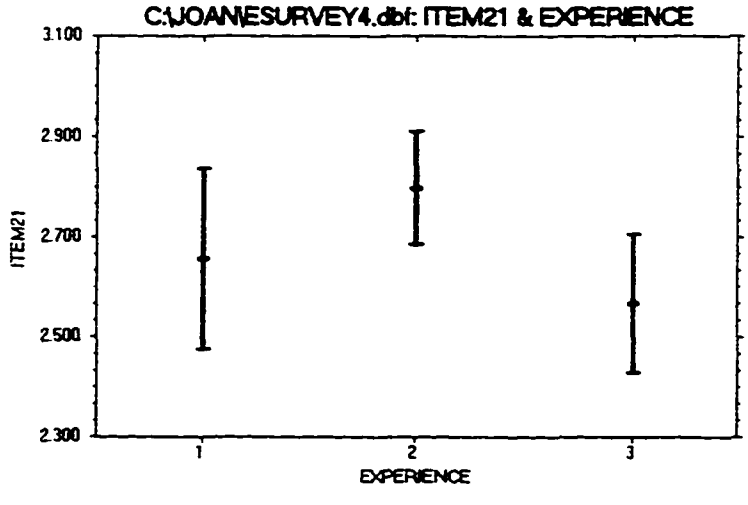
Error term used for comparisons = 1.04 with 163 d.f.

Newman-Keuls Multiple Comp.	Critical q Difference	P	Q	(.05)
Mean(2) -Mean(3) =	0.2316	3	1.833	3.351
Mean(2) -Mean(1) =	0.1424	(Do not test)		
Mean(1) -Mean(3) =	0.0891	(Do not test)		

Homogeneous Populations, groups ranked

Gp Gp Gp
3 1 2

This is a graphical representation of the Newman-Keuls multiple comparisons test. At the 0.05 significance level, the means of any two groups underscored by the same line are not significantly different.



Again not statistically significant, the Mean and Error Bar Chart for Item 21 as grouped by Years Experience levels indicates somewhat lower mean ratings for the Expert group, while the Intermediate group (the largest group) has the highest mean ratings and the smallest error bar range.

Independent Group Analysis Summary

Grouping variable is COMPLEXITY
Analysis variable is ITEM 21

Group Means and Standard Deviations Missing cases removed = 6

1: mean= 2.272727	s.d.= .904534	n= 11
2: mean= 2.741935	s.d.= 1.039159	n= 62
3: mean= 2.731183	s.d.= 1.022994	n= 93

Analysis of Variance Table

Source	S.S.	DF	MS	F	Appx P
Total	172.54	165			
Treatment	2.20	2	1.10	1.05	0.351
Error	170.33	163	1.04		

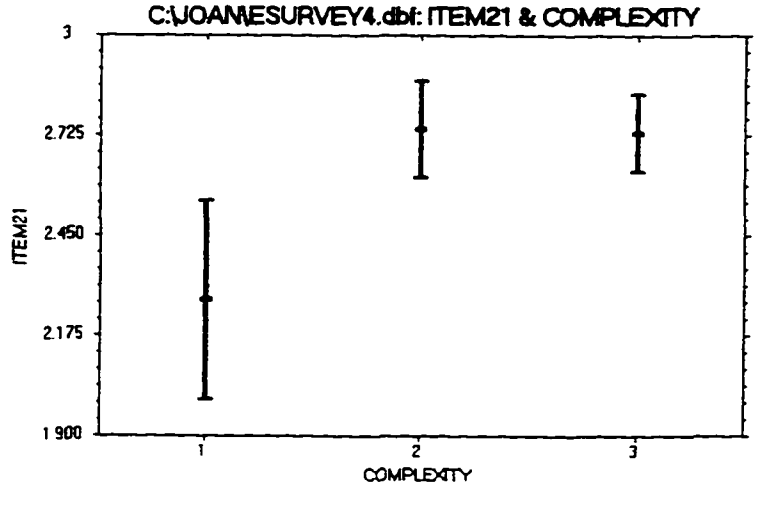
Error term used for comparisons = 1.04 with 163 d.f.

Newman-Keuls Multiple Comp.	Difference	P	Q	Critical q (.05)
Mean(2) -Mean(1) =	0.4692	3	1.984	3.351
Mean(2) -Mean(3) =	0.0108	(Do not test)		
Mean(3) -Mean(1) =	0.4585	(Do not test)		

Homogeneous Populations, groups ranked

Gp	Gp	Gp
1	3	2

This is a graphical representation of the Newman-Keuls multiple comparisons test. At the 0.05 significance level, the means of any two groups underscored by the same line are not significantly different.



This Mean and Error Bar Chart for Item 21 as grouped by Complexity levels indicates higher mean ratings and smaller error ranges for the Medium and High Level Complexity groups than for the Low Level Complexity group. However, these differences are not statistically significant.

Item 22

When working on ISD projects, our instructional development team almost always:

I22. Assesses the trainee's entry level skills and characteristics

---

Independent Group Analysis Summary

Grouping variable is EXPERIENCE
Analysis variable is ITEM 22

Group Means and Standard Deviations Missing cases removed = 5

1: mean= 2.827586	s.d.= .9284767	n= 29
2: mean= 2.891566	s.d.= .8555707	n= 83
3: mean= 2.709091	s.d.= .9751111	n= 55

Analysis of Variance Table

Source	S.S.	DF	MS	F	Appx P
Total	136.61	166			
Treatment	1.10	2	0.55	0.67	0.514
Error	135.51	164	0.83		

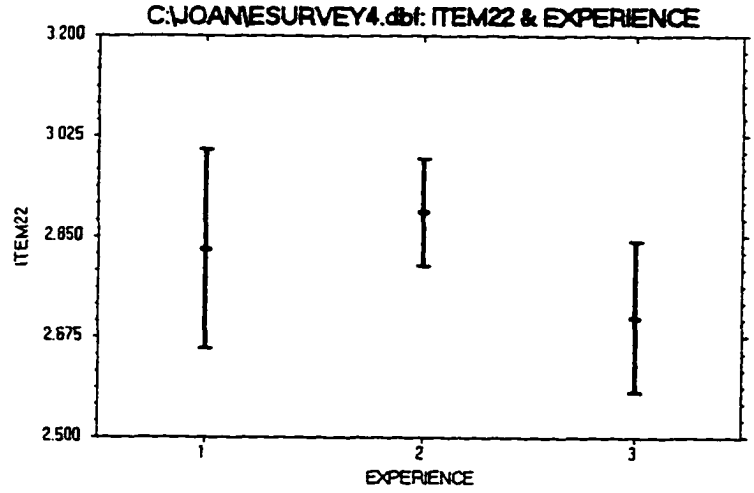
Error term used for comparisons = 0.83 with 164 d.f.

Newman-Keuls Multiple Comp.	Difference	P	Q	Critical q (.05)
Mean(2) -Mean(3) =	0.1825	3	1.633	3.351
Mean(2) -Mean(1) =	0.0640	(Do not test)		
Mean(1) -Mean(3) =	0.1185	(Do not test)		

Homogeneous Populations, groups ranked

Gp Gp Gp
3 1 2

This is a graphical representation of the Newman-Keuls multiple comparisons test. At the 0.05 significance level, the means of any two groups underscored by the same line are not significantly different.



Though not statistically significant yet somewhat surprising, the mean and error bar chart indicates that the Expert group tended to provide lower ratings for Item 22 than did the Novice and Intermediate groups.

Independent Group Analysis Summary

Grouping variable is COMPLEXITY
Analysis variable is ITEM 22

Group Means and Standard Deviations Missing cases removed = 5

1: mean= 2.545455	s.d.= 1.128152	n= 11
2: mean= 2.919355	s.d.= .7745625	n= 62
3: mean= 2.797872	s.d.= .9680908	n= 94

Analysis of Variance Table

Source	S.S.	DF	MS	F	Appx P
Total	137.96	166			
Treatment	1.48	2	0.74	0.89	0.413
Error	136.48	164	0.83		

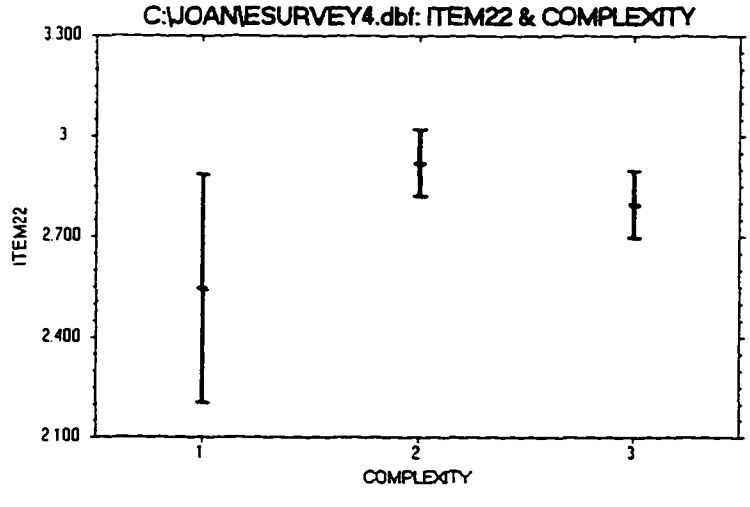
Error term used for comparisons = 0.83 with 164 d.f.

Newman-Keuls Multiple Comp.	Difference	P	Q	Critical q (.05)
Mean(2) -Mean(1) =	0.3739	3	1.772	3.351
Mean(2) -Mean(3) =	0.1215	(Do not test)		
Mean(3) -Mean(1) =	0.2524	(Do not test)		

Homogeneous Populations, groups ranked

Gp Gp Gp
1 3 2

This is a graphical representation of the Newman-Keuls multiple comparisons test. At the 0.05 significance level, the means of any two groups underscored by the same line are not significantly different.



For Item 22 as grouped by Complexity levels, the Medium and High Level Complexity groups provided higher mean ratings and contained much less variance than did the ratings from the Low Level Complexity grouping.

Item 23

When working on ISD projects, our instructional development team almost always:

I23. Establishes learning objectives

Independent Group Analysis Summary

Grouping variable is EXPERIENCE
Analysis variable is ITEM 23

Group Means and Standard Deviations Missing cases removed = 4

1: mean= 3.517241	s.d.= .784706	n= 29
2: mean= 3.619048	s.d.= .7097389	n= 84
3: mean= 3.581818	s.d.= .8539865	n= 55

Analysis of Variance Table

Source	S.S.	DF	MS	F	Appx P
Total	98.66	167			
Treatment	0.23	2	0.11	0.19	0.826
Error	98.43	165	0.60		

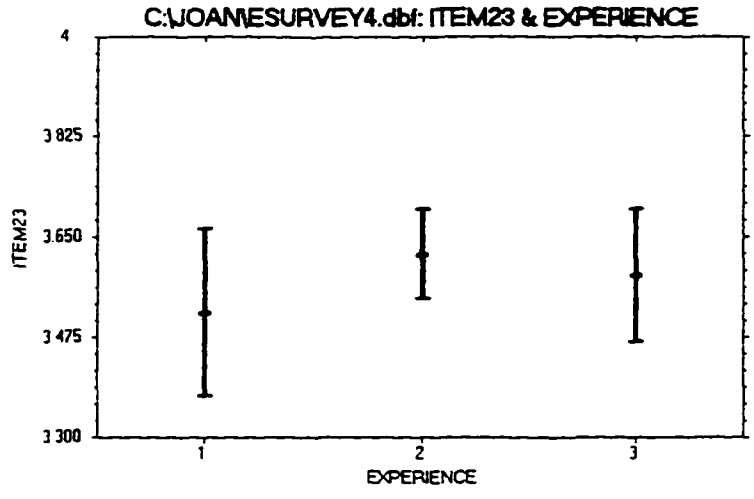
Error term used for comparisons = 0.60 with 165 d.f.

Newman-Keuls Multiple Comp.	Difference	Critical q P	Q	(.05)
Mean(2) -Mean(1) =	0.1018	3	0.865	3.351
Mean(2) -Mean(3) =	0.0372	(Do not test)		
Mean(3) -Mean(1) =	0.0646	(Do not test)		

Homogeneous Populations, groups ranked

Gp Gp Gp
1 3 2

This is a graphical representation of the Newman-Keuls multiple comparisons test. At the 0.05 significance level, the means of any two groups underscored by the same line are not significantly different.



This error bar chart indicates only small differences among the group mean ratings, as well as similar variance within the groups.

Independent Group Analysis Summary

Grouping variable is COMPLEXITY
Analysis variable is ITEM 23

Group Means and Standard Deviations Missing cases removed = 4

1: mean= 3.363636	s.d.= .6741999	n= 11
2: mean= 3.571429	s.d.= .7974614	n= 63
3: mean= 3.62766	s.d.= .7617756	n= 94

Analysis of Variance Table

Source	S.S.	DF	MS	F	Appx P
Total	98.66	167			
Treatment	0.72	2	0.36	0.61	0.547
Error	97.94	165	0.59		

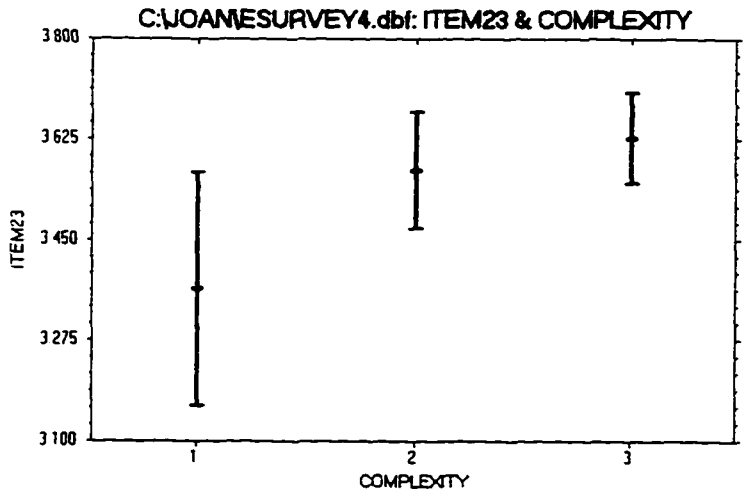
Error term used for comparisons = 0.59 with 165 d.f.

Newman-Keuls Multiple Comp.	Difference	Critical q P	Q	(.05)
Mean(3) -Mean(1) =	0.2640	3	1.521	3.351
Mean(3) -Mean(2) =	0.0562	(Do not test)		
Mean(2) -Mean(1) =	0.2078	(Do not test)		

Homogeneous Populations, groups ranked

Gp Gp Gp
1 2 3

This is a graphical representation of the Newman-Keuls multiple comparisons test. At the 0.05 significance level, the means of any two groups underscored by the same line are not significantly different.



For Item 23 as grouped by Complexity Levels, the mean and error bar chart clearly indicates somewhat higher ratings and tighter error ranges as the Complexity Levels increase. These differences however, are not statistically significant.

Item 24

When working on ISD projects, our instructional development team almost always:

I24. Identifies the types of learning outcomes

Independent Group Analysis Summary

Grouping variable is EXPERIENCE
Analysis variable is ITEM 24

Group Means and Standard Deviations Missing cases removed = 6

1: mean= 3	s.d.= 1.01835	n= 28
2: mean= 3.325301	s.d.= .7825604	n= 83
3: mean= 3.2	s.d.= 1.061097	n= 55

Analysis of Variance Table

Source	S.S.	DF	MS	F	Appx P
Total	141.30	165			
Treatment	2.28	2	1.14	1.34	0.265
Error	139.02	163	0.85		

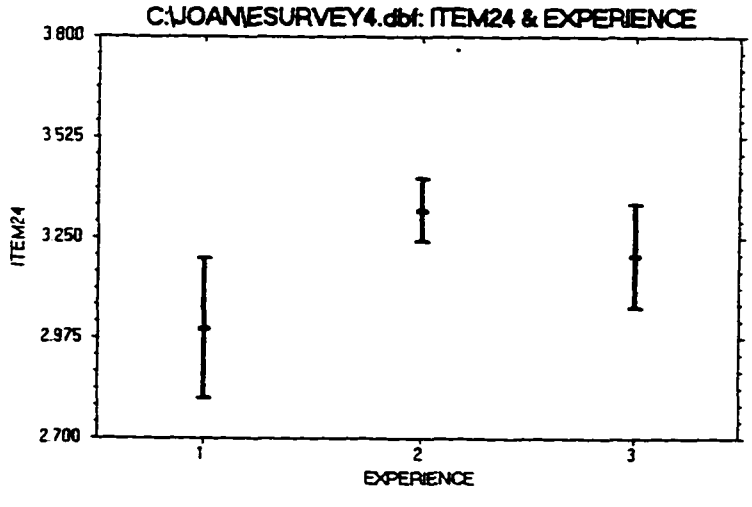
Error term used for comparisons = 0.85 with 163 d.f.

Newman-Keuls Multiple Comp.	Difference	P	Critical q Q	(.05)
Mean(2) -Mean(1) =	0.3253	3	2.279	3.351
Mean(2) -Mean(3) =	0.1253	(Do not test)		
Mean(3) -Mean(1) =	0.2000	(Do not test)		

Homogeneous Populations, groups ranked

Gp	Gp	Gp
1	3	2

This is a graphical representation of the Newman-Keuls multiple comparisons test. At the 0.05 significance level, the means of any two groups underscored by the same line are not significantly different.



The Mean and Error Bar Chart for Item 24 as grouped by Experience Levels indicates that the Intermediate group (the largest Experience group) provided the highest ratings and the smallest error range of all three groups. Again, the Novice group (the smallest group) indicates the lowest mean rating and the broadest error range. These differences are not statistically significant.

Independent Group Analysis Summary

Grouping variable is COMPLEXITY
Analysis variable is ITEM 24

Group Means and Standard Deviations Missing cases removed = 6

1: mean= 2.727273	s.d.= 1.103713	n= 11
2: mean= 3.129032	s.d.= .9997355	n= 62
3: mean= 3.365591	s.d.= .8312503	n= 93

Analysis of Variance Table

Source	S.S.	DF	MS	F	Appx P
Total	141.84	165			
Treatment	5.12	2	2.56	3.05	0.050
Error	136.72	163	0.84		

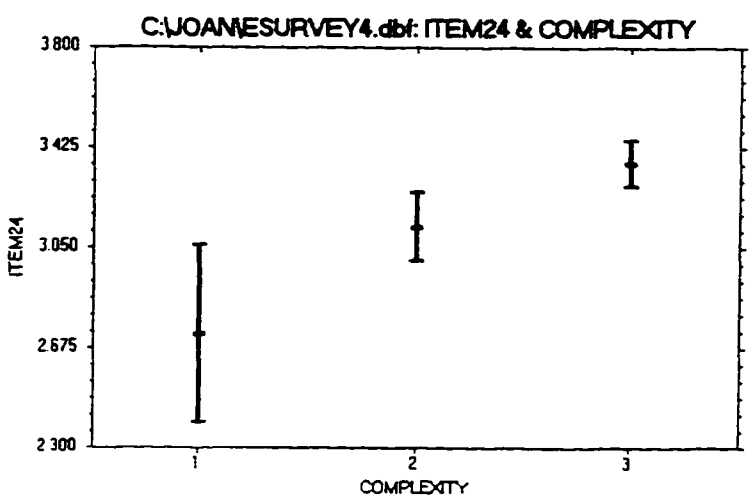
Error term used for comparisons = 0.84 with 163 d.f.

Newman-Keuls Multiple Comp.	Difference	P	Q	Critical q (.05)
Mean(3) -Mean(1) =	0.6383	3	3.091	3.351
Mean(3) -Mean(2) =	0.2366	(Do not test)		
Mean(2) -Mean(1) =	0.4018	(Do not test)		

Homogeneous Populations, groups ranked

Gp 1	Gp 2	Gp 3

This is a graphical representation of the Newman-Keuls multiple comparisons test. At the 0.05 significance level, the means of any two groups underscored by the same line are not significantly different.



The Mean and Error Bar Chart for Item 24 as grouped by Complexity Levels shows a clear increase in mean ratings and tightness of error bar ranges as the complexity levels progress from Low Level, to Medium Level, and then the High Level Complexity. Again, these differences are not statistically significant.

Independent Group Analysis Summary

Grouping variable is EXPERIENCE
Analysis variable is ITEM 25

Group Means and Standard Deviations Missing cases removed = 5

1: mean= 2.896552	s.d.= 1.113066	n= 29
2: mean= 3.107143	s.d.= .9571275	n= 84
3: mean= 2.907408	s.d.= 1.217305	n= 54

Analysis of Variance Table

Source	S.S.	DF	MS	F	Appx P
Total	190.99	166			
Treatment	1.73	2	0.87	0.75	0.474
Error	189.26	164	1.15		

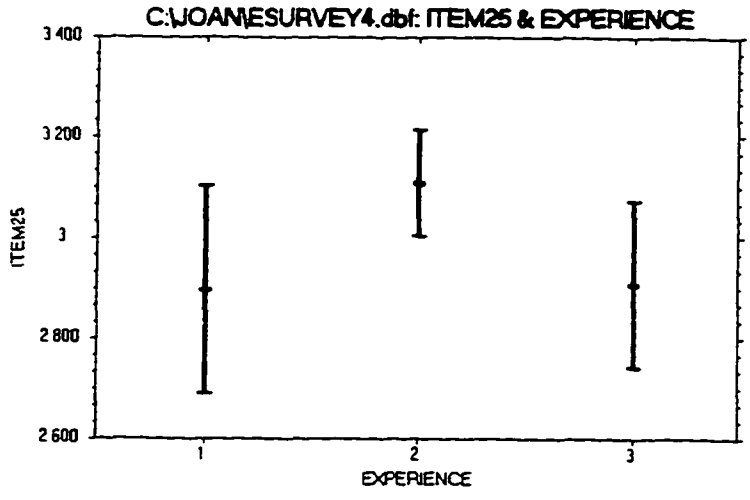
Error term used for comparisons = 1.15 with 164 d.f.

Newman-Keuls Multiple Comp.	Critical q Difference	P	Q	(.05)
Mean(2) -Mean(1) =	0.2106	3	1.287	3.351
Mean(2) -Mean(3) =	0.1997	(Do not test)		
Mean(3) -Mean(1) =	0.0109	(Do not test)		

Homogeneous Populations, groups ranked

Gp	Gp	Gp
1	3	2

This is a graphical representation of the Newman-Keuls multiple comparisons test. At the 0.05 significance level, the means of any two groups underscored by the same line are not significantly different.



Though not statistically significant, and as noted for other items, the Mean and Error Bar chart for Item 25 again indicates that the largest Experience Level group, the Intermediate group, has the highest mean rating and the smallest error bar range.

Independent Group Analysis Summary

Grouping variable is COMPLEXITY
Analysis variable is ITEM 25

Group Means and Standard Deviations Missing cases removed = 5

1: mean= 2.727273	s.d.= 1.272078	n= 11
2: mean= 2.825397	s.d.= 1.114996	n= 63
3: mean= 3.182796	s.d.= 1.010233	n= 93

Analysis of Variance Table

Source	S.S.	DF	MS	F	Appx P
Total	192.95	166			
Treatment	5.79	2	2.90	2.54	0.082
Error	187.15	164	1.14		

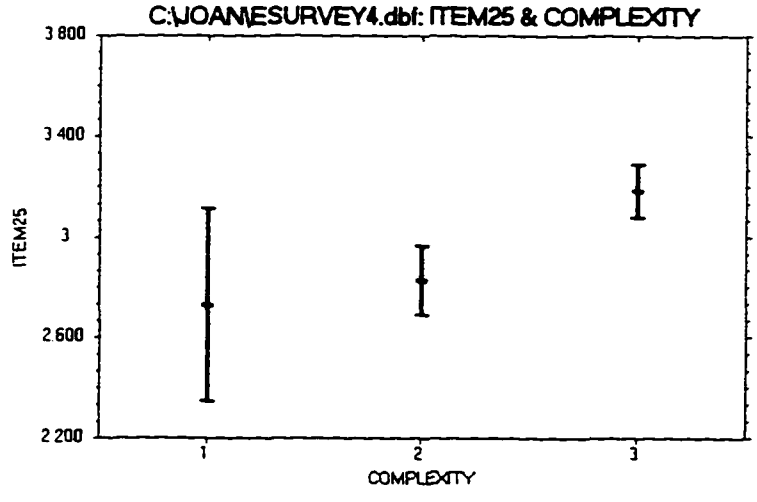
Error term used for comparisons = 1.14 with 164 d.f.

Newman-Keuls Multiple Comp.	Difference	P	Critical q Q	(.05)
Mean(3) -Mean(1) =	0.4555	3	1.891	3.351
Mean(3) -Mean(2) =	0.3574	(Do not test)		
Mean(2) -Mean(1) =	0.0981	(Do not test)		

Homogeneous Populations. groups ranked

Gp Gp Gp
1 2 3

This is a graphical representation of the Newman-Keuls multiple comparisons test. At the 0.05 significance level. the means of any two groups underscored by the same line are not significantly different.



The High Level Complexity group provided the highest mean rating and the smallest error bar range as indicated in this Mean and Error Bar Chart for Item 25. These differences are not statistically significant.

Item 26

When working on ISD projects, our instructional development team almost always:

I26. Selects instructional strategies

Independent Group Analysis Summary

Grouping variable is EXPERIENCE
Analysis variable is ITEM 26

Group Means and Standard Deviations Missing cases removed = 4

1: mean= 3.310345	s.d.= .8495145	n= 29
2: mean= 3.488095	s.d.= .7682565	n= 84
3: mean= 3.418182	s.d.= .8539865	n= 55

Analysis of Variance Table

Source	S.S.	DF	MS	F	Appx P
Total	109.28	167			
Treatment	0.70	2	0.35	0.53	0.587
Error	108.58	165	0.66		

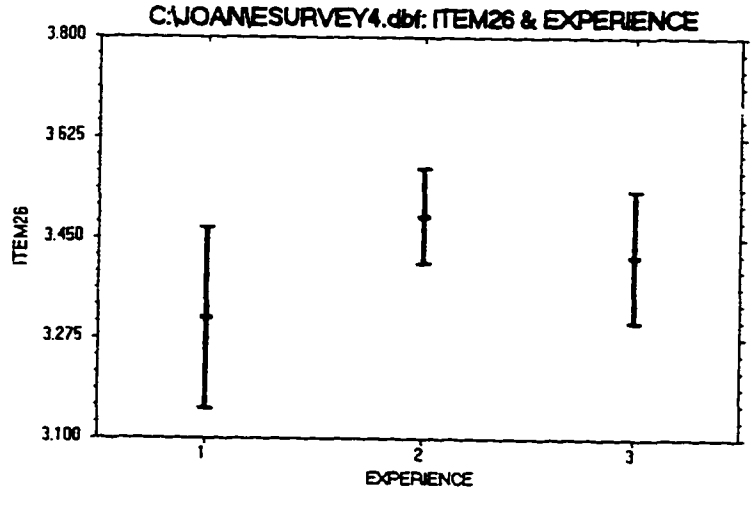
Error term used for comparisons = 0.66 with 165 d.f.

Newman-Keuls Multiple Comp.	Difference	P	Critical q Q	(.05)
Mean(2) -Mean(1) =	0.1778	3	1.439	3.351
Mean(2) -Mean(3) =	0.0699	(Do not test)		
Mean(3) -Mean(1) =	0.1078	(Do not test)		

Homogeneous Populations, groups ranked

Gp	Gp	Gp
1	3	2

This is a graphical representation of the Newman-Keuls multiple comparisons test. At the 0.05 significance level, the means of any two groups underscored by the same line are not significantly different.



The Mean and Error Bar Chart for Item 26 indicates little variance of interest when grouped according to the Years Experience Levels.

Item 27

When working on ISD projects, our instructional development team almost always:

I27. Selects instructional media

Independent Group Analysis Summary

Grouping variable is EXPERIENCE
Analysis variable is ITEM 27

Group Means and Standard Deviations Missing cases removed = 4

1: mean= 3.310345	s.d.= .8905635	n= 29
2: mean= 3.380952	s.d.= .8200024	n= 84
3: mean= 3.254545	s.d.= .9854155	n= 55

Analysis of Variance Table

Source	S.S.	DF	MS	F	Appx P
Total	130.99	167			
Treatment	0.54	2	0.27	0.34	0.711
Error	130.45	165	0.79		

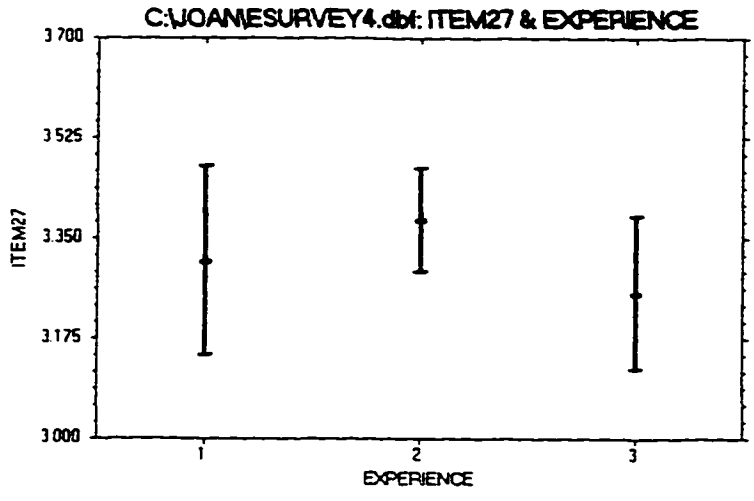
Error term used for comparisons = 0.79 with 165 d.f.

Newman-Keuls Multiple Comp.	Difference	P	Critical q Q	(.05)
Mean(2) -Mean(3) =	0.1264	3	1.159	3.351
Mean(2) -Mean(1) =	0.0706	(Do not test)		
Mean(1) -Mean(3) =	0.0558	(Do not test)		

Homogeneous Populations, groups ranked

Gp Gp Gp
3 1 2

This is a graphical representation of the Newman-Keuls multiple comparisons test. At the 0.05 significance level, the means of any two groups underscored by the same line are not significantly different.



This Mean and Error Bar Chart indicates that though not statistically significant, the Intermediate group again has the highest mean rating and smallest error bar range for Item 27.

Independent Group Analysis Summary

Grouping variable is COMPLEXITY
Analysis variable is ITEM 27

Group Means and Standard Deviations Missing cases removed = 4

1: mean= 2.909091	s.d.= 1.136182	n= 11
2: mean= 3.285714	s.d.= .8693448	n= 63
3: mean= 3.414894	s.d.= .8602272	n= 94

Analysis of Variance Table

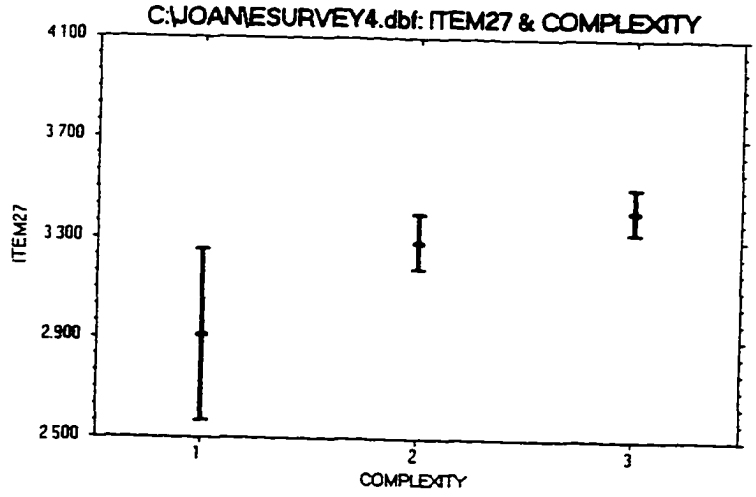
Source	S.S.	DF	MS	F	Appx P
Total	131.33	167			
Treatment	2.75	2	1.37	1.76	0.175
Error	128.59	165	0.78		

Newman-Keuls Multiple Comp.	Critical q Difference	P	Q	(.05)
Mean(3) -Mean(1) =	0.5058	3	2.543	3.351
Mean(3) -Mean(2) =	0.1292	(Do not test)		
Mean(2) -Mean(1) =	0.3766	(Do not test)		

Homogeneous Populations, groups ranked

Gp 1	Gp 2	Gp 3

This is a graphical representation of the Newman-Keuls multiple comparisons test. At the 0.05 significance level, the means of any two groups underscored by the same line are not significantly different.



When group by Complexity Levels, the mean ratings tend to increase as the level of complexity increases as illustrated in this Mean and Error Bar Chart. Although these differences are not statistically significant, also indicated are very tight error bar ranges in the responses from the Medium and High Level Complexity groups.

Item 28

When working on ISD projects, our instructional development team almost always:

I28. Conducts ISD reviews during instructional development

Independent Group Analysis Summary

Grouping variable is EXPERIENCE
Analysis variable is ITEM 28

Group Means and Standard Deviations Missing cases removed = 8

1: mean= 2.75	s.d.= .8871511	n= 28
2: mean= 2.843374	s.d.= .9688053	n= 83
3: mean= 2.849057	s.d.= .9883208	n= 53

Analysis of Variance Table

Source	S.S.	DF	MS	F	Appx P
Total	149.22	163			
Treatment	0.21	2	0.11	0.12	0.891
Error	149.01	161	0.93		

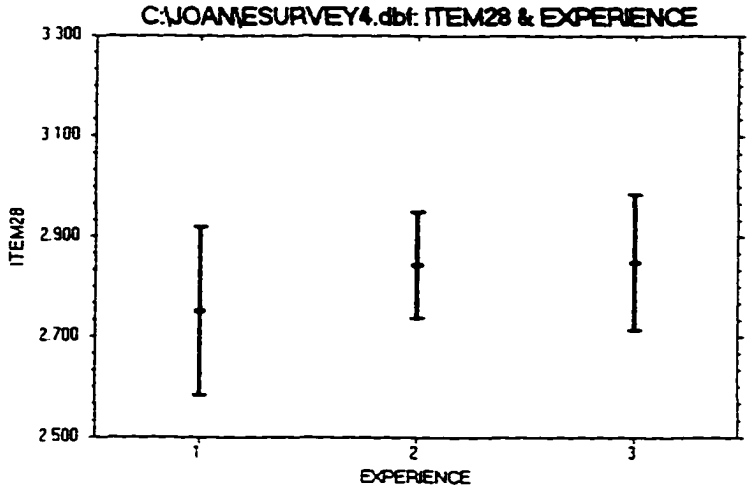
Error term used for comparisons = 0.93 with 161 d.f.

Newman-Keuls Multiple Comp.	Difference	P	Q	Critical q (.05)
Mean(3) -Mean(1) =	0.0991	3	0.623	3.351
Mean(3) -Mean(2) =	0.0057	(Do not test)		
Mean(2) -Mean(1) =	0.0934	(Do not test)		

Homogeneous Populations, groups ranked

Gp 1	Gp 2	Gp 3
———		

This is a graphical representation of the Newman-Keuls multiple comparisons test. At the 0.05 significance level, the means of any two groups underscored by the same line are not significantly different.



This Mean and Error Bar Chart indicates very little difference in the overall group means and error bar ranges for Item 28 as grouped by experience levels.

Independent Group Analysis Summary

Grouping variable is COMPLEXITY
Analysis variable is ITEM 28

Group Means and Standard Deviations Missing cases removed = 8

1: mean= 2.363636	s.d.= 1.026911	n= 11
2: mean= 2.616667	s.d.= .8252717	n= 60
3: mean= 3.032258	s.d.= .9940214	n= 93

Analysis of Variance Table

Source	S.S.	DF	MS	F	Appx P
Total	150.55	163			
Treatment	8.92	2	4.46	5.07	0.007
Error	141.63	161	0.88		

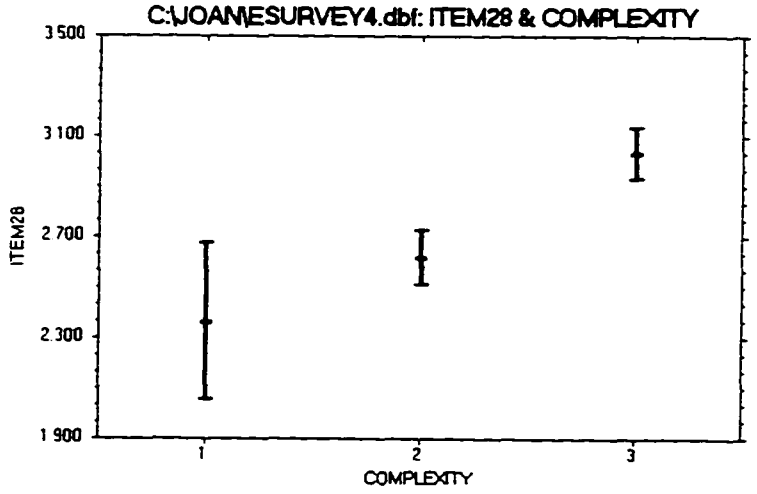
Error term used for comparisons = 0.88 with 161 d.f.

Newman-Keuls Multiple Comp.	Difference	P	Critical q Q	(.05)
Mean(3) -Mean(1) =	0.6686	3	3.162	3.351
Mean(3) -Mean(2) =	0.4156	(Do not test)		
Mean(2) -Mean(1) =	0.2530	(Do not test)		

Homogeneous Populations, groups ranked

Gp Gp Gp
1 2 3

This is a graphical representation of the Newman-Keuls multiple comparisons test. At the 0.05 significance level, the means of any two groups underscored by the same line are not significantly different.



When grouped by Complexity Levels, the Mean and Error Bar Chart for Item 28 indicates increased mean ratings as the project complexity level increases, however, these differences are not statistically significant.

Item 29

When working on ISD projects, our instructional development team almost always:

I29. Ensures Subject-Matter Expert reviews are conducted during development

---

Independent Group Analysis Summary

Grouping variable is EXPERIENCE
Analysis variable is ITEM 29

Group Means and Standard Deviations Missing cases removed = 6

1: mean= 3.357143	s.d.= .8261596	n= 28
2: mean= 3.261905	s.d.= .9329193	n= 84
3: mean= 3.5	s.d.= .8411582	n= 54

Analysis of Variance Table

Source	S.S.	DF	MS	F	Appx P
Total	130.03	165			
Treatment	1.86	2	0.93	1.18	0.308
Error	128.17	163	0.79		

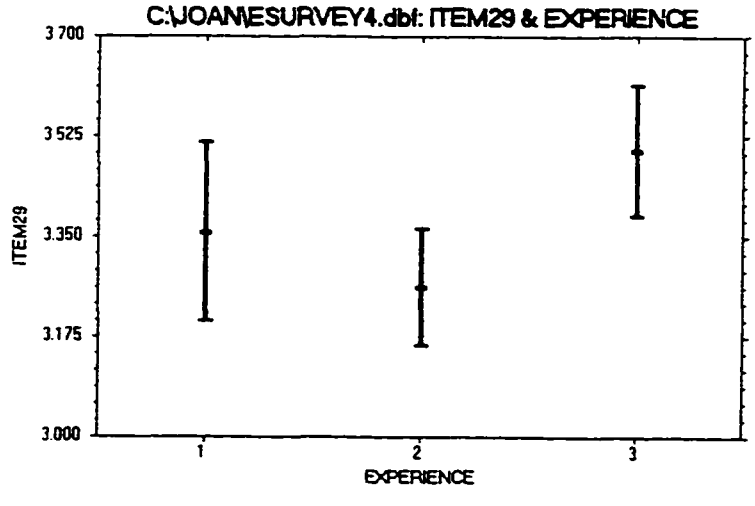
Error term used for comparisons = 0.79 with 163 d.f.

Newman-Keuls Multiple Comp.	Critical q Difference	P	Q	(.05)
Mean(3) -Mean(2) =	0.2381	3	2.177	3.351
Mean(3) -Mean(1) =	0.1429	(Do not test)		
Mean(1) -Mean(2) =	0.0952	(Do not test)		

Homogeneous Populations, groups ranked

Gp Gp Gp
2 1 3

This is a graphical representation of the Newman-Keuls multiple comparisons test. At the 0.05 significance level, the means of any two groups underscored by the same line are not significantly different.



The Mean and Error Bar Chart for Item 29 as grouped by the Years Experience Levels indicates that the Expert group has somewhat higher ratings than the Novice and Intermediate groups. All three groups have fairly broad error bar ranges. None of these differences are statistically significant.

Independent Group Analysis Summary

Grouping variable is COMPLEXITY
Analysis variable is ITEM 29

Group Means and Standard Deviations Missing cases removed = 6

1: mean= 3.272727 s.d.= .7862454 n= 11
2: mean= 3.278688 s.d.= .9332943 n= 61
3: mean= 3.43617 s.d.= .8367694 n= 94

Analysis of Variance Table

Source	S.S.	DF	MS	F	Appx P
Total	124.58	165			
Treatment	1.02	2	0.51	0.67	0.511
Error	123.56	163	0.76		

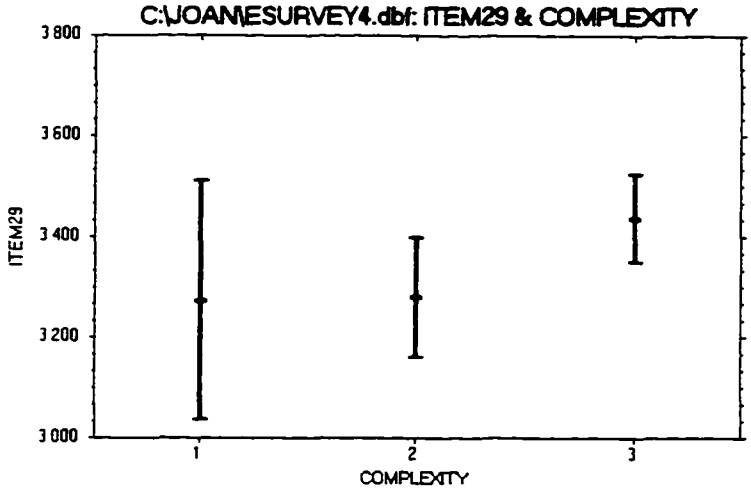
Error term used for comparisons = 0.76 with 163 d.f.

Newman-Keuls Multiple Comp.	Difference	P	Critical q Q	(.05)
Mean(3) -Mean(1) =	0.1634	3	0.833	3.351
Mean(3) -Mean(2) =	0.1575	(Do not test)		
Mean(2) -Mean(1) =	0.0060	(Do not test)		

Homogeneous Populations, groups ranked

Gp Gp Gp
1 2 3

This is a graphical representation of the Newman-Keuls multiple comparisons test. At the 0.05 significance level, the means of any two groups underscored by the same line are not significantly different.



The Complexity groupings indicate a slightly higher mean rating for the High Level Complexity group and a slightly tighter error bar range as compared to the other two groups. These differences are not statistically significant.

Item 30

When working on ISD projects, our instructional development team almost always:

I30. Conducts individual (one-to-one) trials of instruction before completion

---

Independent Group Analysis Summary

Grouping variable is EXPERIENCE
Analysis variable is ITEM 30

Group Means and Standard Deviations Missing cases removed = 4

1: mean= 2.241379	s.d.= 1.057462	n= 29
2: mean= 2.607143	s.d.= 1.029889	n= 84
3: mean= 2.563636	s.d.= 1.084634	n= 55

Analysis of Variance Table

Source	S.S.	DF	MS	F	Appx P
Total	185.85	167			
Treatment	2.98	2	1.49	1.34	0.264
Error	182.87	165	1.11		

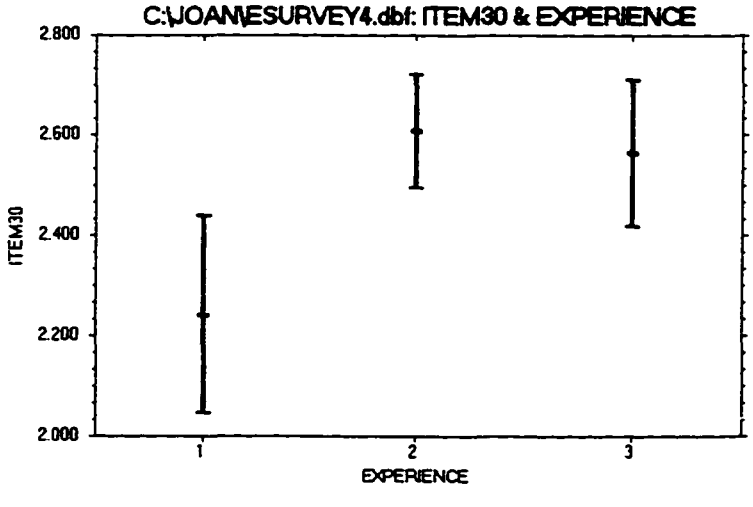
Error term used for comparisons = 1.11 with 165 d.f.

Newman-Keuls Multiple Comp.	Critical q Difference	P	Q	(.05)
Mean(2) -Mean(1) =	0.3658	3	2.281	3.351
Mean(2) -Mean(3) =	0.0435	(Do not test)		
Mean(3) -Mean(1) =	0.3223	(Do not test)		

Homogeneous Populations, groups ranked

Gp	Gp	Gp
1	3	2

This is a graphical representation of the Newman-Keuls multiple comparisons test. At the 0.05 significance level, the means of any two groups underscored by the same line are not significantly different.



The Mean and Error Bar Chart for Item 30 as grouped by the Years Experience Levels indicates that the Intermediate and Expert groups rated the item higher than did the Novice group, yet these differences are not statistically significant.

Item 31

When working on ISD projects, our instructional development team almost always:

I31. Conducts small group trials of instruction before completion

---

Independent Group Analysis Summary

Grouping variable is EXPERIENCE
Analysis variable is ITEM 31

Group Means and Standard Deviations Missing cases removed = 4

1: mean= 2.517241	s.d.= 1.021927	n= 29
2: mean= 2.690476	s.d.= .9691157	n= 84
3: mean= 2.636364	s.d.= 1.042853	n= 55

Analysis of Variance Table

Source	S.S.	DF	MS	F	Appx P
Total	166.57	167			
Treatment	0.65	2	0.33	0.32	0.724
Error	165.92	165	1.01		

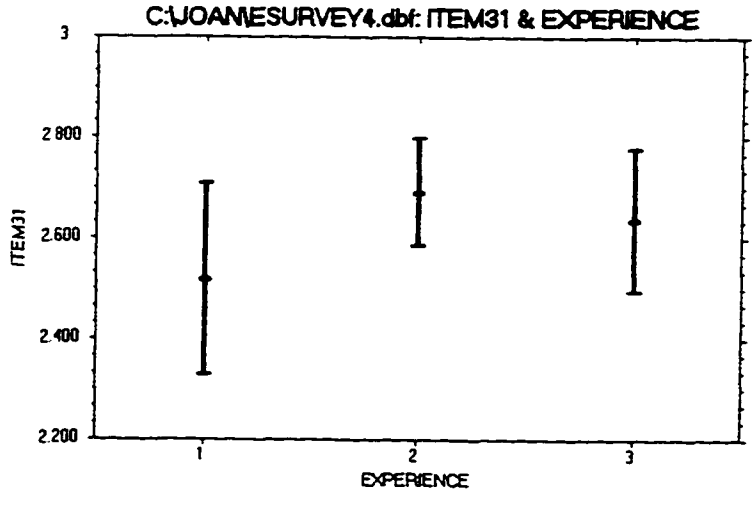
Error term used for comparisons = 1.01 with 165 d.f.

Newman-Keuls Multiple Comp.	Difference	P	Critical q Q	(.05)
Mean(2) -Mean(1) =	0.1732	3	1.134	3.351
Mean(2) -Mean(3) =	0.0541	(Do not test)		
Mean(3) -Mean(1) =	0.1191	(Do not test)		

Homogeneous Populations. groups ranked

Gp Gp Gp
1 3 2

This is a graphical representation of the Newman-Keuls multiple comparisons test. At the 0.05 significance level. the means of any two groups underscored by the same line are not significantly different.



This Mean and Error Bar Chart indicates nothing of significance for Item 31 as grouped by the three Years Experience Levels.

Independent Group Analysis Summary

Grouping variable is COMPLEXITY
Analysis variable is ITEM 31

Group Means and Standard Deviations Missing cases removed = 4

1: mean= 2.090909	s.d.= 1.221028	n= 11
2: mean= 2.492064	s.d.= .9816546	n= 63
3: mean= 2.808511	s.d.= .9757996	n= 94

Analysis of Variance Table

Source	S.S.	DF	MS	F	Appx P
Total	170.57	167			
Treatment	7.36	2	3.68	3.72	0.026
Error	163.21	165	0.99		

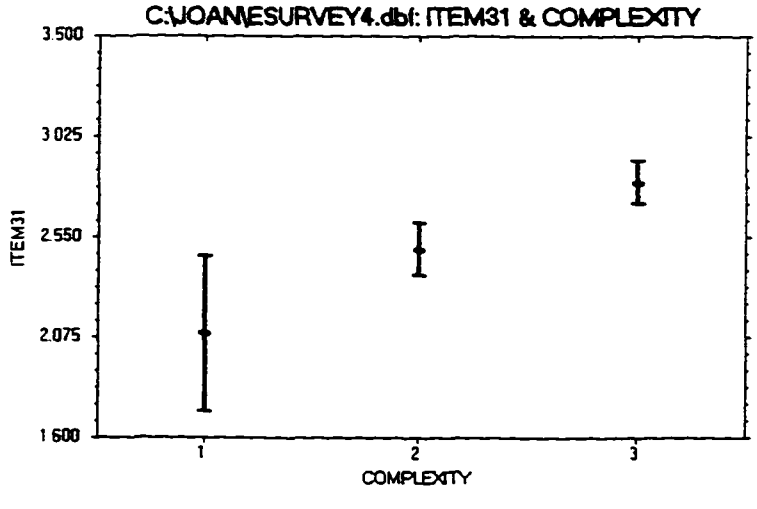
Error term used for comparisons = 0.99 with 165 d.f.

Newman-Keuls Multiple Comp.	Critical q Difference	P	Q	(.05)
Mean(3) -Mean(1) =	0.7176	3	3.202	3.351
Mean(3) -Mean(2) =	0.3164	(Do not test)		
Mean(2) -Mean(1) =	0.4012	(Do not test)		

Homogeneous Populations, groups ranked

Gp Gp Gp
1 2 3

This is a graphical representation of the Newman-Keuls multiple comparisons test. At the 0.05 significance level, the means of any two groups underscored by the same line are not significantly different.



Though the differences are not large enough to be statistically significant, the Mean and Error Bar Chart for Item 31 as grouped by Complexity Levels again indicates an increase in the mean item rating as the complexity level increases from Low Level, to Medium Level, to High Level project complexity.

Item 32

When working on ISD projects, our instructional development team almost always:

I32. Pilot tests instruction before completion

Independent Group Analysis Summary

Grouping variable is EXPERIENCE
Analysis variable is ITEM 32

Group Means and Standard Deviations Missing cases removed = 4

1: mean= 2.62069	s.d.= 1.115277	n= 29
2: mean= 2.726191	s.d.= .9982055	n= 84
3: mean= 2.872727	s.d.= 1.08959	n= 55

Analysis of Variance Table

Source	S.S.	DF	MS	F	Appx P
Total	182.99	167			
Treatment	1.35	2	0.68	0.62	0.542
Error	181.64	165	1.10		

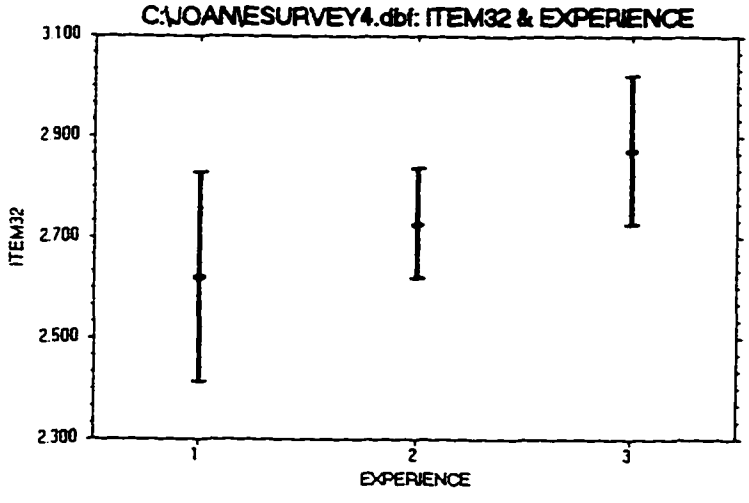
Error term used for comparisons = 1.10 with 165 d.f.

Newman-Keuls Multiple Comp.	Critical q Difference	P	Q	(.05)
Mean(3) -Mean(1) =	0.2520	3	1.480	3.351
Mean(3) -Mean(2) =	0.1465	(Do not test)		
Mean(2) -Mean(1) =	0.1055	(Do not test)		

Homogeneous Populations, groups ranked

Gp Gp Gp
1 2 3

This is a graphical representation of the Newman-Keuls multiple comparisons test. At the 0.05 significance level, the means of any two groups underscored by the same line are not significantly different.



The Mean and Error Bar Chart for Item 32 as grouped by the Years Experience Levels indicates an increase in the group mean ratings as the categories progress from Novice, to Intermediate, to the Expert categories. Though an interesting representation, these findings are not statistically significant.

Independent Group Analysis Summary

Grouping variable is COMPLEXITY
Analysis variable is ITEM 32

Group Means and Standard Deviations Missing cases removed = 4

1: mean= 2.363636	s.d.= 1.206045	n= 11
2: mean= 2.396825	s.d.= 1.024533	n= 63
3: mean= 3.021277	s.d.= .9613915	n= 94

Analysis of Variance Table

Source	S.S.	DF	MS	F	Appx P
Total	181.99	167			
Treatment	16.41	2	8.21	8.18	<.001
Error	165.58	165	1.00		

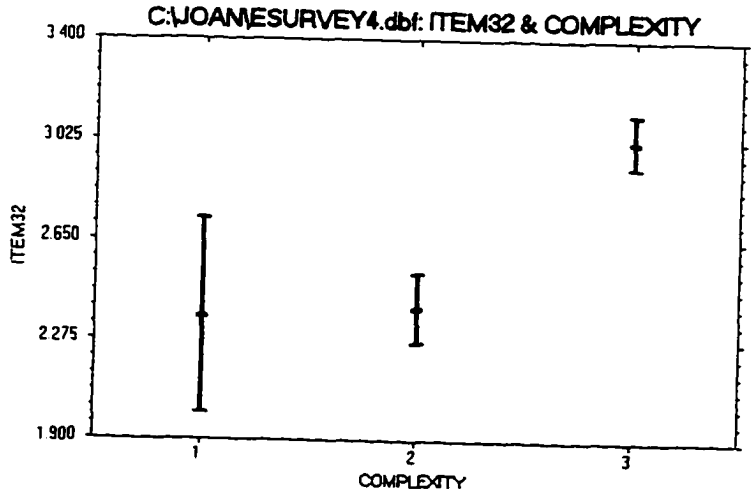
Error term used for comparisons = 1.00 with 165 d.f.

Newman-Keuls Multiple Comp.	Difference	P	Critical q Q	(.05)
Mean(3) -Mean(1) =	0.6576	3	2.913	3.351
Mean(3) -Mean(2) =	0.6245	(Do not test)		
Mean(2) -Mean(1) =	0.0332	(Do not test)		

Homogeneous Populations. groups ranked

Gp 1	Gp 2	Gp 3
———		

This is a graphical representation of the Newman-Keuls multiple comparisons test. At the 0.05 significance level, the means of any two groups underscored by the same line are not significantly different.



This Mean and Error Bar Chart for Item 32 as grouped by the project Complexity Levels indicates that the High Complexity project group tended to provide higher ratings than did the other two complexity level groups. Again, though not statistically significant, this chart provides and interesting representation of the respondent data. Not only does the Highest Level of project complexity have the highest mean group rating for this item, but it also has a rather small error bar range.

Item 33

When working on ISD projects, our instructional development team almost always:

I33. Conducts a follow-up evaluation after training

Independent Group Analysis Summary

Grouping variable is EXPERIENCE
Analysis variable is ITEM 33

Group Means and Standard Deviations Missing cases removed = 7

1: mean= 2.862069	s.d.= .8334154	n= 29
2: mean= 3.012195	s.d.= 1.012196	n= 82
3: mean= 2.777778	s.d.= 1.075747	n= 54

Analysis of Variance Table

Source	S.S.	DF	MS	F	Appx P
Total	165.64	164			
Treatment	1.87	2	0.93	0.92	0.399
Error	163.77	162	1.01		

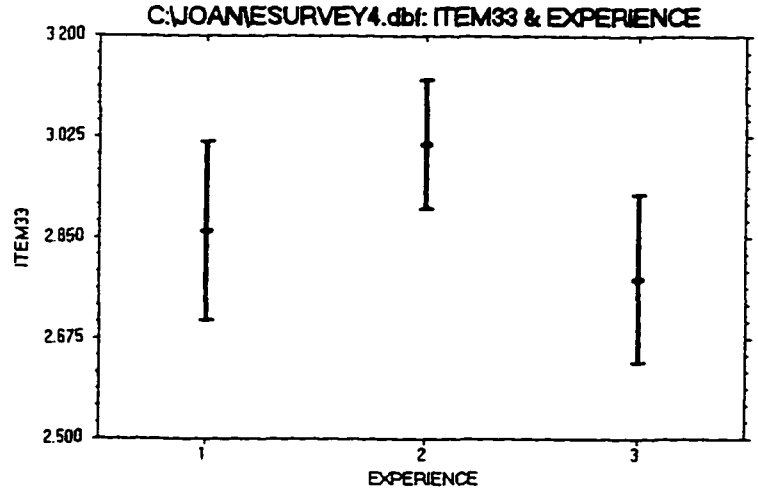
Error term used for comparisons = 1.01 with 162 d.f.

Newman-Keuls Multiple Comp.	Difference	P	Q	Critical q (.05)
Mean(2) -Mean(3) =	0.2344	3	1.881	3.351
Mean(2) -Mean(1) =	0.1501	(Do not test)		
Mean(1) -Mean(3) =	0.0843	(Do not test)		

Homogeneous Populations. groups ranked

Gp Gp Gp
3 1 2

This is a graphical representation of the Newman-Keuls multiple comparisons test. At the 0.05 significance level. the means of any two groups underscored by the same line are not significantly different.



Although all three Experience groups indicate a fairly broad error bar range, the Expert group has provided the lowest overall mean rating for Item 33. This difference is not statistically significant.

Independent Group Analysis Summary

Grouping variable is COMPLEXITY
Analysis variable is ITEM 33

Group Means and Standard Deviations Missing cases removed = 7

1: mean= 3	s.d.= .8944272	n= 11
2: mean= 2.83871	s.d.= 1.074191	n= 62
3: mean= 2.945652	s.d.= .9762468	n= 92

Analysis of Variance Table

Source	S.S.	DF	MS	F	Appx P
Total	165.64	164			
Treatment	0.52	2	0.26	0.26	0.775
Error	165.12	162	1.02		

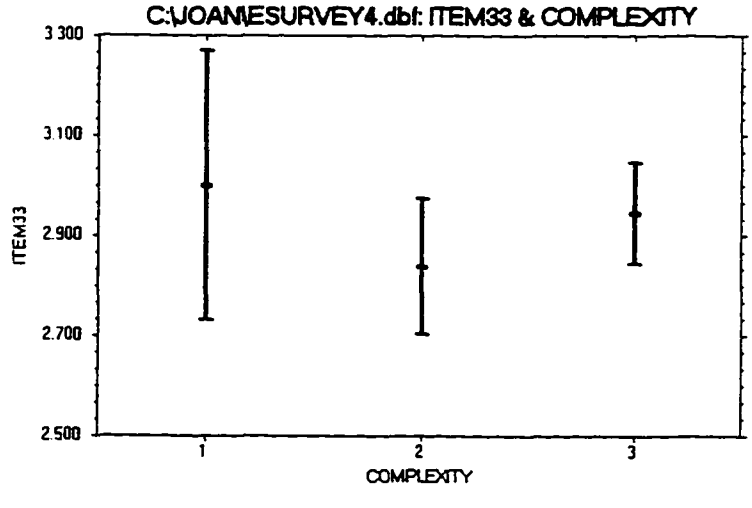
Error term used for comparisons = 1.02 with 162 d.f.

Newman-Keuls Multiple Comp.	Difference	P	Q	Critical q (.05)
Mean(1) -Mean(2) =	0.1613	3	0.691	3.351
Mean(1) -Mean(3) =	0.0543	(Do not test)		
Mean(3) -Mean(2) =	0.1069	(Do not test)		

Homogeneous Populations, groups ranked

Gp Gp Gp
2 3 1

This is a graphical representation of the Newman-Keuls multiple comparisons test. At the 0.05 significance level, the means of any two groups underscored by the same line are not significantly different.



When grouped according to the three Complexity Levels, the responses for Item 33 indicate a little difference among the group means; however of note is the quite broad error bar range for the Low Level Complexity ratings. This observation is not statistically significant.

Item 34

When working on ISD projects, our instructional development team almost always:

I34. Conducts evaluations to determine update/revision requirements

---

Independent Group Analysis Summary

Grouping variable is EXPERIENCE
Analysis variable is ITEM 34

Group Means and Standard Deviations Missing cases removed = 4

1: mean= 2.827586	s.d.= .9284767	n= 29
2: mean= 2.904762	s.d.= .9893292	n= 84
3: mean= 2.709091	s.d.= .9363587	n= 55

Analysis of Variance Table

Source	S.S.	DF	MS	F	Appx P
Total	153.99	167			
Treatment	1.27	2	0.64	0.69	0.504
Error	152.72	165	0.93		

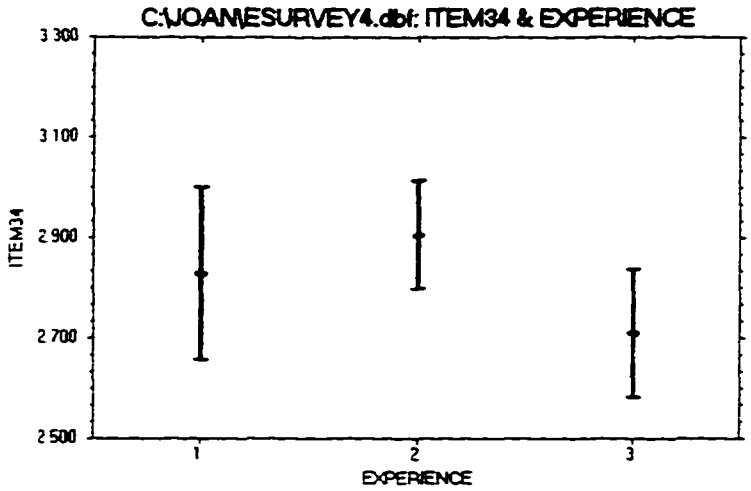
Error term used for comparisons = 0.93 with 165 d.f.

Newman-Keuls Multiple Comp.	Difference	Critical q P	Q	(.05)
Mean(2) -Mean(3) =	0.1957	3	1.658	3.351
Mean(2) -Mean(1) =	0.0772	(Do not test)		
Mean(1) -Mean(3) =	0.1185	(Do not test)		

Homogeneous Populations, groups ranked

Gp Gp Gp
3 1 2
———

This is a graphical representation of the Newman-Keuls multiple comparisons test. At the 0.05 significance level, the means of any two groups underscored by the same line are not significantly different.



This Mean and Error Bar Chart indicates very little differences among the Years Experience groups. Nothing of significance is noted for these group responses to Item 34, however, the mean rating for the Expert group is slightly lower than the mean ratings for the other two groups.

Independent Group Analysis Summary

Grouping variable is COMPLEXITY
Analysis variable is ITEM 34

Group Means and Standard Deviations Missing cases removed = 4

1: mean= 2.818182	s.d.= .9816498	n= 11
2: mean= 2.825397	s.d.= .9425374	n= 63
3: mean= 2.851064	s.d.= .9611535	n= 94

Analysis of Variance Table

Source	S.S.	DF	MS	F	Appx P
Total	150.66	167			
Treatment	0.03	2	0.02	0.02	0.984
Error	150.63	165	0.91		

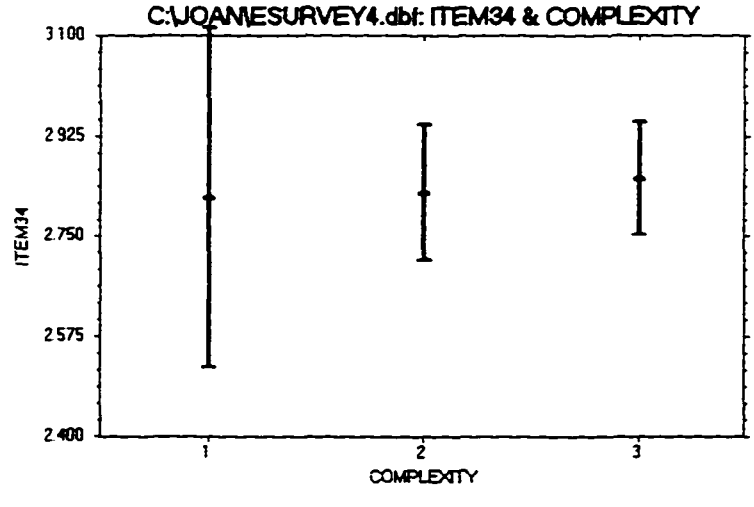
Error term used for comparisons = 0.91 with 165 d.f.

Newman-Keuls Multiple Comp.	Critical q Difference	P	Q	(.05)
Mean(3) -Mean(1) =	0.0329	3	0.153	3.351
Mean(3) -Mean(2) =	0.0257	(Do not test)		
Mean(2) -Mean(1) =	0.0072	(Do not test)		

Homogeneous Populations, groups ranked

Gp Gp Gp
1 2 3

This is a graphical representation of the Newman-Keuls multiple comparisons test. At the 0.05 significance level, the means of any two groups underscored by the same line are not significantly different.



When grouped by the Complexity Levels, Item 34 responses indicate an extremely large error bar range for the Low Level Complexity group, yet the means of all three groups are very close. This is not a statistically significant finding.

Item 35

When working on ISD projects, our instructional development team almost always:

I35. Conducts evaluations to determine possible training system deterioration

---

Independent Group Analysis Summary

Grouping variable is EXPERIENCE
Analysis variable is ITEM 35

Group Means and Standard Deviations Missing cases removed = 7

1: mean= 2.137931	s.d.= .9900988	n= 29
2: mean= 2.261905	s.d.= 1.042692	n= 84
3: mean= 2.096154	s.d.= 1.107189	n= 52

Analysis of Variance Table

Source	S.S.	DF	MS	F	Appx P
Total	181.18	164			
Treatment	0.97	2	0.49	0.44	0.647
Error	180.21	162	1.11		

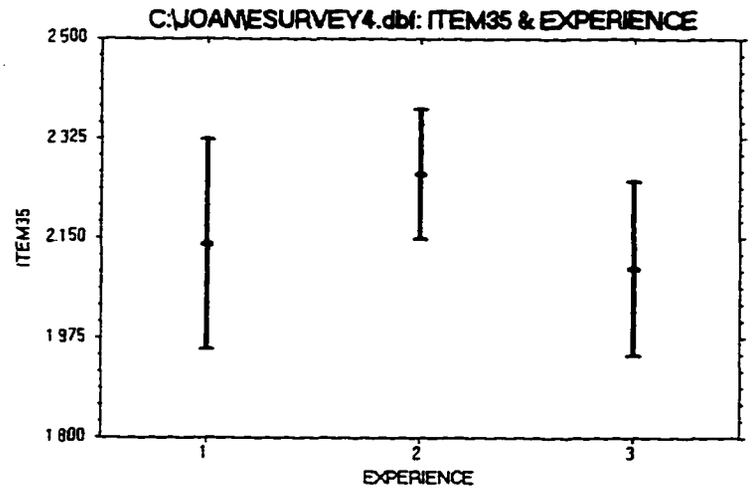
Error term used for comparisons = 1.11 with 162 d.f.

Newman-Keuls Multiple Comp.	Difference	Critical q P	Q	(.05)
Mean(2) -Mean(3) =	0.1658	3	1.260	3.351
Mean(2) -Mean(1) =	0.1240	(Do not test)		
Mean(1) -Mean(3) =	0.0418	(Do not test)		

Homogeneous Populations, groups ranked

Gp Gp Gp
3 1 2

This is a graphical representation of the Newman-Keuls multiple comparisons test. At the 0.05 significance level, the means of any two groups underscored by the same line are not significantly different.



The mean and error bar chart for Item 35 as grouped by Years Experience indicates no patterns of interest.

Independent Group Analysis Summary

Grouping variable is COMPLEXITY
Analysis variable is ITEM 35

Group Means and Standard Deviations Missing cases removed = 7

1: mean= 2.090909	s.d.= 1.221028	n= 11
2: mean= 2.193548	s.d.= .9553767	n= 62
3: mean= 2.217391	s.d.= 1.097711	n= 92

Analysis of Variance Table

Source	S.S.	DF	MS	F	Appx P
Total	180.40	164			
Treatment	0.16	2	0.08	0.07	0.930
Error	180.24	162	1.11		

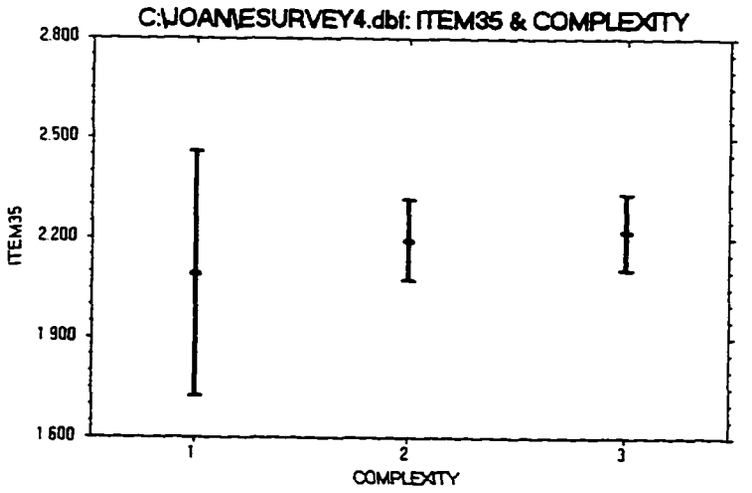
Error term used for comparisons = 1.11 with 162 d.f.

Newman-Keuls Multiple Comp.	Difference	P	Q	Critical q (.05)
Mean(3) -Mean(1) =	0.1265	3	0.532	3.351
Mean(3) -Mean(2) =	0.0238	(Do not test)		
Mean(2) -Mean(1) =	0.1026	(Do not test)		

Homogeneous Populations, groups ranked

Gp 1	Gp 2	Gp 3

This is a graphical representation of the Newman-Keuls multiple comparisons test. At the 0.05 significance level, the means of any two groups underscored by the same line are not significantly different.



The Mean and Error Bar Chart for Item 35 as grouped by Project Complexity Levels indicates a broad range of responses for the Low Complexity Level group and much tighter ranging responses for the Medium and High Complexity level groups. These differences are not significant.