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AN EVALUATION OF AN ELECTRONIC PERFORMANCE

SUPPORT SYSTEM IMPLEMENTATION

BY

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## TABLE OF CONTENTS

List of Tables .....	vi
Abstract .....	vii
1. INTRODUCTION .....	1
Purpose of the Study .....	8
Research Questions .....	8
Significance of the Study .....	9
2. REVIEW OF LITERATURE .....	10
Change and Diffusion .....	11
Socio-Technical Systems .....	14
E.P.S.S. and C.I.E.P. ....	15
Evaluation .....	18
3. METHODOLOGY .....	24
Participants .....	25
Instruments .....	26
The Interview Process .....	27
Observations .....	27
Focus Group .....	28
Data Preparation and Analysis .....	28
Coding	
Testing Findings	
Triangulation	
Researcher Effects	
Outliers, Extreme Cases, and Negative Evidence	
Summary .....	32
4. RESULTS .....	33
District Review .....	33
Survey Results .....	34

Teacher Cases .....	36
Susan's Case	
Janet's Case	
Linda's Case	
Renee's Case	
Specific Research Questions.....	49
 5. SUMMARY AND CONCLUSIONS .....	 65
What actually occurs within a worksite during the implementation of an E.P.S.S. .....	 65
In what ways has the E.P.S.S. changed the group work? .....	67
In what ways has the work relationship between colleagues changed due to the E.P.S.S.?.....	67
What could be done to make the E.P.S.S. a more useful tool for the user?.....	67
How can E.P.S.S. developers incorporate flexibility into their tools?.....	67
Limitations of the Study.....	67
Implications for the development of E.P.S.S.'s .....	68
 APPENDICES .....	 70
 BIBLIOGRAPHY .....	 78
 BIOGRAPHICAL SKETCH .....	 83

## LIST OF TABLES

1. Timeline of Participant Selection and Data Gathering .....	28
2. Frequency of Highest Concerns Stage for Individuals .....	35
3. Frequency of Second Highest Stage Score for Stage 0 Respondents .....	36
4. Summary of Time Savings and Time Trade-Off by Respondent .....	50
5. Work and Work Relationship Change Responses by Respondent .....	53
6. Improvement Recommendations by Respondent .....	57

## ABSTRACT

The current emphasis on the use of technology in schools is not a recent development and new software tools are being developed that can assist teachers in their work. Computerized Individual Education Plans and related software tools hold great promise for reducing the paperwork of special education teachers. The use of any support tool, however, requires the user to expend time and energy in learning how to use it.

This study was an evaluation of the implementation of an E.P.S.S. for special education teachers. This study investigated the question 'what actually occurs within a work site during the implementation of an electronic support system'. As a mixed method study, a survey, informant interviews, observations, and a focus group were used to collect data. Key informants were teachers using the electronic I.E.P., their supervisors, and their support personnel.

The Stages of Concern Questionnaire provided a general overview of the concerns of the teachers across the district. The peak score analysis indicated that nearly half of the teachers had peak stage Scores in the '0' stage, reflecting low levels of concern regarding the software. Further analysis of the second peak score for the teachers indicated that many of the teachers across the district were still dealing with feelings of uncertainty as far as their abilities to use the software.

The data reflect that respondents made substantial changes in the method they used to produce an I.E.P. Obvious aspects of these changes were in data entry, manipulation of data, and printing. For many of the teachers, time - either in training, exploration of the tool, or in update reviews - was a concern. Support staff and administrators also recognized the issue of time for many of the same reasons.

Overall, the feelings of the teachers were that the software is a good tool to use, and that it is worth the time and effort put in to learning how to use it. Respondents made recommendations for improvement that included use of a central server system,

differentiated training, and an update memo. Implications for the development of E.P.S.S.s were discussed.

## CHAPTER 1

### INTRODUCTION

The evaluation of any new educational process or product should be undertaken with the understanding that a system is always nested within a supersystem; change requires time, effort, energy, and resources; and ultimately it is the individual who must make the change.

#### **Educational Reform**

The topic of educational reform and restructuring has been the object of significant public debate during the past two decades. Three waves of reform were identified by Murphy (1993) for just the 1980's in the United States. During the 1990's the trend continued with major and minor reform efforts both in the United States and abroad, with the recent advances in microcomputer design generating a resurgence of technology innovations for education.

Restructuring and reform efforts targeted at public education, particularly in the k-12 systems, can be divided into a variety of categories. Papagiannis, Easton, and Owens (1992) delineated categories focusing on governance, instructional methodology, and funding or resource issues. They did, however, distinguish between "the fundamental issue of school governance from the equally important but derivative issues of instructional methodology, administrative organization and resource use" (Papagiannis et al., 1992, p. 3). In *High School Restructuring: A National Study*, Cawelti (1994) described five categories of reform: 1) curriculum/teaching, 2) school organization, 3) community outreach, 4) technology, and 5) monetary incentives. Elmore, Peterson and McCarthy (1992) were particularly interested in the structure of the schools they studied, specifically student grouping, allocation of time to content or subject matter, and teachers relating to groups of students.

There is some consensus among Papagiannis et al. , Elmore et al., and Cawelti that technology is a significant component of the restructuring movement. The recent advances in microcomputer processing power and storage, telecommunications, and multimedia design could promote a new emphasis on technology in the classroom. The key issue is determining the appropriate use of technology so that it is not just another fad imposed on the teacher, but an integrated component of the instructional and management process.

### **Organizational Change**

The studies identified to this point focus on restructuring plans that use one or two interventions to change the educational process. Cuban (1988) would describe these methods as first order attempts at change. First order changes are piecemeal changes that attempt to “make what already exists more efficient and more effective, without disturbing the basic organizational features, without substantially altering the ways in which adults and children perform their roles” (Cuban, 1988, p.342). Second order changes, on the other hand, are more systemic in nature, and attempt to “alter the fundamental ways in which organizations are put together” (Cuban, 1988, p. 342).

Second order or systemic change has been promoted by a number of researchers in the field (Morgan, 1971, 1994; Branson, 1987; Reigeluth and Garfinkle, 1994; Pogrow, 1996 ). Both Branson (1987) and Reigeluth and Garfinkle(1994) have used a transportation metaphor to describe the level of change necessary for systemic restructuring. Reigeluth and Garfinkle(1994) related how as our society changed and moved from an agrarian base to an industrial and then to an information base, our transportation modes changed from the horse to the train, and eventually to the car and plane. These changes weren't just visible indicators of the change process, but integral components that were necessary for the innovations to succeed (Reigeluth and Garfinkle, 1994).

Branson's (1987) metaphor of the change between prop-driven aircraft and jet-powered aircraft served to highlight his upper-limit hypothesis of the current state of education. His basic proposition was that just as piston- engined aircraft went through a continuous development process until they reached the practical upper limit of performance, so has the current educational system. No more gains in performance can

be reached under the current design philosophy of education (Branson, 1998). The system itself virtually insures that approximately 6.25% of children in schools will have teachers that are in the lower quartile of performance two years in a row, leading to a learning deficit that is “virtually unrecoverable” (Branson, 2000, p.197). Therefore, a completely new system must be designed.

Pogrow (1996) and Reigeluth and Garfinkle (1994) concur with Branson. Pogrow stated at numerous times in his article that systemic change must occur for real progress to be made. He is particularly insistent about the need for systematic planning for specific learning outcomes as a prerequisite for an improved system.

### **Individual Change**

One of the problems associated with systemic or deep change efforts is the individual’s ability to deal with change. Cawelti (1994) addressed this personal change issue in terms of high school teachers by stating “some change theorists argue that it is better to undertake a full transformation, but practitioners find it difficult to manage such comprehensive change. Experience has shown that difficulties and resistance sometimes arise from implementing even a single element, such as a schedule change or establishment of standards” (p.61).

Various theories have been presented that address the problems of individuals attempting to change their behaviors. Prochaska et al (1994) developed a model of personal change known as the transtheoretical approach. They believe that change requires time and energy, and often requires multiple attempts to achieve success. Rather than label the unsuccessful attempts as failures, they believe these attempts are part of an iterative process. Information, strategies, and tactics developed during early change attempts may be reinterpreted and recycled as part of a subsequent attempt at personal change.

Vohs and Heatherton (2000) have researched the problem of self-regulatory failure under the construct of resource depletion. Their studies of self-regulatory failure investigated how “self regulatory resources can be depleted or fatigued by self-regulatory demands. Hence, the active effort required to control behavior in one domain leads to diminished capacity for self-regulation in other domains” ( Vohs and Heatherton, 2000, p. 249). In the case of a classroom teacher, this could happen quite easily, given the

continual changes of schedules, instructional programs, staffing changes, and technology implementation. Other researchers (Sweller, 1989) have used the construct of cognitive load to address the difficulty individuals have with learning new material or implementing new processes. Taken together, the constructs of self-regulatory failure due to resource depletion and cognitive load provide a strong theoretical lens through which the individual change process can be viewed.

### **Technology in Schools**

The current emphasis on the use of technology in schools is not a recent development. During the 20<sup>th</sup> century public education has attempted to adopt a variety of different types of educational media and technology. The introduction of each new type of media to the educational realm has been accompanied by overly optimistic visions of the future. Radio, television, videotapes and the microcomputer have each been heralded as the next savior of education (Gillman, 1989; Apple, 1992;). Computers in particular have borne the brunt of unfulfilled high expectations since the early 1980's. Apple (1992) believed that computer literacy was oversold:

Since the requirements are in many ways artificial--computer knowledge will not be so necessary, and the number of jobs requiring high levels of expertise will be relatively small-- we will simply be affixing one more label to these students. "Functional literacy" will simply be broadened to include computers. (p. 51)

It is difficult to imagine that future students will not need more sophisticated knowledge of computers than they currently have. Microcomputers have become almost a standard in businesses of every type. From auto parts stores with computerized stock information to hair salons that have data bases for scheduling, nearly every level of work has been touched by the electronic wave. Although Apple (1992) admitted that more workers will be using computers and other forms of technology, he believes that the technology "may actually reduce the skills and discretion required to perform many jobs" (p. 48). Despite this reduction in skill and discretion, computers will still continue their transformation of the workplace. Educational systems must be ready to provide their students with the basic needs for employment, and in this new era "computing is the new basic in education" (Gillman, 1989, p. 10).

## **Performance Support for Teachers**

At this point in time we must admit that computers are here to stay. Rather than debate that point, it would be better to expend our energy on determining how they can best be used in the educational process. One of the pieces of the puzzle that is missing from the picture is the teacher. While the rest of society has adopted computers in practically every work environment, teachers have been left behind. Hand-written lesson plans, written documentation of student work in triplicate, and desktops covered with books of local and state guidelines are still the norm.

The use of the computer as an instructional tool is not a new concept, and nearly all schools have computers to manage the basic information about a student-- name, age, grade, parent's name, courses enrolled in, etc. In this instance the computer, or group of computers, is an administrative system. This administrative system juggles the logistical problems of hundreds of students, but does little to assist the classroom teacher in the management of their instruction.

Gillman (1989) envisioned an integrated information system that would assist teachers in many of their daily tasks. He describes the integrated information system as having two components: 1) an instructional system, and 2) a management information system. Both of these component parts, albeit in simplified form, have been used before in schools. The discriminating feature of the integrated system is:

... the ability to merge data. For example, classroom teachers may store grading information, although the office may input information on students' progress in a particular subject area. After determining student strengths and weaknesses, the teachers can draw more information from a curriculum alignment database that lists appropriate audiovisual materials. The teachers can then take the combined information and use it for the development of lesson plans appropriate to the needs of the students.

Gillman, 1989, p.17

Recent advances in microcomputers have made sophisticated management tools such as this available to teachers everywhere. These management tools are often referred to as electronic performance support systems (E.P.S.S.).

Carr (1992) recommended that we define a PSS (or its electronic cousin the E.P.S.S.) by the functions it serves rather than its component parts. He identified four specific functions commonly found in E.P.S.S.'s: librarian, advisor, instructor, and dofer (Carr, 1992). The librarian function assists the user in locating and using information. The advisor function assists the user by providing guidance or expert advice. The instructor function is apparent in training that is provided just at the time the user needs it. The dofer function is found in the components that carry out routinized work tasks.

Scales (1994) extended the description of E.P.S.S.'s to discriminate between basic and complex E.P.S.S.'s- the former could be as simple as a database and on-line help system whereas the latter could include "hypermedia databases, expert systems, modular interactive training, [and] a dynamic maintenance system...(Scales, 1994, p. 751). The result is a performance support system that "uses computers and associated technology to provide just the help a performer needs to do a job, just when the performer needs it, and in just the form in which he or she needs it" (Carr 1992, p. 32).

Hudzina, Rowley, and Wager (1997) developed a matrix to organize the findings of their review of the literature on E.P.S.S.'s. The matrix categorized E.P.S.S.'s by environment, rationale, and system features. The environment is the context or setting in which the E.P.S.S. will be used. The rationale is the reason why the E.P.S.S. was initially developed. System Features identifies specific components of the E.P.S.S.. Due to the wide variety of features found in E.P.S.S.'s, this category was further divided into subcategories of ergonomic, informative, and performative (Hudzina, Rowley, and Wager, 1997).

### **Individualized Education Plans**

The individualized education plan (I.E.P.) has long been a staple in the management of students with special needs. Branson (1998) argued that "there is no logical reason why special-education students should have I.E.P.'s while the rest of the students are relegated to lockstep grade-level, one-size fits all classes" (p128). One of the problems in implementing an I.E.P. driven curriculum for all students would be the logistical nightmare this would create for the teacher. Without a sophisticated support system teachers would soon be overwhelmed by the paperwork involved in planning, tracking and assessing student performance in such a system. This would add to the

workload of the already overworked teacher, rather than assist them. With a modern support system, however, there is “the possibility of truly individualized instruction tailored to fit the special needs of each student” (Gillman, 1989, p. 10). With an integrated information system the teacher could have instant access to all the information necessary to develop a more focused plan of study for the student.

### **Conceptual Framework of the Study**

The conceptual framework for this study will be based on the sub field of evaluation known as implementation evaluation. Also known as process evaluation, this genre of evaluation places emphasis on determining the fidelity of the implementation as opposed to the attainment of program objectives. This study falls within the paradigm of systems-based evaluation as identified by Driscoll (1984). This alternative paradigm is appropriate, due to the fact that “social, political, or economic problems can impair technology effectiveness to as great or greater degree than some inherent problem with the technology itself” (Driscoll, 1984, p. 314).

The CIPP (Context, Input, Process, Product) Model (Stufflebeam, et al. 2000) will be used to structure this study. The CIPP model uses a systems approach and is “based on the view that the most important purpose of evaluation is not to prove, but to improve” (Stufflebeam, 2000, p. 283). The CIPP model identified four types of evaluations: context, input, process, and product. This study was a process evaluation. Stufflebeam (2000) identified three goals for a process evaluation: 1) to provide feedback to staff regarding how well planned activities are being carried out, 2) to identify problems with the implementation and make needed corrections, and 3) to assess how well participants accept and perform their roles. The CIPP model is particularly suited to the evaluation of a process involving teachers and other education professionals, because it focuses on stakeholder involvement:

Involving all levels of stakeholders is the right thing to do, because it equitably empowers the disadvantaged as well as the advantaged to help define the appropriate evaluation questions and criteria, provide evaluative input, and receive and use evaluation findings. Involving all stakeholder groups is also the intelligent thing to do, because involvement of stakeholders in a change process (read evaluation) increases the likelihood

that they will accept and act upon the change process' products (e.g., evaluation reports). Stufflebeam, 2000, p. 281.

For this study a survey, informant interviews, observations, and a focus group were used to collect data. Multiple methods of data gathering are recommended because they assist in data triangulation (Krathwohl, 1993). The key informants for this study were teachers using the electronic I.E.P., their supervisors, and their support personnel. Informants are chosen for “their sensitivity, knowledge, and insights into their situation...” (Krathwohl, 1993). Gleaning information from each of the informant groups is critical for a number of reasons. First, this information will help to identify if there is a shared goal or objective for the program; Branson (2000) recognized this shared vision or commitment as a critical factor in the sustaining successful change.

A focused interview format was used for the interviews. These interviews were directed by an interview guide, a group of questions that were to be addressed at some point in the interview, but without a specified order. The interview began with broad questions that allowed the informant to lead the discussion at first, and then proceeded to semi-structured and structured questions at the end (Krathwohl, 1993). Information obtained early in the interview guided the order and depth of questioning later in the interview. A focus group was used in addition to the informant interviews, and was directed by a guide similar to the interview guide.

### **Purpose of the Study**

The purpose of this study was to examine how educators in a work setting respond to the implementation of an electronic performance support system.

### **Research Questions**

This study investigated the question ‘what actually occurs within a work site during the implementation of an electronic support system’. To document the process of implementation and support the improvement of the program, additional questions were posed:

1. In what ways has the E.P.S.S. changed the work of the individual?
2. In what ways has the E.P.S.S. changed the group work?
3. In what ways has the work relationship between colleagues changed due to the E.P.S.S.?

4. As a whole, is the E.P.S.S. a help or a hindrance to the individual?
5. What could be done to make the E.P.S.S. a more useful tool for the user?
6. How can E.P.S.S. developers incorporate flexibility in to their tools?
7. What do teachers, staff, and administrators view is the return on investment for this program?
8. What performance improvement techniques are applicable to the use of E.P.S.S.'s?

### **Significance of the Study**

Change in educational systems has taken a myriad of forms, ranging from management and funding reforms to the adoption of new school calendars and media technology. Regardless of the context or type of change, however, little research has been done on the implementation process as it evolves. This study is an attempt to gain further information about the implementation process of an E.P.S.S. for public school teachers. Specifically, this study will attempt to explicate the implementation process as it is experienced by a work group within a public school. This study of mandated change will provide insight as to how an E.P.S.S. changes the culture of practice within the educational setting.

It was hoped that information derived from this study would shed light on how individuals adapt or reinvent technology tools for their own use. The tool that had been adopted has the potential to significantly reduce the time and energy required to produce, store, and retrieve Individualized Education Plans. Although reinvention or adaptation is acknowledged in the literature (Hall and Hord, 1977; Ellsworth, 2000 ; Rogers, 1995), there is little information on how designers of technology tools can provide flexibility of use and still maintain fidelity to the original goals or objectives. This information has implications for the development of all E.P.S.S.'s, in any work environment.

## CHAPTER 2

### REVIEW OF LITERATURE

The topic of educational change has generated substantial research in a variety of fields. Although each of these fields has its particular vision of the change process, they share many fundamental concepts. Understanding the context of the educational change is of primary importance. Is the change effort focused on the individual, work unit, or whole system? Is it a voluntary or mandated change effort? Is it a reorganization of the current work and system, or the implementation of a technology tool? The answers to each of these questions leads one to a body of related information, a theory camp. To determine which theory camp to associate with, the researcher must determine the most applicable models that match the research question and type of investigation.

For this study, the literature can be divided into three general areas:

- Change and Diffusion;
- Computerized I.E.P.'s and Electronic Performance Support Systems; and
- Evaluation.

The last half of the twentieth century was punctuated with numerous efforts to change education. Curriculum reforms spurred on by the launching of Sputnik in 1957 were followed by site-based management efforts, funding reforms, and instructional technology programs. Three waves of reform were identified by Murphy (1993) for just the 1980's in the United States. During the 1990's the trend continued with major and minor reform efforts both in the United States and abroad, with the recent advances in microcomputer design generating a resurgence of technology innovations for education.

Restructuring and reform efforts targeted at public education, particularly in the k-12 systems, can be divided into a variety of categories. Papagiannis, Easton, and Owens (1992) delineated categories focusing on governance, instructional methodology, and

funding or resource issues. They did, however, distinguish between “the fundamental issue of school governance from the equally important but derivative issues of instructional methodology, administrative organization and resource use” (Papagiannis et al., 1992, p. 3). In *High School Restructuring: A National Study*, Cawelti (1994) described five categories of reform: 1) curriculum/teaching, 2) school organization, 3) community outreach, 4) technology, and 5) monetary incentives. Elmore, Peterson and McCarthy (1992) were particularly interested in the structure of the schools they studied, specifically student grouping, allocation of time to content or subject matter, and teachers relating to groups of students.

Schrock (1990) identified six types of reform activities associated with performance technology: personnel selection, job redesign, evaluation/feedback, and incentives, instructional technologies, and organization redesign. It is unfortunate that Shrock’s description of job redesign delineates only two tactics: differentiated staffing and career ladders. Even though these tactics have been recommended since the 1970’s (Morgan, 1971), they address only certain aspects of the work environment for teachers. When these tactics have been used, they tend to preserve “traditional teacher behaviors and environments (e.g., lock-step, large group, teacher talk classrooms)” (Shrock, 1990, p.16). Shrock’s coverage of evaluation and feedback reform options is limited to information on effective teaching strategies and checklists for documenting teacher behaviors. Although these uses of evaluation and feedback are appropriate, they barely touch the surface of a wide range of interventions that could assist teachers in their daily work routine.

There is some consensus among Schrock, Papagiannis et al. , Elmore et al., and Cawelti that technology is a significant component of the restructuring movement. The recent advances in microcomputer processing power and storage, telecommunications, and multimedia design could promote a new emphasis on technology in the classroom. The primary issue is integrating technology into the instructional and management process at the root level, as opposed to layering it over a conventional system.

### **Change and Diffusion**

One of the more widely known and accepted theories regarding the change process is Rogers’ (1995) model of diffusion of innovations. Despite the wide acceptance

of his work, there has been criticism on specific aspects of the diffusion model. Three issues particularly salient to the discussion of implementing an E.P.S.S. in public education are 1) adoption in an organization, 2) the definition of 'adoption', and 3) equity issues that arise from the adoption of an innovation.

The portion of Rogers' diffusion research applicable to the adoption of E.P.S.S.'s in public schools is the content regarding the innovation process in organizations. The Innovation Process in an Organization model (Rogers, 1995) is "made up of two broad activities: (1) initiation,... and (2) implementation" (1995, p.392). These two subprocesses are made up of five stages: 1) agenda setting, 2) matching for initiation, 3) redefining/restructuring, 4) clarifying, and 5) routinizing for implementation. This model differs from the individual adoption model because innovation adoption in organizations is rarely a yes or no decision, but is normally a process that develops over time (Rogers, 1995, Fichman, 1992). In contrast to this model is the framework of Kwon and Zmud that has "five contextual factors (user community characteristics, organizational characteristics, technology characteristics, task characteristics, and environmental factors) each of which may impact any of six stages of IT implementation (initiation, adoption, adaptation, acceptance, routinization, infusion)" (in Fichman, 1992, p. 4).

These models or frameworks are more applicable to the adoption of an innovation by an organization for two reasons. The first reason is that some of the variables in the classical diffusion model do not translate well to the analysis of organizations (Fichman, 1992) and in organizational studies the main dependent variable is implementation rather than adoption (in this instance adoption being "the decision to use the innovation" (Rogers, 1995, p. 389). Fichman's work (1992, 1999) supports Rogers' approach in general, but he uses the term deployment to describe when the innovation is actually put in to use.

The Innovation Process in an Organization model works well for understanding the overall picture by which the organization as a whole adopts an innovation. Eventually, however, the adoption process works its way down to the level of the individual. It is at this point in the research flow that the well-known adopter categories and characteristics of innovations (Rogers, 19995) can be revisited. The one caveat is that

if the adoption of an innovation is mandated, these constructs have to be used tentatively, because an individual's decision would be influenced by management (Leonard-Barton and Deschamps, 1988 in Fichman, 1992).

Fichman (1992) addressed a number of issues that some researchers have with the “classical” diffusion model as depicted by Rogers (1995). To understand how more recently developed ‘s’ diffusion curves may differ from the traditional ‘s’ curve, you first have to identify the context of the original studies. Fichman stated that “much of diffusion theory was developed in the context of adopters making a *voluntary* decision to *accept or reject* an innovation based on the benefits they expect to accrue from their own *independent use* of the technology” (1992, p. 1). This may have been true in the early studies of farmers choosing to use a new type of grain or farming technique (Ryan and Gross, 1943, cited in Rogers, 1995), but in modern educational settings it is often the case that the use of an innovation is mandated for a group of individuals such as teachers (Hall and Hord, 1987). Fichman (1992) would categorize this type of adoption decision as an individual adoption of type 2 Technologies. Type 2 technologies are “characterized by high knowledge barriers...or significant user interdependence”, a situation where the capacity to use an innovation may be a more important factor than the willingness to adopt (Fichman, 1992, p. 13).

This type of diffusion environment is very different from the agrarian adoption environment of the early diffusion studies. The adoption of Information Technology (IT) type innovations may involve a two-part adoption process, where an organization adopts a technology, but the decision to actually use the innovation devolves to the department or individual level (Fichman, 1992). The question then becomes “at what time do you determine an innovation to be adopted?”. Is it when the innovative product is purchased, or when it is first used? To address this question, Fichman (1999) has developed the construct of *assimilation gap*. This gap is defined as “the difference between the pattern of cumulative acquisitions and cumulative deployments of an innovation across a population of potential adopters” (Fichman, 1999, p.5).

There is a high degree of relevance for the use of this model in studying diffusion in public schools. Although a school or district may purchase a piece of software or hardware, its eventual use in the classroom is not guaranteed. Teachers have a high level

of autonomy in the classroom, and unless there is a mechanism in place that reports use or non-use of a tool, a teacher could choose to not use that tool. Given that Type 2 technologies often are accompanied by knowledge barriers, this could impose an additional cognitive load on teachers, who are already overburdened by the “do it all” teaching centered model (Branson, 1998).

Even with such a mechanism in place, those empowered to sanction the non-use of the tool may choose not to do so, having other more pressing duties to perform. In this instance an innovation may reach only a slight penetration, level off in the adoption curve and eventually be discontinued (Rogers, 1995).

The equity issue in diffusion revolves around the disproportionate distribution of benefits from the adoption of an innovation. Attention to this issue surfaced as more diffusion studies were performed in Third World countries. The transition from the old paradigm of development to the more participatory development model emphasized the focus on equality (Rogers, 1995). In the public education setting it is not only possible -but likely- that some participants in a study would benefit more than others. Those teachers with more knowledge or experience working with technology tools could acquire even more skill and knowledge while their less well-prepared colleagues do not. Research studies may be designed to glean information from all users, document problems and the solutions, and then to reflect this information back to the users in a format so that all of the participants may improve their performance.

### **Socio-Technical Systems**

A very different conception of how to change the work environment for higher productivity is offered by the proponents of the Socio-Technical Systems (STS) approach. The STS approach advocated by Trist has been implemented in operations from Britain to Japan and Scandinavia for over thirty years (Perelman, 1987) and more recently in North America (Taylor and Felton, 1993). According to Dean (2001) “Trist coined the term socio-technical system to represent the interaction of people (a social system) with tools and techniques (a technical system). Trist knew that both could be a catalyst for change and improvement” (p. 5).

STS has been used in a wide variety of production environments by companies such as General Motors, Proctor and Gamble, Weyerhaeuser, and Sherwin Williams

(Taylor and Asadorian, 1985). Both a philosophy and a method (Taylor and Felton, 1993), STS attempts to integrate the “production (technical) requirements of the work process with the organizational (social) functions of the people working in the process” (Taylor and Asadorian, 1985, p. 13). One of the key constructs of STS that is applicable to the education sector is joint optimization. Joint optimization requires both a technical and social system analysis:

The overall effectiveness of a work process, however it is measured, can be thought of as the combined effect of the social and technical “subsystems”, each with its own optimal point. The work process that optimizes the technical functions is often not optimal for the social functions, and vice versa. What is best for the work process as a whole may be at a point that is not optimal for one or the other subsystems.

Taylor and Asadorian, 1985, pp.13-14.

In the instance of teachers using an E.P.S.S., what may be the best technical design may not work well with the social system or the individual teacher. Considering the amount of reinvention that occurs with many innovations, the best technical design would probably become a modified design, utilized in an operational environment somewhat different from what it was originally intended for.

The STS method as espoused by Taylor and Asadorian (1985) was originally applied in production environments. These production environments were predominantly of the continuous process or linear process type, such as food processing or auto assembly (Taylor and Felton, 1993). In North America the STS methodology has also been adopted in work environments such as customer service and knowledge work, where the throughput of the work process is “often accumulated knowledge and persuasive argument” (Taylor and Felton, 1993, p. 204). The work of teachers could accurately be described as knowledge work.

### **E.P.S.S. And C.I.E.P.’s**

The literature on electronic performance support systems (E.P.S.S.) dredges up a wealth of information of what one might call the “nuts and bolts” of an E.P.S.S.: interface design, wizards, font use, searchable databases, templates, etc. Although these component or design aspects are central to the discussion regarding E.P.S.S. development, there has

been a subtle move toward redefining the essential nature of what an E.P.S.S. is and what it should do. An appropriate performance assistance tool can be developed only after there is a clear understanding of the role the performance tool will play in the organization.

Marc Rosenberg has perhaps the most radical of the new perceptions of what he called electronic performance support (EPS). His view was that “it is possible, and often desirable, to enhance performance without necessarily promoting learning, to create expertise without necessarily creating an expert” (Rosenberg, 1995, p. 95). Gery described her own recent work as evaluating software with “an eye to identifying, labeling, and categorizing the common characteristics, activities, and behaviors that seem to quickly generate competent and confident learners” (1995, p. 54). Barry Raybould (1995) espoused a third view of E.P.S.S.’s. His perspective is that an entirely new model should be used for the development of E.P.S.S.’s. He labeled this model the Organizational Performance/Learning Cycle model. In this model a high value is placed on the capture of individual knowledge and the subsequent redistribution of this knowledge to other parts of the organization. These three conceptions of what an E.P.S.S. should be are not mutually exclusive, but they are different enough that a developer should choose which design paradigm they will use before they begin the design process.

To determine which design model should be used, a developer should ask his or herself what type of job would this E.P.S.S. be supporting. In the case of a bank teller, one can see the relevance of Rosenberg’s model. The knowledge and skill set required for this job remain fairly stable, and after initial training an E.P.S.S. could provide support in the form of cue cards, coaches, and databases that would assist the teller in specific tasks.

Raybould’s model would be particularly appropriate for developing an E.P.S.S. for an environment that could make the most use of the capture and redistribution of individual learning. One environment might be the production of large, highly complex weapons delivery systems like aircraft carriers or bombers. Throughout the development of these large systems changes must be made “on the run” to address unforeseen development or production problems. Since these systems are developed in classes (i.e. Enterprise class carriers, B-2 class bombers) with multiple complex subsystems, reuse of component systems is guaranteed. And even if a certain ‘fix’ for a problem is very useful,

documentation of the method for finding the ‘fix’ could be even more useful. Gery’s model (1995) is structured around three types of performance support: 1) intrinsic support, 2) extrinsic support, and 3) external support. She believed that intrinsic support is integrated into every aspect of the tool, including interface, content, and behavior and application logic. Extrinsic support can be provided through advisors, wizards, and cue cards. External support is provided by materials completely separate from the software, and may include training, documentation and job aids, and peer support. A primary concern of Gery’s was ease of use. She believed that immediate use of the tool is essential: “ultimately, no consumer or large-scale software system will be acceptable until day-one performance by both novice and expert performers is generated”(1995, p. 48).

One specific example of an E.P.S.S. is the computer generated individualized education plan. These computer generated plans are electronic versions of documents that identify specific goals, objectives, and components for an individual’s educational program. The I.E.P. was developed in response to and in accordance with various federal laws that stipulate how a public school must provide a ‘free and appropriate education’ for all handicapped students (Krivacska, 1987). The I.E.P. is the document that is generated as a result of a comprehensive assessment of a child with a disability.

In 1984 the Kenosha (Wisconsin) Unified School District worked with a regional university campus computer center to develop a mainframe based system that incorporated the following elements:

- A thesaurus for behavioral objectives that can be updated;
- A Management Information System;
- Storage of student data; and
- Print capabilities.

This system, built for a mainframe computer, required the use of data entry operators. Much of the behavioral information was in coded format. Time savings for those using the system was estimated at 40% (Kellog, 1984).

Davis (1985) reviewed what he called computerized data management system (CDMS) for special education. These systems ranged from simple software programs that

collected and stored demographic data on microcomputers, to sophisticated systems that had demographic data, pre-defined instructional objectives and goals, teaching strategies linked to objectives, and directories of materials. Davis (1985) identified the following advantages and disadvantages of the CDMS applications:

Advantages of these systems:

- Reduced I.E.P. preparation time by 30%-50%;
- Increased teacher efficiency by more accurate goal and objective preparation;
- Increased teacher proficiency;
- Increased supervisory knowledge via monitoring; and
- Increased parent knowledge.

Disadvantages:

- Software must be adapted to match local interpretation;
- Time spent on staff training; and
- Some individuals may be intimidated by the computer presence at an I.E.P. meeting.

Krivacska (1987) found other disadvantages of the computerized I.E.P.'s, such as the potential for loss of individualization, and that the format of the I.E.P. is determined by the software developer, and not the end users.

### **Evaluation**

Evaluation is, in its most basic sense, an attempt to determine the value or worth of some program or project (Stufflebeam etc., 2000). The methods, theoretical bases, and products of evaluation have developed over the past decades to support decision making in fields such as education, social programming and development. In order to make informed decisions in these varied contexts, a wide range of tactics and strategies have evolved over the years. Determining which theories and methods to use should not be driven so much by academic predisposition, but by the type of data required by the decision makers (Patton, 2002). Dick and Carey (1991) stated specifically that “the particular variables selected and the procedures used depend on the unique characteristics of the object measured and the decisions that need to be made about it (Dick and Carey, 1991, p.230).

One of the earliest evaluation efforts in education was the Eight Year Study by Tyler (Patton,1986; Shadish, Cook, and Leviton, 1991; Dick and Carey 1991). Tyler's methods of objectives-based evaluations using empirical data set the standard for decades (Worthen and Sanders,1987). It was not until the 1960's that there was a strong push for more evaluation of educational programs, as a condition of federal programs begun under Presidents Kennedy, Johnson and Nixon (Shadish, Cook, & Leviton, 1991).

One of the long-held conceptions of evaluation divided evaluation efforts in to two main categories: summative evaluation, and formative evaluation. This distinction, popularized by Scriven, has served well as a basic typology for evaluation. Payne (1994) described one of the more traditional views of evaluation by stating "the suggestion has been made that summative and formative evaluations differ only with respect to the time when they are undertaken in the service of program or project development" (p. 8). He does recognize other distinguishing aspects of these two evaluation types, such as differences in purpose, audience, who does the evaluation, and design constraints. Stufflebeam (2000) focused more on the use of the evaluation, as opposed to the methods and timing: "formative evaluations are employed to examine a program's development and assist in improving its structure and implementation" (p. 59).

Formative evaluation has been used in Instructional Systems Design (I.S.D.) from the beginning. Dick and Carey (1991) described the use of one-on-one and small group testing to improve instructional materials. An essential component of their model of instructional design is the feedback loop, making it possible to continually improve the product as new information is gained through the development cycle.

Perhaps one way of looking at the formative and summative aspects is to map them as a function of data use over time. Ordinarily almost any evaluation can be seen to have both summative and formative facets. Information that was originally gathered for formative feedback can eventually be used for summative decisions, and information gathered for summative decisions could be used as improvement feedback for the program.

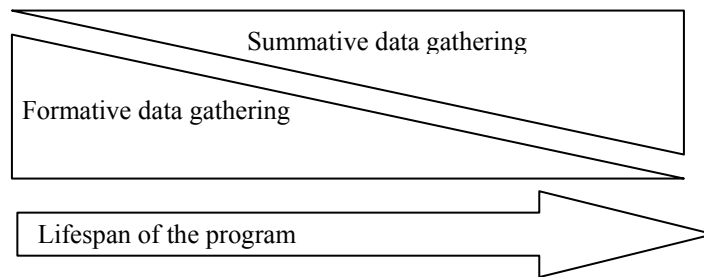


Figure 1  
Use of Evaluation Data During Program Lifespan

The developing field of evaluation has produced a wide variety of models and philosophies since the 1960's. Many of the early leaders in the field developed methods that reflected their perception of how and why evaluations should be done. Some of the more widely known types of evaluation are Responsive evaluation as envisioned by Stake (Shadish, et al, 1991) Utilization Focused Evaluation by Patton (1986), the Context, Input, Process, and Product model of Stufflebeam (2000), and the goal-free type of evaluation championed by Scriven (Shadish, et al, 1991). The proposed study used aspects of each of these models as a guide, and drew specific tactics and strategies from a variety of evaluation resources.

Payne (1994) listed three functions of evaluation as “1) improvement of the program during the development phase,... 2) facilitation of rational comparison of competing programs, ...and 3) contribution to the general body of knowledge about effective program design” (p. 7-8). In contrast to this, Stufflebeam (2000) specified four types of evaluation to match the required function of the evaluation: Context, Input, Process and Product. Similar to this is the way that Gagne, Briggs and Wager (1992) oriented evaluation around the four types of decisions that will be made: planning, structuring, implementing, and recycling. This study attempted to address the improvement of the program during the development phase, which corresponds with the Process Evaluation of Stufflebeam and the Implementation Evaluation of Gagne, Briggs, & Wager (1992).

Setting the boundaries for an evaluation can be difficult. Sleezer et al. believed that performance must be analyzed and understood as an integrated whole, rather than discrete parts: “Many opportunities for performance improvement exist within the processes, accomplishments, and capacities of individuals, teams, and organization processes and accomplishments” (1999, p.126). Approaching an evaluation study with this mindset would be helpful, because it forces one to address the needs of all aspects of the system. This is particularly important in complex work environments because of the interaction among levels in the work environment:

Every organization system contains subsystems, and every organization exists within a larger environmental system. By applying the concept of nested systems, performance improvement professionals remain open to the possibility that problems and opportunities could be addressed by intervening within smaller or larger frames of reference ...p. 122. Sleezer, et al. 1999

One of the most appropriate evaluation models for addressing the question ‘What is going on here?’ is implementation evaluation. This type of evaluation “focuses on finding out if the program has all its parts, if the parts are functional, and if the program is operating as it’s supposed to be operating.” (Patton, 1986, p. 124). Other titles used for this type of evaluation are process evaluation (Worthen and Sanders,1987 ) and program monitoring (King,1987).

A hallmark of each of these types of evaluation is a complete description of the program. Payne believed that this documentation by description is “important so that 1) we can better understand and monitor the fidelity of implementation, and 2) there exists a basis for generating replications if the program proves valuable” (p. x). It seems likely that a number of programs that have received favorable evaluations may be succeeding not due to their inherent worth, but due to unknown adaptations made during the implementation. If such a program was implemented elsewhere as originally designed, it may fail due to the lack of knowledge of the previous adaptation. Without complete documentation, educators may be doomed to replicate the mistakes of others (King, 1987).

Before attempting an evaluation, a researcher should recognize the potential pitfalls of the evaluation setting. Patton (1986) identified two incipient models of evaluation: the pure pork barrel politics type, and the charity orientation. For pork barrel type evaluations the primary concern is to identify the most powerful constituent base and determine the political gain made by supporting or not supporting the program. A charity oriented evaluation uses the level of caring of the staff and the sincerity of funding agencies as the main criteria for evaluation (Patton, 1997).

Stufflebeam (2000) described the politically motivated type of evaluation in different terms: “Frequently, clients want a politically advantageous study performed, while the evaluator wants to conduct questions/methods-oriented studies that allow him or her to exploit the methodologies in which he or she is trained” (p. 81). Armed with the knowledge that an evaluation can be co-opted and used for a variety of purposes, the evaluator must determine exactly what type of evaluation will appropriately address the nature of the question.

Structuring an evaluation requires that the evaluator match the theoretical base with the research questions and the intended use of the evaluation. In this instance, a case study approach using mixed or multiple methods for data collection was planned. This design balanced the standardized findings of quantitative methods with the contextual and individual information of qualitative evidence (Stufflebeam, 2000 ).

The case study approach is a “focused, in-depth description, analysis, and synthesis of a particular program or other object” (Stufflebeam, 2000 p. 53). A case study approach looks beyond the stipulated objectives of the program so that it can reveal both the intended and unintended outcomes, beneficiaries, and processes, and assists in the triangulation of information. Qualitative inquiry is especially useful for studying program improvement, facilitating better implementation, and uncovering different effects on participants (Patton, 1986). Worthen and Sanders (1987) identified techniques that may be used for qualitative data analysis ranging from narrative description to quantifying text pieces such as sentences, phrases and themes.

The Stages of concern Questionnaire (Hall, George, and Rutherford, 1977 ) will be used to take a “snapshot” of the overall use of the program. The interviews, focus

groups, and observational data will be used to flush out the details of the program as it has developed, via the perspective of the intended users.

Since the intent of the study is the documentation and improvement of the program, utilization of the final product is a primary concern. Patton, a leader in utilization focused evaluation (Stufflebeam, 2000) regards use of the products of the evaluation as paramount:

“There is a common, underlying problem of information use in trying to get people to use seatbelts, stop smoking, exercise, eat properly, and pay attention to evaluation findings..., often the central problem is getting people to use information. (Patton, 1986, p. 13).

There is some debate regarding the merits of evaluation as research. Payne (1994) is of the opinion that evaluation is not research, but that there is value in the description of the program. Patton (1986) concurred with Stake’s (1981) opinion that research places more emphasis on the generalizability of findings, and evaluation places more emphasis on the specific aspects of a particular program. Regardless of the type of study, in any data collection effort the extent to which there is concern about utility, generalizability, scientific rigor, and relevance of the data to specific information users will vary. Each of these dimensions is a continuum . . . Both program evaluation and evaluation research are concerned with data accuracy, validity, and reliability. Patton, 1986, p. 15.

A properly designed evaluation can support the needs of both the practitioner who requires data to make informed programmatic decisions and the researcher who is interested in expanding the base of knowledge.

## CHAPTER 3

### METHODOLOGY

This study was an evaluation of the implementation of an E.P.S.S. for special education teachers. The conceptual framework of this study was constructed from three widely held beliefs regarding change in the workplace:

1. Change is not a single act, but is a process;
2. Implementation of an innovation nearly always leads to an adaptation or reinvention of the innovation; and
3. Adoption of the innovation ultimately rests in the hands of the individual.

The conceptual framework for this study can best be described as: What happens when special education teachers are required to adopt an E.P.S.S.? To properly address this question, data from two different time frames were acquired. The first type of data is that regarding all of the activities that precede the implementation effort. The second type of data is that which was generated during and after the implementation effort. Rogers (1995) identified these two activities of the adoption process for organizations as initiation and implementation.

As a multi-method study, this evaluation used both quantitative and qualitative methods. The Stages of Concern Questionnaire (SoCQ) was used to obtain quantitative data. The qualitative portion of the study was structured as a case study with multiple levels:

Case studies may be layered or nested. For example, in evaluation, a single program may be a case study. However, within that single-program case (N=1), one may do case studies of several participants. In such an approach, the analysis would begin with the individual case studies; then the cross-case pattern analysis of the individual cases might be part of the data for the program case study. Patton, 2001, p. 447.

The data gathering process for this study was divided into two phases. Phase I was dedicated to acquiring data that would frame the context of the adoption process. To accomplish this, 3 types of data gathering techniques were to be used:

1. Identification of documents describing the initiation process of the organization
2. Interviews with district staff who work with the program
3. A survey using the Stages of Concern Questionnaire (Hall, George, and Rutherford, 1977)

Review of the documentation of the program prior to its implementation and the district staff interviews would have assisted in the accurate identification of the type of organization innovation decision, i.e. an optional innovation decision, a collective innovation decision, an authority innovation decision, or a contingent innovation decision, as described by Rogers (1995). Unfortunately no documentation was available on this process. Information on the innovation decision was obtained through the interviews with the teachers, staff, and administrators.

The Stages of Concern Questionnaire was intended to give a one-time picture- a snapshot, if you will- of the current feelings of the special education teachers from across the district. The survey also served as a recruitment tool for the second phase of the study. A form asking for volunteers for the second phase was appended to the survey.

The second phase of the data gathering process was composed of interviews, observations, and a focus group at school sites. In addition to the special education teachers, school support staff, and the Assistant Principal, a district Staffing Specialist and the Director of Special Education were asked to participate in the study. These methods align well with King's (1987) recommendations for data collection.

### **Participants**

The primary participants for this study were the teachers who were required to use the software product. In addition to the teachers, other support and administrative personnel for the district and at specific schools were asked to participate. Each special education teacher in the district was provided a survey, either in a group meeting at the school in the case of the elementary and middle schools, or via the Assistant Principal at the high school. An addendum to the survey asked for volunteers who would like to participate in interviews, focus group, and observations as part of Phase II of the study.

Volunteers were to be selected for inclusion in the second phase based on a rubric using the following considerations:

- High proportion of a work group (e.g. 6 of 7 special education teachers at one school);
- Variability of responses to survey (e.g. individual teachers at the same site having distinctly different high stage scores);
- Ability of support and administrative staff to participate; and
- Depth of information from fewer sites is favored over breadth of information from many sites.

One site fit three of the four considerations well. Four teachers had volunteered, as well as the school support person for Dynamo and the Assistant Principal. This site provided the most complete work group at a single site. A second site was chosen because it offered the opportunity to study a second work environment with different work processes.

The actual selection process for Phase II proceeded as follows. After the questionnaires were distributed and returned, a list of the volunteers grouped by school was made. The school with the most volunteers (5) was contacted to see if the support person and a representative of the administrative staff would participate. The Assistant Principal agreed to participate, and gave contact information for the support person. She also agreed to participate.

### **Instruments**

One instrument was used during Phase I of the study. The Hall, George, & Rutherford (1977) Stages of Concern Questionnaire was distributed to each Special Education teacher in the school district as noted before. This survey was developed specifically for studying the concerns of teachers who are adopting some kind of innovation. The survey was originally developed using public school teachers and college faculty who were adopting curriculum innovations. Considerable effort was expended to develop an accurate instrument, with multiple revisions producing an instrument with 35 items covering 7 stages. Coefficients of Internal Reliability (N=830) were calculated, and ranged from a low of .64 for Stage '0' and a high of .83 for Stage 2. Test-retest

correlations were also performed (N=132), and resulted in Pearson-r correlations ranging from .65 for Stage '0' to .86 for Stage 1 (Hall, George, & Rutherford, 1977).

Shotsberger and Crawford (1996) conducted an analysis of two modified versions of the SoCQ. Attempts to reformulate the survey using 5 stages and 15 items did not improve on the reliability or validity of the original instrument, and as there appears to be no apparent benefit from using the modified SoCQ instrument, the original version developed by Hall, George, & Rutherford was used.

Scoring of the survey may be accomplished using one of three methods: Peak Stage Score Interpretation, First and Second High Stage Score Interpretation, and Profile Interpretation. Each of these methods may be used for either individual or group data (Hall, George, & Rutherford, 1977). For this study, the Peak Stage Score and Second High Stage Score method were used. Results of the survey were reported in descriptive statistics. The statistics were used to describe in general terms the concerns of the special education teachers throughout district.

### **The Interview Process**

An interview guide was used for each interview. The interview guide method was chosen because it outlines the general questions and issues that are to be discussed, but also allows for flexibility in the sequencing of questions and further probing for information (Patton, 2002 ). This method provides a pragmatic approach to balancing the need for information as it is structured and expressed by the participant, and the need for relevant data that can be coded and compared. Patton (2002) believed that “the purpose of qualitative interviewing is to capture how those being interviewed view their world, to learn *their* terminology, and judgments, and to capture the complexities of *their* individual perceptions and experiences.” (p. 348). Audiotapes were made of the interviews, and were transcribed at a later time.

### **Observations**

Observation of the teachers focused explicitly on the use of the software. Notes were taken throughout the session for documentation. The participants were asked to perform functions using the software. The specific functions that were performed had been identified from previous responses on the survey and from interview data. Participants were asked to demonstrate basic skills, to describe and demonstrate

problematic functions, and to describe and demonstrate helpful or particularly useful functions. Each participant was reminded that their performance would not be ‘judged’ for advancement or other personnel issues, but would be analyzed to determine if there were effective and efficient performance improvement modifications that could be made.

**Focus Group**

The Focus Group served as a third opportunity for data gathering- this time in a social context. The Focus Group Interview also served as part of the process for eliciting performance improvement tactics or strategies from the participants themselves. As the daily users of the software, the teachers had solved many of the implementation issues on their own.

Table 1  
Timeline of Participant Selection and Data Gathering

Beginning		End	
Evaluation Activity			
Documents	xx		
Survey	xxxxxx		
Scoring		xxxxxxxx	
Site ID		xxxxxxx	
Interviews	xxx(District Staff & Support)xx		xx(Teachers, Admin & Staff)xx
Observations			xxxxxxx
Focus Group			xxxxxxx

**Data Preparation and Analysis**

The SoCQ and the case study data required different methods of analysis. For the SoCQ, the Peak Score method and Second High Stage Score (Hall, George, & Rutherford, 1977) were used to score the survey, and results were reported in descriptive

statistics. The statistics were used to describe, in general terms, the concerns of the special education teachers in the district.

The case study data was transcribed by a professional transcriptionist as part of the data preparation. A read-through of the transcriptions while listening to the audiotapes was done by the researcher to assure accurate transcription. The general field notes and memos made during the interviews, observations, and focus groups informed the coding and analysis process, but were not used as data.

The iterative, emergent nature of qualitative work is well documented in the literature (Patton, 2002; Worthen and Sanders, 1987; Guba and Lincoln, 1985). Early analysis allows the researcher to clarify concepts with the participants, and direct or redirect the investigation to new avenues. In referring to the early and continuous analysis of data, Worthen and Sanders (1987) stated “this continuous data analysis encourages the evaluator to draw tentative conclusions that can then be checked. Evidence supporting conclusions or validating facts can be gathered for use when reports are written” (p. 330).

#### Coding

Coding is one method of aggregating data for analysis. Codes are labels that have been assigned to specific chunks of information, and vary from descriptive codes that require little interpretation to interpretive codes that require more interpretation (Miles and Huberman, 1994).

Initial codes were developed using constructs based on the review of literature. The first transcript was coded ‘on the fly’, using low inference codes such as ‘time’ and ‘paper’. After finishing the first transcript, the codes were reviewed, and new codes were added to discriminate more clearly between related concepts. For example the code ‘time’ was split into time savings, and time trade-off. The first transcript was reread, and the coded sections were updated to reflect the refined codes. This did not entail a vast amount of work; most of the coded sections needed only a refinement of the original code to a more select code as in the case of time to time savings.

After finishing the coding of the second transcript, the code list was reviewed to determine if more codes were needed, and to determine if a relationship structure was emerging. Up to this point all coding was done by hand, on the hard copies. Although these early coding sessions could have been done while using the NUDIST software, they

were done by hand for two reasons. The first reason is that the researcher was comfortable with hand-coding, having developed a method on a previous research project. The second reason was that the researcher was unfamiliar with the NUDIST software, and was concerned with how difficult it would be to recode text sections once they were initially coded.

A tentative relationship structure to the codes was beginning to emerge at this point. Forays in to the NUDIST software had produced a basic knowledge of how the software used a tree structure to organize code groups. The basic relationship among some of the codes was established, which led to a simple pattern for organizing the rest. These could be described as ‘related areas’, and were grouped under the headings of Work, Social/Individual, Technical, History, Outcomes, and Performance Improvement.

The coding of the third transcript was the test of the code groups, and it went very well. Having code groups made the coding much quicker, because as a section of text was read, it was fairly easy to determine which code group it should go in, and after a quick glance at the specific codes under each group, a code would be assigned. The remainder of the transcripts were coded by hand on hard copy using this technique.

Some general information regarding how the NUDIST software supported the coding process and the rest of the analysis is in order. It was obvious from the start that the developers of the software were “dyed in the wool” qualitative researchers. If there was a basic task that needed to be done, it was often accomplished with just a few clicks of the mouse on the computer. For example, if one wanted to view all the text from all of the interviews coded as ‘computer literacy’, one only had to select the ‘node’ where all of this information was kept, and click on the browse button. A document window would open, showing all of the collated text grouped by source with a reference. If you were unsure that a certain text unit had been coded properly, and wanted to see it in the original context, all you had to do was click the “jump to source” button on a selection palette, and the original document would open in a separate window. If one was still unsure of the coding, the “reveal coding” button could be selected, and all codes for that text would be displayed.

## Testing Findings

The use of qualitative data and analysis requires the researcher to use inductive reasoning. Krathwohl (1993) defined analytic induction as “finding commonalities in the data leading first to a description and then to an explanation of the regularity.” (p. 324). Although this method has had its detractors in the past, many strategies have been developed to support the findings of inductive analysis.

## Triangulation

Miles and Huberman (1994) and Krathwohl (1993) cited three types of triangulation identified by Denzin (1978): 1) data triangulation, 2) investigator triangulation, and 3) method triangulation. For this study both data triangulation and method triangulation were used. Data triangulation was structured into the study by comparing an individual's responses from the survey, interviews, observations, and focus group. Data from each of these activities was analyzed using the constant comparison method proffered by Krathwohl (1993). As each new piece of information is obtained, it is coded and compared to similar data. This continuous comparison leads to reorganization of some information, with new insights noted and checked along the way. The structure of the study also supported method triangulation. Three discrete methods - survey, interview, and observation,- provided the participants with a number of instances and formats for responding.

## Researcher Effects

Miles and Huberman (1994) specified two potential sources of researcher bias: a) how the researcher effects the case, and b) how the case effects the researcher. To guard against researcher effects on the site, three of Miles and Huberman's tactics were to be used:

1. Staying on-site as long as possible;
2. using unobtrusive measures when possible; and
3. Making sure the researcher intentions are unequivocal.

The configuration of Dynamo did not allow for unobtrusive measures to be taken.

Therefore only measures one and three were used.

To guard against case effects on the researcher, 4 of Miles and Huberman's tactics were used:

1. Include dissidents, cranks, marginals;
2. Avoid elite bias by using participants from many levels in the organization;
3. Triangulate by using several data collection methods; and
4. Show field notes to a colleague for a check.

A colleague checked the field notes and coding scheme for accuracy, and found them to be consistent and representative for this setting.

Despite the best attempts of the researcher, there were some dissident users who did not volunteer for the second phase of the study. Elite bias was countered by including respondents from each level in the special education area: teachers, a school support person, an Assistant Principal, a district Staffing Specialist, and the Director of Special Education.

#### Outliers, Extreme Cases and Negative Evidence

As part of the sampling rubric noted before, outliers and extreme cases were sought for inclusion in the study. These instances, particularly in the context of a case study, helped to convey the range and intensity of the participants' experiences. Miles and Huberman (1994) describe negative evidence as "a more extreme version of looking for outliers and for rival explanations; you are actively seeking *disconfirmation* of what you think is true" (p. 271). They also warn that it can be problematic if the original hypothesis is discarded or revised too early.

#### **Summary**

The methods for this study were chosen for their appropriateness to the type of research questions being asked. As an implementation evaluation both quantitative and qualitative data were used to determine the nature of the adoption process within an organization. The survey contributed data regarding the general feelings of the respondents toward the adopted software. The interviews, observations, and focus groups generated data that described in the participants own words and actions the process of adoption in the organization. The combination of these methods supported data and method triangulation which bolstered the strength of the study.

## CHAPTER 4

### RESULTS

This chapter reports the study findings in four sections: 1) The District Review, 2) Questionnaire Results, 3) Teacher Cases, and 4) Specific Research Questions. The overarching question for the study was “what actually occurs within a work site during the implementation of an electronic performance support system?”. The district case and questionnaire results provide a picture of the general context of the district and the concerns of the special education teachers throughout the district. The teacher cases provide specific information on the positive and negative aspects of the implementation for individuals. The specific research questions address the issues regarding changes in the work and work relationships, E.P.S.S. flexibility, and E.P.S.S. performance improvement.

#### **The District Review**

The school district chosen for this study is located in a small rural county in north Florida. Comprised of three elementary schools, two middle schools and one high school, there was a total enrollment of 4,661 students for Fall 2002 (Statistical Brief Membership, January 2003). The majority of the student population is white non-Hispanic (85%), with black non-Hispanic students (12%) being the largest minority group (Statistical Brief Membership, January 2003).

The full-time instructional staff for the district is 281 teachers. Their representation by race is similar to the student body, with 90% of the teachers being white and 8% of the teachers being black. As with the student population, a small number of teachers from other racial groups make up the balance of the instructional staff.

A visitor to the district would come away with a very positive impression of the facilities of the schools. Only the high school is more than 10 years old. This is, however, a recent change of events. The county has a very small tax base, and previously had

significant problems with its old school facilities. Using a state funded grant program the district was able to begin a building campaign to replace the old schools and create new schools.

### **Survey Results**

The Stages of Concern Questionnaire was developed to gather information on the concerns that teachers have in their use of innovations. The results of the questionnaire identify the concerns of the teacher by placing them in one (or more) of seven stages. The seven stages as described by Hall, George & Rutherford (1977, p. 7) are:

- 0 - Awareness: little concern or involvement with the innovation.
- 1 - Informational: a general awareness and interest in learning more about the innovation.
- 2 - Personal: uncertainty about the demands of the innovation and his/her ability to meet those demands.
- 3 - Management: feelings are focused on the processes and tasks of using the innovation, and best use of information and resources.
- 4 - Consequence: attention is on the impact of the innovation on his or her students.
- 5 - Collaboration: concerns are focused on coordination and cooperation with others regarding the use of the innovation.
- 6 - Refocusing: feelings revolve around exploration of more global benefits from use of innovation including major changes and/or replacement with an alternative.

The Stages of Concern Questionnaire was distributed to the teachers in one of two fashions. At the elementary and middle schools the questionnaire was distributed in person by the researcher at a group meeting. After a brief introduction the questionnaire was given to each teacher; upon completion it was returned directly to the researcher. The questionnaires for the high school teachers were left with an Assistant Principal who distributed them to the teachers and collected them after they were completed. Across the district a total of 40 questionnaires were distributed, with 35 returned. Two returned questionnaires were incomplete, and were not used. The return rate of usable questionnaires was therefore .825.

The peak stage score method was used for analysis. This method is very straight forward: each stage is represented by a scale which includes five statements. A raw score

for each scale is produced by summing the responses to the five statements. This was done using a Microsoft Excel spreadsheet. From the raw score a percentile score was calculated using the Raw Score-Percentile Conversion Chart developed by Hall, George & Rutherford (1977).

The results of the questionnaire were at first disconcerting. The large number of teachers who scored highest on Stage 0 (20) was not expected, since the innovation had been in use for a number of years. It was expected that more teachers would score in the range of Stages 3, 4, or 5. This expectation was based on the idea that teachers with experience using the tool would be more focused on the management, consequences, and collaboration aspects of using the tool than the awareness aspect, and on the results of the original investigators who developed the questionnaire (Hall, George & Rutherford, 1977). Three dual high scores were recorded: one for Stage 0/Stage 2; one for Stage 0/Stage 6, and one for Stage 2/Stage 5. These scores were included in the tallies for both Stages. Please see Table 2 below for complete results on the teachers' scores.

Table 2  
Frequency of Highest Concerns Stage  
For Individuals

Stage	0	1	2	3	4	5	6
Number of Individuals	20	1	6	5	0	1	1

The developers of the questionnaire were aware of the dual nature of Stage 0 scores, which could be interpreted quite differently depending on if the respondent was a user or nonuser. Their method for properly interpreting user Stage 0 scores:

In general, Stage 0 scores for users are low, in the 10<sup>th</sup>, 20<sup>th</sup>, and 30<sup>th</sup> percentile range, while Stages 3 through 6 concerns will be relatively high. However, the Stage 0 score for established users who are no longer particularly concerned about the innovation begins to climb...Experienced users tend to have many other things on their minds outside of the innovation that concern them more, and their Stage 0 score reflects this fact by being up in the 60<sup>th</sup>, 70<sup>th</sup>, and perhaps even 80<sup>th</sup> percentiles.

This clarified much of the confusion regarding so many Stage 0 scores. The questionnaire was distributed near the end of the school year, and there were undoubtedly many other things on the minds of the teachers. There was a second point to ponder, however: what were the second highest stage scores for these Stage 0 users? This question is in line with the developers recommendations for analyzing the second high stage for further insight into the individuals’ responses. The data from this analysis is presented in Table 3 below.

Table 3  
Frequency of Second Highest Stage Score  
For Stage 0 Respondents

Stage	0	1	2	3	4	5	6
Number of Individuals	N/A	1	12	4	0	0	1

This analysis revealed a distinct grouping of scores at Stage 2. Once again the description of Stage 2: Personal: uncertainty about the demands of the innovation, and his or her ability to meet those demands; also includes concerns about his/her role in decision making, consideration of potential conflicts, and reward structure. After this analysis one could tentatively suggest that over half of the teachers, despite having many other things on their minds, are still concerned with some basic issues regarding the use of Dynamo. Only one is contemplating the issues of consequence, collaboration, or refocusing. To gain better insight into the actual use of Dynamo, let us turn to data from the second phase of the study.

**Teacher Cases**

The following five teacher cases were derived from interviews and observations of the individuals. Each case includes background information, the respondents self-rating of use and questionnaire Peak Stage Score, positive and negative comments regarding use of the Dynamo product, and specific issues for that individual.

**Susan’s Case**

Susan came to the county at about the same time as Dynamo was first introduced to the district. She has 6.5 years teaching experience, and her degree is in Vision

Impairment. Since completing her bachelor's degree she has gone on to obtain a certificate in Varying Exceptionalities (V.E.).

Susan's results on the survey identified her as being in Stage 2. In this stage the respondent is focused on personal issues. This stage is exemplified by feelings regarding his or her adequacy or inadequacy in using the tool, and his or her role in relation to rewards, decision making and potential conflicts within the organization (Hall & Rutherford, 1977). This assessment is corroborated by some of Susan's comments regarding the day-to-day mechanics of using the tool such as printing and entering individualized goals and objectives into the database. This may seem to be somewhat out of line with her self-assessment of her ability (8 on a scale of 10). It should be noted, however, that despite her concerns, she is more than capable in her ability to use the software to produce I.E.P.'s, and is willing to offer assistance when she can.

Susan had no experience with electronic I.E.P.'s prior to coming to the district. Her experience with standard paper-based I.E.P.'s began in Pensacola, where a district staff person coordinated the I.E.P. process. According to Susan the staff person "actually did the informational pages and then we brought our own goal pages.... She was in charge of the whole I.E.P....she ran the meetings and did everything like that."

Susan attended training on Dynamo when she first came to the district. She remembered the training as taking one or two days, with two people assigned to a computer to do hands-on work. Since her training she has sought and received assistance from the developers, and from her school support person.

Susan's positive comments on Dynamo focus on the issues of student information being maintained from year to year, and the professional look of the hardcopy output. The maintenance of student information is key for her, because "you're not having to redo information every year. Once it gets in there, you have it." Considering the amount of handwriting required to produce a paper-only I.E.P., this makes sense. When comparing the old handwritten copy to the Dynamo output, Susan commented "I think it looks much more professional and...looks really neat and it's a nice thing for the parents to have". She also appreciates the navigational aids that assist in moving through the student records and the built-in information such as district data and goals and objectives.

Dynamo does have some faults in Susan's opinion. The three-year reevaluation date routine is not as easy to update as it could be:

You can't just click on the date to change the year re-eval date. I guess they're doing that as a safeguard, but we as the teachers, we're the ones that have to go back and fix [it]. You know what I'm saying? I see how it's a safeguard and they're probably like 'well three year re-eval's really important if the date is right'. But we're the only ones that are going to change that anyway.

Another item that Susan wishes was different is the option for inputting user-defined goals and objectives. She understands that she could cut and paste from one student to another but she would like to have her custom goals and objectives available through the pull-down menus:

I wish there was some way that you could put your own goals in there, and then if it does apply to that student, you could go back and just click, like the school click thing [a drop-down menu] where you can click and put it in there. {Much later in the interview} I want it to be able to pop up the screen that shows me the different things I did for little Joe that might closely relate to what I'm going to do for little Suzy.

Thankfully this crucial feature is available, and is known by some but not all of the teachers. This issue was resolved, and the technique for doing it was presented by Janet at the Focus group meeting. Additional information on this issue will be presented in a later section.

Three issues came up regarding the Dynamo training Susan attended. These issues were the capacity to take in new information, not knowing enough to ask the proper question, and problems making the transition to the classroom. Susan recounted the training session:

I think we had a little group and there was one computer for two people. We were able to click around, but you do not really even know what to ask... you do not know what you are looking for until you get out there.

Susan noted a feeling of being overwhelmed by the program at first, and when asked about the pitfalls of learning an entirely new process, she replied, “a lot of the stuff, you just can't take it all in, in a half day training or whatever”.

The transition to the classroom was problematic due to the fact that the computers they were using did not have enough memory. As with educational institutions of all levels, the cycle of hardware replacement and software revisions seldom coincide. The new software, running on old hardware, caused significant problems:

When we got back to our classroom computers, they just couldn't handle the whatever, the print memory or whatever the thing is to keep it. And I'm telling you, every time it was trying to keep on, the whole computer would go blue screen and say error.

Overall, Susan appreciates having the software, and is positive about using it. If only those reevaluation dates were easier to modify.

#### Janet's Case

Janet's case reflects a number of issues involved in the implementation of an E.P.S.S.. As a teacher with over 28 years of experience, she has watched the I.E.P. process change significantly over the years.

After receiving her bachelor's degree in special education with a certification in learning disabilities and mental retardation, she came to work in the district. She has witnessed the I.E.P. develop from a standard form filled out by hand to the current Dynamo generated I.E.P..

When we first started it was like a piece of paper like this, it was a form on a piece of regular paper, which you filled out and they copied that and then it went to triplicate paper, pink, yellow, golden rod kind of thing and they were still like forms that basically were hand written, everything was filled in by hand.

Janet's experience with Dynamo began when the program was first adopted by the district, approximately five years ago. She attended training when the software was first adopted. Janet's results on the Stages of Concern (SOC) survey identified her as being in Stage O. This stage is exemplified by a low level of concern for the innovation

(Hall & Rutherford, 1977). This result is understandable in her case because she has worked with the innovation for a number of years.

Her low level of concern is reflected in her rating of her own use of Dynamo. She currently rates herself as a '9' on a 1-10 scale, 10 being the ultimate user. She explained that she did not give herself a '10' because she does not know how to transfer files to another teacher. Part of her ability she attributes to her general computer literacy and she describes herself as feeling "I felt comfortable enough; I knew I was pretty computer literate. . . there were some people that I know that were not computer literate and did have more trouble with it".

Another reason Janet gives for her ability with the program is her comfort with just jumping in to a program to see what it can do:

It is like I tell people, do not practice word processing by writing your masters thesis and then go back and try to edit. . . I made imaginary students and went and looked at all the forms that would go with them and that kind of thing.

Janet's positive feelings regarding Dynamo cluster around a few features of the software, specifically that student files are easily sorted, all forms are readily available, student data is conserved, and that the data can be modified and updated easily:

the stuff that is always there and stuff that you need to modify every year is modifiable, I mean it is not you know, you do not have to go in every year and put the child's name... you can transfer information from disc to disc... all that basic demographic and special information is always there and yet the stuff that you need to change can be modified....

She also appreciates that there are many options for editing information, and that the software can be run off of a zip drive for portability.

Janet's ability and desire to launch herself in to learning a piece of software is in contrast to the fear that some teachers feel when working with technology:

They are afraid to break it or do some permanent damage that they cannot undue... Make up an imaginary kid, John Jones, Mary Smith, go in and put stuff in, you can always delete their record and then play around with it. That is what you play around with not your actual class list.

One of the main goals of the use of electronic I.E.P.'s is the reduction of paperwork. It is easy to understand this focus when you read some of Janet's comments:

Now, over the years they keep saying how paperwork is going to get easier, we are going to take it away, but it has not, it's a big lie. Every year it is more paperwork. Paperwork verifying that you did paperwork. [The] paperwork load has greatly increased.

For Janet the issue of paperwork became more than just a time or resources conflict, it led to a physical impairment:

At one point for a long period of time they [the I.E.P.'s] were done in September or by the end of September, . . . and I actually developed arthritis in my right hand. I would go to the doctor every September and they looked after a couple years and they said 'you know you come in every September with this, what is the problem?'. I said 'well it's pressing through three layers of carbon paper'. He said it was directly related, he knows the pattern, I did not even think about it, but at the end of every September, he looked back and he said 'do you realize you come in every fall about this time with your hands swollen up'.

It is easy to see how this could occur. For a given student an I.E.P. would entail a minimum of a demographics page, two pages of goals and objectives, and an accommodations and modifications page. When you factor that number of pages by the number of students, and the use of NCR type paper, it becomes obvious that the paperwork can be more than just annoying. It is even more disheartening to realize that none of that effort is instructional in nature; the I.E.P. guides the instructional process, but is not instruction in and of itself.

The incorporation of Dynamo into the work environment has made some changes in the way teachers communicate with one another. Janet appreciates that she can provide other teachers with a portion of the I.E.P. that lists accommodations and modifications appropriate for a particular student. Janet's method is to provide the teachers with the document pages, and then "I go back and remind them occasionally, but it also makes it more like this is a contractual thing, you need to be doing it".

With most forms of software there are usually initial problems that must be worked out, and ongoing issues that develop as the tool is revised and updated. While on the whole Janet is a wholehearted supporter of the use of Dynamo, there are some problems still to be dealt with. One problem is with the type of font used for the interface. At the normal (100% magnification) size Janet has problems with discerning between the letter 's' and the letter 'a'. Normally a user would just increase the magnification to work, however due to the density of information on the I.E.P. forms this would require scrolling back and forth across and up and down the page on the screen. This, however, cannot be construed to be a problem with the teacher, the software, or the hardware, but the relationship of all three. Janet also had problems with some data entry. In the parent information section, the field for inputting parent phone numbers was not functional, nor were some of the selection boxes on certain other forms.

One form of improvement Janet would like to see in the tool is the use of a server for storing information:

I think it would be nice, school wise, not so much Dynamo wise, that if this information could be put on a server somewhere in the school, so that all the teachers could access it and not have to pass this back and forth, for instance, you know all of our basic student information could be in a program on a server somewhere.

Overall Janet found the program a time saver, and a very functional tool.

#### Linda's Case

Linda is a new teacher in the school system, having completed her first year teaching at the time of the interview. She has a B.S. in Communication Disorders and an M.S. in Speech Language Pathology from FSU. Prior to working with Dynamo in this county, she did have some minimal experience working with an electronic I.E.P. program in her internship.

Linda's results on the survey identified her as having two peak stages of 0 and 6. Her low level of concern for the innovation (0 stage) is balanced by her refocusing (stage 6) on other more universal benefits of the innovation and consideration of major changes or replacement of the innovation (Hall, Rutherford, & George, 1977).

Linda's self-assessment of her ability to use the software, was a 7 on a scale of 10. She feels comfortable using the tool, but also recognizes that there is much she could learn about the more advanced uses of Dynamo. Time to explore the tool is one factor she noted.

As described before, Linda had some prior experience with an electronic I.E.P. program. She believes the program may have been Dynamo, but she is not certain. This experience may have made the learning process easier for her, but it was not a comprehensive introduction:

the speech therapist I worked under kind of went in, got me the form I needed and then I filled it out, so I didn't really know how to go into the program, move around. I didn't have to navigate much, so really came into this fresh, I would say, with not a lot of knowledge.

Before beginning the school year Linda attended a day-long training on the Dynamo product. After the training she felt "relatively comfortable" using Dynamo. She stated that after the training she still had questions regarding some aspects of the program, but that between the school front office and access to the developers via the 1-800 number, she was able to figure things out.

Many of Linda's positive feelings toward the software center around time savings, the built-in goals and objectives, and the ease of use. Although Linda does feel that the process is time consuming even with the use of the software, without it would be even worse. Thinking back to the I.E.P.'s she had written just a short time before, she remarked that "if I had to handwrite all of those, there's no way I'd be done right now". She finds the goals and objectives menus a great help:

It has goals already printed into it, like a glossary so to speak, of objectives that you could go through and cut and paste. . . so it makes that easy. A lot easier. With this program, it's just easy to get in there, you enter the student, and then it goes through the pages. It's basically very self-explanatory for the most part of what information you need, and you just go through and enter it in.

For Linda, the positive is balanced by the one difficulty she noted in using the software. When originally presented the question 'what is the worst thing about

Dynamo’, she replied “I guess because I haven't had a lot of trouble with it, I really don't have a worst thing”. At a later point in the interview, she did identify one problem area: “I guess that could be my fill in the blank on the bad thing about, is just you have to know where everything is located in order to get to it”.

As a first year user Linda has a fresh perspective of the new user. For her, the first year was mainly meeting the necessities of the job:

I'll be honest with you, for the first year, or this past year being my first year, I haven't had the time to go in and find out exactly what it could do for me. I've basically done what I've needed to get by and get the job accomplished.

The ‘time issue’ she mentions may be related to another issue that she raised regarding learning the software: knowing where to find things. Most software users can empathize with this statement. Even with an excellent help or tutorial system, users often find themselves stumped by their limited knowledge: how can you look for something if you don't know what it is called, or where it might be addressed in the help sections? Despite this problem, Linda looks forward to exploring the software when she has time:

I'm hoping this summer to kind of do some more of that. I've got a little more time to sit down, look at the program and see what it can do for me. Because I know it can do more than I know I'm using it for.

Overall, Linda finds the tool to be very useful. When asked if she thought the Dynamo product was a good investment of her time and energy, she replied “I think so. I don't have anything to compare it to, but I think so at this point.”

#### Wendy's Case

At the time of the interview, Wendy had just finished her second year of teaching in the district. Her degree is in special education. Wendy had previously taught in Alabama, and the population of students she worked with changed from students with physical handicaps to students with behavioral problems when she came to Florida. In Alabama Wendy produced her I.E.P.'s in the traditional hand-written format. She had received some training in an E.I.E.P. program that had been developed in-house for the district. The program was run as a stand-alone application on the teachers computers, but the district was hoping to eventually run it from a central server.

Wendy's results on the questionnaire give her a two-peak Stage score of 0 and 2. In Stage 0 the respondent has a low level of concern about the innovation. In Stage 2 the respondent has personal concerns regarding the demands of the innovation and his or her ability to meet those demands. This two peak score is similar to many others in the district who had a peak stage score of 0 with a second-highest peak Stage of 2. Her interview data did relate more to issues of the basic use of the tool, which is in line with her own self-assessment of Dynamo use being a 7 on a scale of 10. It is interesting to note that late in the interview, after discussing various problems with the use of the software, Wendy commented that "maybe I need to change my number", indicating that perhaps she would like to revise her self-assessment down some.

Wendy received training in Dynamo her first year. The training lasted one day, but as she remembers it, it was not as hands-on oriented as other respondents had found. She says the trainers would ask if there were any questions, but that until you had a chance to really get in to the program you don't know enough to ask a question. When asked about her comfort level in using the software at first, she replied: "you do not have the questions until you actually work with it and everything, and plus it was such a new thing to me, I was not very comfortable with it when I first started."

The positive aspects of the program for Wendy are that it is much faster typing I.E.P.'s with the program as opposed to hand writing them, it is easy to change information, and generally is a more efficient use of time. She notes this efficiency in relation to parent meetings where the I.E.P. is reviewed:

I normally have it set up on the lap top when the people come in for the meetings and I already have a printed out copy. So if there are any changes that they want to make I can just go right into the program and change them and print them out a new copy.

Other aspects of the program that she appreciates are the zip drive portability, and that the software maintains the data for easy access at any time, eliminating the need to sort through stacks of papers.

The less positive aspects of the program for Wendy are the inconsistent structure of some of the interface screens, printing problems, and the difficulty in finding some of the forms commonly used by the teachers. While the I.E.P. itself is the most important

and utilized form in the software, all of the other forms such as the Parent Invitation Participation form that are part of the I.E.P. process are available on Dynamo. The only problem is finding them when it is referred to by another name: “I have looked for forms before and it has been like no, it is called some long name; ok then why doesn't anybody call it that long name here?” An example of this is the previously mentioned Parent Invitation Participation form, which is commonly known in the schools as the P.P.O.

When asked about her work on Dynamo in conjunction with other teachers, Wendy’s responses reflected that much of the discussion centered around the functions of the software, and not on student issues: “when we discuss things, it is how do you do this, how do you get to this page...different things like that, it is actually about the program....” Helping each other with the use of Dynamo is a common event for the teachers. A portion of the interview transcript describes a process familiar to most software users:

Wendy: When I went to write my first I.E.P.s, I was running around looking for teachers...’what do I do here?’.

Interviewer: Sometimes if you needed assistance you would walk around and grab somebody and say come and help me with this....

Wendy: Exactly. Most of the ESE teachers are really good about [that], especially when you are just learning, to come in and say no do it this way, this way. And Mrs. [omitted] and I, the lady you will be interviewing next, we work real close together so we try to do our I.E.P.s on the same day, so if she forgets something or if I forget something we are both there so that we can help each other out...

Wendy did have one recommendation to improve the use of Dynamo. She feels that the training would be better if it were more hands-on, with the instructor leading the teachers through the various portions of the I.E.P., entering data and accessing various forms. It is interesting to note that an email from the developer also recommended this type of training format. It is possible that for any given training session there are many issues that could impact the actual training environment, as contrasted with the recommended environment such as availability of an appropriate room, availability of suitable computers, time allowed for training, and variance in the teachers’ prior knowledge of computers.

In summing up her feelings on using the software, Wendy's remarks were positive:

I feel like it is worth my time, like I said because everything is there, it is consolidated, and then if Ms. [omitted], who is over the special education, if she needs to look at it, she does not have to go stumbling through the files. She can just say 'Wendy, I need your disc', I do not have to go fumbling through the files looking for everything, for the I.E.P. I mean it saves a lot of time and I think that it is a good program for using.

Especially coming from what I did come from.

#### Renee's Case

Renee's case data is slightly different from the other teachers because the interview guide for staff and support personnel was used for her interview. Renee has two roles in her work with Dynamo, first as a teacher, and second as the technical support person for Dynamo at the school. She has been teaching for sixteen years, having earned a bachelor's degree in elementary education with an emphasis in special education. In addition to her experience as a teacher in formal education, she has worked in group homes for children with special needs and with handicapped adults.

As the support person for Dynamo at the school, Renee has a broader perspective of the issues surrounding the use of the tool at the school level. This case will therefore present more information on school-wide issues as opposed to her personal issues with the tool.

Renee's responses to the survey placed her in Stage 0. For this stage there is a low level of concern about the innovation. This was the most interesting result of the survey for the respondents. One might assume that a support person would be at a different stage, perhaps at Stage 5: Collaboration, where concerns are highest regarding coordination and cooperation of the use of the tool. It may be that her low concerns regarding the use of the tool were more influenced by her long term use of the tool as a teacher rather than her role as a support person .

Renee's support duties came about as a result of her personal desire to learn more about software, and the departure of the former support person. She reflected that the added responsibilities were based more on need rather than desire:

She just asked me if I would take it over because I already know how to do it and she would not have to train someone. Basically because I wanted to know how to do it, I went and asked how to do it, got the information and figured out how to do it, I ended up having to do it. It is not because I am that wonderful in technology, it is just based on the fact that I understand the information and wanted to know about it.

Renee's comments on the good and bad aspects of Dynamo reflect her dual position as a user and support person. Some of the good aspects of the tool she feels are the editing features, how fast it is to write an I.E.P. with it, and that the structure and built-in components allow her to spend more time on what she considers to be the more important items. As Renee stated it, "I can fill in all of that monotonous [stuff] quick, I can get all of that done so I can spend most of my time on the goal page that needs to have the most time spent on it".

As the support person at the school, Renee's experience with the negative aspects of the program go beyond her own problems. For her personally she would like to see some of the drop down menus for dates corrected, and the addition of more editable drop-down menus. For the school as a whole (and potentially for the district), one of the main concerns is the use of zip discs for data storage and back-up.

Renee's position as a teacher and support person put her in a unique position: she is responsible for making back-ups and providing support, but she is not a supervisor. It's a tenuous position. For example, what can she do when a teacher leaves his or her data disc at home, and even upon further coaxing does not bring the disc in? Keeping up with the discs can be problematic for some teachers:

They cannot find it but they say it's at home...[but] if it was at home, the next day it would be here. Well four weeks later they say 'I really have not been able to find that disc'. That is what scares me, and I am not even in charge of it. What it all comes down to, it is not only my job, it's going to be theirs. If you do not want to get in trouble you better get your disc here. I am not covering your.... I do not say anything until they [administrators] ask, 'did you get everybody's disc?'. I am not going to tattle either.

As a support person, one of Renee's main tasks is helping other teachers use Dynamo. Renee described herself as feeling "fine" about helping others at first, despite being a little bit scared because she had to do the back-ups for everyone. "That is probably why I make so many back-ups" she said, "so in case I mess up trying to do that, [not] every bodies work [goes] down the drain". Since the school that Renee teaches at has all the teachers do their I.E.P.'s at the same time (close to the end or beginning of the term), Renee's ability to do her own work could be impacted by the needs of others: "I do not mind doing it, it is just hard to help them and teach at the same time".

As one can imagine, Renee's most prominent thoughts on the implementation and how it can be improved focused on running Dynamo from a central server, and training. Two of her training recommendations are that all training be 'hands-on' in a lab, and that somehow new and experienced users receive more focused information:

The only other thing I would tell them to do is that if you want to learn about Gibco, the new people, what ever, they need to have two sessions. One where you only go over the new stuff, and then have one like in the afternoon for the beginners.....or something like that. Or like I said, do it all for the new people because they need more time and they need to ask questions and they need someone who is an expert to be able to maneuver them through it. [Then]. . . highlight on a memo or on a little brochure of all the new parts of it.

Even in the midst of a chaotic end-of-the-school-year time, Renee was able to keep a sense of humor about it all. Her reply to the question "do you think it has changed how you work with some of the other teachers?" she replied "I run the other way because I do not want them to ask me..." followed by laughter.

### **Specific Research Questions**

The specific research questions were developed to investigate particular aspects of the adoption process. The questions that are addressed in this section are:

1. In what ways has the E.P.S.S. changed the work of the individual?
2. In what ways has the E.P.S.S. changed the group work?
3. In what ways has the work relationship between colleagues changed due to the E.P.S.S.?

4. As a whole, is the E.P.S.S. a help or a hindrance to the individual?
5. What could be done to make the E.P.S.S. a more useful tool for the user?
6. How can E.P.S.S. developers incorporate flexibility in to their tools?
7. What do teachers, staff, and administrators view is the return on investment for this program?
8. What performance improvement techniques are applicable to the use of E.P.S.S.'s?

These questions cover both the technical aspects of the adoption process and the social and personal impacts of the adoption.

*In what ways has the E.P.S.S. changed the work of the individual?*

The adoption of Dynamo has caused some changes in the teachers work. These changes are apparent in the amount of time teachers take to produce the I.E.P.'s, and a change in some teachers' affect by the expression of fear.

The literature on computerized I.E.P.'s identified time savings as one of the primary outcomes of the use of these tools (Kellog, 1984; Davis, 1985; Krivacska, 1987). Data from the interviews sometimes expressed a trade-off in time, since the time saved in writing the I.E.P. by hand each time was offset by the time required to enter data into the database, and the time required to learn how to use the tool. Statements supporting this finding are summarized in Table 4 below.

Table 4  
Summary of Time Savings and  
Time Trade-off by Respondent

Respondent	Time Savings	Time Trade-off
<b>Staff Specialist</b>		I think that if you can become [proficient], practice it, work with it enough, it can be a time saver..... and it is time consuming to learn, especially if your computer skills...
<b>Susan</b>	I do think it saves us time to have the information in there	you have to be able to get in there and explore it, and have the time to look through it

Table 4 - continued

<b>Respondent</b>	<b>Time Savings</b>	<b>Time Trade-off</b>
<b>Wendy</b>	It is quicker, definitely more efficient as far as time wise, in getting it done	
<b>Linda</b>	if I had to handwrite all of those, there's no way I'd be done right now.	I haven't have the time to go in and find out exactly what it could do for me.
<b>Renee</b>	Everything they have changed has improved the amount of time it takes,	

The first perception of time is in the form of learning time: that which is required to begin use of the tool. For Susan, this meant that she would like “to get in there and explore it, and have the time to look through it”. Renee speculated that there is a need for more time for new users of the software: “do it all for the new people because they need more time and they need to ask questions”. From the developers of Gibco: “Training days should be 8 full hours of training with AM and PM breaks and a lunch break. That gives plenty of time for the teachers to work hands on and get experience with Dynamo. As identified by the district specialist, “it is time consuming to learn, especially if your computer skills....” Preparing for a hand-off of job responsibilities, the Assistant Principal commented: “This is going to become her baby, so I have been spending a lot of time with her getting her trained on it.”

The second aspect of time is that there is a trade-off in regards to the time saved by using the software, and the amount required to learn and use the software. The district head of Special Education stated: “problems we have is just the actual inputting, the time to input, especially for teachers with high case load”. The district specialist feels she isn’t using the tool properly because “I do not have time to put in all that data”. One of the teachers feels that it is “still is time consuming even though you have a program like this”.

Another aspect of the time trade-off is the amount of time available to go beyond the basic skills to more efficient and productive use of the tool. For Linda, this meant: “I haven’t had the time to go in and find out exactly what it could do for me. I’ve basically done what I’ve needed to get by and get the job accomplished.” From the staffing

specialist: “But it's the update kind of thing. It is really hard to get, they have so many training's that will be in their own school, it is hard to find time to offer it...”

For those who are familiar with the daily work of teachers, time is a concern in many respects. As noted by Branson (1998), the Hero model of teaching and bad job design have placed a huge burden on teachers by requiring them to fulfill a broad range of duties with limited resources and time.

As the data analysis progressed the issue of time became an overarching theme. This is not surprising, given that the literature on change, diffusion of innovation, and electronic I.E.P.'s is full of information regarding time. In the context of the county's adoption and implementation of the Dynamo product, time was a factor in the thoughts of individuals at the instructional, support, and administrative levels. In some ways the competing needs of training, practice, and daily teaching tasks became a Catch-22.

One of the key pieces from the literature that addresses critical aspects of these time issues is Prochaska's (1994) transtheoretical approach. One of the fundamental issues for Prochaska is that change takes time, and for any personal change effort to be successful, it must be afforded this time. If all other time factors for the teachers (and staff) were held steady, and the time needs of users of Dynamo were compared with non-users, the time trade-off would be the difference between the time it takes to hand write the I.E.P.'s compared with the amount of time for training, inputting data, and time to print the I.E.P.'s.

*In what ways has the work relationship between colleagues changed due to the E.P.S.S.?  
In what ways has the E.P.S.S. changed the group work?*

At the outset of the study these two questions were posed separately. They were posed separately because the researcher believed that the question regarding the actual work would provide information on more of the technical aspects, while the question on the work relationship would provide information on the social interaction. During the analysis it became apparent that these two questions were so closely tied together that it would be difficult to answer them independently.

Based on the concepts of Socio-Technical systems, the question regarding the change in working relationships between colleagues due to the implementation of Dynamo was a key focus.

Table 5  
Work and Work Relationship  
Change Responses by Respondent

<i>Respondent</i>	<i>Relationship Change</i>	<i>No Change</i>	<i>Work change</i>
Janet	it also makes it more like this is a contractual thing, you need to be doing it (with reference to lawsuit)		just print a copy out and like here is the child in your class, this is what you need to do for this child
Assistant Principal	I think that it has made the teachers, they are more willing to help somebody that is not familiar with it,	Our teachers worked well together before we got Gibco	
Linda		I don't think that it's really changed.	
Renee		no, I mean it has not,	
Susan	I think we have had to, especially the first couple of years, we had to reach out to each other,		That is where the collaboration came in.... I was like didn't you say something about this red button, didn't they say to put it this way
Wendy	The lady you will be interviewing next, we work real close together so we try to do our I.E.P.s on the same day		the rest of the time it is just about how do you do this, where is this, which form do I use, what is it called,

Based on the information in the matrix, the answer to the question would be yes, in some situations. For three of the respondents (Wendy, Susan, Assistant Principal) there were changes due to technical questions about the software. For Lisa and Renee, there did not appear to be any real work relationship changes. For Janet, although some of the interactions did not change, the format of the document presented a more official, contractual image and may have more impact on other teachers who work with students who have I.E.P.s.

She relates a story about a regular education teacher who did not want to incorporate I.E.P. recommendations into his classwork:

they mentioned at the beginning of this year that a middle school teacher somewhere had been sued because he would not provide the accommodations in the child's I.E.P. in his social studies class or something, he said it was too much trouble. Well it cost him 15 thousand dollars...The regular ed teachers went 'OOOOOOhhh' and the ESE teachers were going 'yeah'. We are all going 'yes, yes, sue him again, make them pay attention, it's a law, a federal, civil rights law'. It will make the teachers much more amenable to that kind of thing.

This is the heart of the issue in regards to the distinction between working relationship change and work change.

The data support the conclusion that Dynamo has changed the work of colleagues as far as mechanical production of the I.E.P. and distribution of information from it, but it has not substantially changed the content of the I.E.P.. In the opinion of one of the teachers it has encouraged some change in the working relationship. For more concrete conclusions much more data would have to be gathered.

*As a whole, is the E.P.S.S. a help or a hindrance to the individual?*

*What do teachers, staff, and administrators view is the return on investment for this program?*

The first question above was one of the original specific research questions posed in the Prospectus. During the Prospectus defense the second question was recommended as an addition to the specific research question. This second question *What do teachers, staff, and administrators view is the return on investment for this program?*, proved to be a much more productive line of investigation to follow. The question and the replies were discussed in general terms, not in a specific economic analysis format.

Without exception the replies were positive toward the use of Dynamo, at every level in the organization. Although there were a number of statements of the nature 'it's good, but I wish that...', the overall impression is of a tool that is useful, and more efficient, than the previous process.

Despite the overall positive reactions provided by the interview respondents, there is reason to believe that there are some who do not enjoy or appreciate using Dynamo. From the beginning of the implementation, there were some teachers who were

not comfortable with the program even after multiple training opportunities. The Director recounts some of the feelings during the early stages of the implementation:

...just to make them feel a little more comfortable.... I tried to, I thought we did. But there were teachers there, I mean within probably the first two years, we might have had 5, 6 maybe 8 trainings; and maybe one of the teachers that was complaining had gone to one of them half a day....

Even with the multiple trainings, and the early intermediary step of allowing some teachers to use Dynamo as a form printer, there were some reticent users.

One of the difficulties with conducting research using volunteers is the problem of self-selection. Those who do choose to participate may not be representative of the group. At each of the elementary and middle schools this issue was addressed in the short introduction to the study that preceded the distribution of the questionnaire. Those with negative feelings toward the software were strongly encouraged to volunteer for the interviews in an attempt to incorporate all views of the use of the tool.

At one school, as the questionnaires were being returned, one teacher was talking to another about using Dynamo. Although her exact words could not be heard, it was apparent from her body language and affect that she was not happy about having to use Dynamo. She was again encouraged to be a volunteer so that her 'side of the story' could be heard. Her terse reply was "You don't want to know my opinion". Even though the proverbial door slammed on an opportunity to hear a contrary opinion, the message still came through, loud and clear.

For many of the teachers, staff, and administration, Dynamo is a very useful tool. Teachers who experience some technical difficulties like Susan still appreciate it. In response to the question 'do you feel that using Dynamo is a good investment of your time and energy?', replied:

Yes... If those changes were in there it would help.... I do think it saves us time to have the information in there, because, if the dates are right, their yearly eval dates...you can just click on the page and so yes I do....

For a user such as Janet who experienced more negative effects from the hand-written forms than most, the answer is less equivocal: "Yeah, now that I have used it for a few

years and now that I know how to manipulate it... it is much easier than having to shuffle pieces of paper, much, much easier”.

For administrators and district staff, the positive feelings reflect that they must review large numbers of I.E.P.'s. For the Assistant Principal, the clean copy eases the burden:

Every I.E.P. is supposed to have the same thing on it and whenever I look and I know there should be an X there and an X there and there.

Whenever I pick it up immediately my eyes just fly to the one that does not have anything there...so we make the corrections before they go over the county office and become part of the child's file....

For some of the users, the process takes a quantum leap forward when other technical innovations such as the laptop computer and Zip drive are bundled together. Just as Rogers (1995) suggested, the coordinated effect of the components is what can make the difference:

It was wonderful because the zip drive hooked right in and it worked great. So we were able to go into another room where no one would bother us or anything. It was very convenient, very nice because the year before I did not have the laptop and we had to [do] it in the computer lab where all the students come in, their CPC lab. I hardly got anything done, just because there was so much traffic coming in and out, and different things like that.... So this year it was great, I finished them all in a day, a lot easier.

Although the issue of time has already been discussed, it is appropriate to mention it here again. Much of the data regarding time savings and time trade-off are applicable to the discussion of the return on investment for the teachers, staff and administration. Two comments from Linda give some insight in to how the teachers feel. On the topic of using Dynamo versus handwriting the I.E.P.'s: “If I had to handwrite all of those, there's no way I'd be done right now”. On the topic of increasing her own level of knowledge about the program: “I haven't had the time to go in and find out exactly what it could do for me.” Even though she knows that she has saved time by using Dynamo, she has not been able to afford more time to ‘get in to’ the program to find more useful features of the software.

*What could be done to make the E.P.S.S. a more useful tool for the user?*

*What performance improvement techniques are applicable to the use of E.P.S.S.'s?*

One of the basic premises of an implementation evaluation is to identify methods for improving the performance of a program or project. For an E.P.S.S., this could involve a wide array of interventions, ranging from training to job redesign, incentives and job aides. The results from the interviews provided information on three types of modifications to the current system. Table 6 displays the most pertinent information on these modifications.

Table 6  
Improvement Recommendations  
By Respondent

<i>Respondent</i>	<i>Central Database /Server</i>	<i>Differentiated Training</i>	<i>Update Memo</i>
Staff Spec		I think I am thinking more of just updates and be there for a talk-to kind of thing....	
Renee	the only thing I like about changing would be the data would be all on a hub and not ....	they need to have two sessions, one where you go only go over the new stuff and then have one like in the afternoon for the beginners	even a memo that says here are the new features of [it] and I can go through it
Director	I believe that if we had a server we could probably do even a little better		
Janet	but it seems to me that would be a more effective use, if all the information was on one big data base on a server, you could access it through our network		

Table 6 – continued

<i>Respondent</i>	<i>Central Database /Server</i>	<i>Differentiated Training</i>	<i>Update Memo</i>
Gibco	or with FileMaker Pro Server Software that allows multiusers		One of our best techs even sends regular email/bulletins, Dynamo Notes, to his teachers, telling them about any shortcuts, new features.
Assistant Principal	if it was on the database, where you could print out the form that says he is coming to you, it says he is an ESE student with an I.E.P. on file, all you have to do is download it, print it off and you can pick right up where he left off...		

From this matrix it is apparent that having Dynamo available via a central server is the ‘most wished for’ improvement. This makes a great deal of sense when you review the comments regarding this option. This recommendation carries even greater weight when you consider that this option is highly regarded by persons at four of the five operational levels of the organization (teacher, school support person, assistant principal, and director).

Janet puts this idea in the context of updating information that is easily transmitted to others:

if this information could be put on a server somewhere in the school, so that all the teachers could access it and not have to pass this back and forth, ... Say I have kids coming from third grade to fourth grade, I could just change the teacher name and access... not have to have her give me information and stuff, it would be nice, you could access it through our network.

The Assistant Principal seconded this opinion, and also expressed that if this concept were to be implemented state-wide, students could be tracked as they moved, and their information would be available immediately to the teachers in their new district. The savings in man-hours could be tremendous:

Now when we get a student in like that, that means that we have to, within two weeks, we are going to have an I.E.P. meeting with those parents, ok? Think of the man hours that are already involved in that, if it was on the data base, where you could, you print out the form that says he is coming to you, it says he is an ESE student with an I.E.P. on file, all you have to do is down load it, print it off and you can pick right up where he left off...

The positive result isn't limited just to saving peoples' time and energy, it would greatly enhance the accuracy of the I.E.P.. The Assistant Principal describes the disjointed nature of the current I.E.P. system:

It is like pin the tail on the donkey until you get the kid in there and know him long enough. That is exactly what you feel like whenever you have to sit down in front of that parent and tell them 'I am not really sure that this is going to be appropriate for little Johnny but this is where we are going to start...' That is a big problem and it is a big problem even moving inter-county. We are still required to have a new I.E.P.. If the child shows up in your school, registers, the parent does not tell you he is an ESE student so you make a classroom assignment. The records come in four weeks later and there he is an LD [learning disability] kid and I have him sitting in this classroom when he should be in the inclusion classroom. So then the child has to move to this room, the teacher has to start learning all over again.

Gibco does offer a version of Dynamo that runs off of a server. There are a few very important caveats to remember, though. The first caveat would be that with a server, all of your eggs are 'in one basket'. If the server is down, no one can work on their I.E.P.'s. A second caveat is that the district has all of the teachers do their I.E.P.'s at roughly the same time each semester. This means that much of the time the server would be idle, but then under a heavy load at critical times.

These two considerations do not necessarily disqualify the central server as an option. Modern servers can be quite robust, and with the proper support plan can be guaranteed to be operational within a day if not hours. As for the heavy load issue, this could be addressed by having a rolling update plan where teachers from different schools would be assigned time windows for doing their I.E.P.s. This could be an issue, depending on the type of FileMaker Pro software used according to the developers (Gibco).

There are other consideration that must be taken in to account regarding the central database solution. Comments from the Assistant Principal and the Staffing Specialist recommended that any new software should be able to interface with the district's student demographic database, referred to as 'Gateway': "The only thing that needs to be done with this program ... is it needs to be compatible with your student data base...it needs to work with Gateway (Assistant Principal). This would be a great time saver because teachers would not have to do their own student demographic data entry, thereby saving time. A central server/software combination that incorporates automatic student data importing could be an excellent solution. There are such systems available, however they are considerably more expensive than the current system.

The developers of Dynamo also suggest that support and infrastructure issues for a central server/networked system be thoroughly examined before implementation. A system of this type must be supported by a trained individual, and most likely would have to be run on the existing network: "until there are better faster networking cabling setup for school districts, servers and software being used by 100s of users just is not going to work" (Gibco).

One system currently available that is server based and automatically imports student demographic data is the A3 I.E.P.. The A3 I.E.P. software is produced by Synergistic Frameworks Inc. The website for this product touts their product as being all-inclusive: "A3 I.E.P. is designed to facilitate the Exceptional Student Education process, from pre-referral to I.E.P. dismissal." (Synergistic Frameworks, Inc. 2004). The description of the product lists a number of modules in addition to the I.E.P. Management, some of which are Meeting Management, Eligibility Management, Special

Education and Related Services, Assessment Management, and Transitional Educational Plan.

This product has been in the pilot program stage for approximately one year at a nearby district, and is scheduled to be implemented across the board for all Special Education teachers in the district in the next year or two (personal communication, LCSB rep, 2-27-04). One issue has been noted in the training for A3. Some of the teachers who had previously been trained on Dynamo had some difficulty transitioning to the A3 system. This was attributed to the difference in the interface design, as Dynamo is a WYSIWYG interface while the A3 interface was described as “flowing fields”, that could be manipulated to incorporate changes in data entry (personal communication, LCSB rep, 2-27-04). The Director for the district has some familiarity with this product, but is not ready to make a change yet:

Now, we are not doing that yet... I have to feel a little bit more comfortable with their program before I switch from something I know is working. And the cost, the cost is \$30-\$40,000 with Synergistics; it would cost \$800 with Gibco [Dynamo].

Answering the question “what performance improvement techniques are applicable to the use of E.P.S.S.’s?” could be an entire dissertation in itself. It was included in this study as an opportunity to apply some of the information developed from the related question “What could be done to make the E.P.S.S. a more useful tool for the user”, but in a more general context.

Many of the issues of using E.P.S.S.’s were discussed in the Review of Literature. Fichman (1992) identified problems with high knowledge barriers and user interdependence for IT technologies. One finding that came out of the focus group meeting was that the teachers themselves had the answers to their questions. The knowledge was there, but it was not held by all of the users. How to identify, organize, and capture this information is the realm of knowledge management. Wager (2001) believes that “the basic idea of knowledge management is to capture the knowledge of expert performers and to store their knowledge in such a way that another performer or learner might be able to benefit from it.” In the case of the teachers, it was not just expert

performers that had valuable information, but even the less proficient users. Expert or not, the knowledge was valuable, and held by individuals.

The focus group was an opportunity for the teachers to share their knowledge. Janet volunteered to teach the others how to modify pull-down menus to include teacher-developed goals and objectives: “you have to use your code numbers...you can customize them if you want to. Then you can, including the ones that are already there, you can delete them, create a new goal, objective...”. This technique also worked for sharing how to print a whole I.E.P. at one time, as was demonstrated by Renee.

This concept of capturing knowledge has become a focus point for fields such as management (Senge, 1990; Argyris and Schon, 1996) and web development (SCORM). Raybould’s (2000) Organizational/Performance learning model incorporates many elements to capture, store, and redistribute knowledge for an organization. If an organization were to use Raybould’s model, they would have a good system for identifying and managing their knowledge. The primary problem with his model, at least as to how it could be applied in education, is that it is a very sophisticated model that would require either a paid consultant to help design the system, or an in-house expert with advanced training and expertise. Either of these options are not often available to the average school district due to cost limitations. A focus group would be ideal for identifying, codifying, and sharing the knowledge held by the users of the system. It would not only be a cost effective technique, it would be highly relevant to the users because the agenda could be set by the users themselves, and would address the use of the innovation in its reinvented form.

Perhaps the most obvious method for performance improvement would be the application of a full development model for E.P.S.S.. In most Instructional Systems models such as Dick and Carey (1990) or Gagne, Briggs, & Wager (1988) both formative and summative evaluation are integral parts of the development and use of an instructional system. The same argument can be made for E.P.S.S.’s, and was the basis for this implementation evaluation.

*How can E.P.S.S. developers incorporate flexibility in to their tools?*

The data from the interviews presented two ways of looking at the issue of flexibility of the E.P.S.S. tool. The first way is to consider how the tool could be more

flexible in regards to how the users work with the tool to produce the I.E.P. product. The second way is to look at how the tool could be more flexible in the support functions of data archiving and transmission.

The developers of Dynamo have continued to update their product over the time of its use in the district. These changes have been implemented in response to requirements by the Florida Department of Education, and requests by school districts (Assistant Principal, Gibco email, February 2004). One of the ways the tool has been adapted to the local district is in the format of many of the forms used for ESE students, in particular the I.E.P. form itself. The process as described by the Director of Special Education:

We started with their forms, then by the end of the year we were asking them could they change this, change that, do this, until we went on an agreement, with a change in form was not that costly but a new form would cost a certain amount. We eventually switched over to all our forms...

The forms in Dynamo are displayed on-screen in a WYSIWYG display. The formatting of the document is the same as what will be printed, giving the work a high degree of realism fidelity. Twelker et al (1969) described realism fidelity as the state where the work environment resembles “as closely as possible the real situation”. WYSIWYG displays are not an industry standard, however. In a personal communication (Leon County Schools Representative personal communication, February 2004) a project coordinator for another district described one of the pitfalls of adopting a new web-based system. Instead of having a WYSIWYG display, the screen has data entry fields different from the hardcopy format. The project coordinator stated that one of the few problems with training individuals in using the new system is that they were used to the WYSIWYG format, and had trouble transitioning to the new system of data entry.

For the district being evaluated one of the process bottlenecks is the use of Zip disks. Although the zip discs provide a high level of portability and independence for the users, they also present problems because they can be lost, must be individually backed-

up, and are in the teachers' care. If the teachers have modified some of the pull-down menus this information is lost when updating to a new version.

The developers of the Dynamo product were contacted by email to find out if there were server versions of their product. Their response was very informative. They not only have server versions, they have assisted districts in devising and building specific solutions for their needs. These solutions use various combinations of FileMaker Pro and FileMaker Pro Server so that a district can design their own system with varying levels of access and server functions:

We feel the best way to have Dynamo set up in a district is to have a FileMaker Server on each SCHOOL server, with a school level Dynamo with the various access privileges set using passwords. With this setup every teacher would be accessing the same Dynamo file. Students with multiple teachers would have only one record and every teacher who is servicing that child would be accessing the same student record. At the district level there should be a District Master Dynamo which would only need a single user FileMaker Pro to operate. Note: If there will be multiple district level personnel who want access to the Dynamo file at the same time, a FileMaker Pro SERVER will be needed at that level. The district level software can have a script setup that will go to the school Dynamos and periodically import the data from those school Dynamos. At anytime the district level personnel can run the script and have an instantaneous update of the records.

While this configuration is the generic recommendation, Gibco has assisted districts in structuring their own systems using unique combinations of FileMaker Pro and FileMaker Pro Server. In their email replies the developers also noted that when a server system is used, a host of other issues may be opened up as far as data connections between sites, the effect of heavy loads on server systems causing system slow downs, and the coordination of tech support within the district.

## CHAPTER 5

### SUMMARY AND CONCLUSIONS

This chapter presents a concise review of the outcomes of the evaluation. The overarching question of ‘what happens during the implementation of an E.P.S.S.?’ will be reviewed first. The specific questions of ‘in what ways has the E.P.S.S. changed the work of the individual?’, and ‘as a whole, is the E.P.S.S. a help or a hindrance to the individual?’ will be incorporated into the review of the overarching question. This will be followed by a review of the remaining specific research questions. This information will present a context and discussion of what happens when special education teachers are required to use an E.P.S.S. to produce I.E.P.’s for exceptional students.

***What actually occurs within a work site during the implementation of an electronic performance support system?***

This study centered on the experiences of the teachers, but also investigated the systemic effects caused by the implementation. Issues regarding the support and administration of the E.P.S.S. were also investigated and will be reported along with information from the teachers.

The Stages of Concern Questionnaire provided a general overview of the concerns of the teachers across the district. The peak score analysis indicated that nearly half of the teachers had peak stage Scores in the ‘0’ stage, reflecting low levels of concern regarding the software. This finding is in line with other results of this questionnaire when the respondents have had long term exposure to the innovation. Further analysis of the second peak score for the teachers indicated that many of the teachers across the district were still dealing with feelings of uncertainty as far as their abilities to use the software.

For the respondents in the second phase of the study there were substantial changes in the method they used to produce an I.E.P.. The most obvious aspect of this

change is that the teachers had to produce their I.E.P.'s by first entering data into a database, manipulating a variety of information available from the built-in databases, and then printing the finished document. Each of the steps in this process presented an opportunity for improved performance over the old hand-written process, but each step also presented problems or time constraints for the users.

Data entry for the teachers was not problematic as a technical process, but in terms of time. Teachers, support, and administrative personnel believed that the time required to input the data was not trivial. Despite the time required to input the data, they felt it was worthwhile because once the data were in the database, they could be accessed easily and updated easily.

The use of Dynamo to manipulate the information also had its good points and bad points. After a certain level of familiarity had been achieved with the software the users felt comfortable and proficient in using it. Attaining this level of proficiency, however, was a unique process for each individual, depending on her or his prior experience, experience during the training workshops, and access to support. For many of the teachers, time - either in training, exploration of the tool, or in update reviews - was a concern. Support staff and administrators also recognized the issue of time for many of the same reasons.

There were some issues regarding the printing of the I.E.P. document. First, there were two printing processes in use: in some schools they use NCR-type 3 color paper, while other schools use standard paper and then make xerox copies in the required colors. In either system the respondents historically had problems. One of the current problems is that only one of the teachers involved in the interviews knew how to print a single whole I.E.P. at one time. All of the other teachers were printing page by page. In the focus group meeting the method for one-step printing was shared with the other teachers.

Overall, the feelings of the teachers were that the software is a good tool to use, and that it is worth the time and effort put in to learning how to use it. For the staff and administrators Dynamo printed I.E.P.'s had a distinct advantage over the handwritten I.E.P.'s due to their clarity and uniformity.

***In what way has the E.P.S.S. changed the group work?***

***In what way has the work relationship between colleagues changed due to the E.P.S.S.?***

It is common for special education teachers to collaborate with each other and with specialists on developing I.E.P.'s for their students. For some of the respondents in Phase 2 of the study there were changes in the group work as indicated by two of the teachers scheduling their I.E.P. time together to assist each other. Some of the other respondents did feel that the use of Dynamo had caused a change in the working relationship, particularly in asking for help from their colleagues and in providing help to their colleagues. In this sense the users became impromptu support persons for each other. Other teachers, however, believed there was no change in the work or work relationship.

***What could be done to make the E.P.S.S. a more useful tool for the user?***

The respondents were clear on what they believed would make the tool more useful. Persons working in four of the five operational levels of the organization (teacher, school support, school administration, and district administration) recommended going to a server base for the Dynamo product. Their reasons were that it would save the time required to input the student demographic data, the zip discs would not be needed, and the I.E.P. information would be available to all appropriate personnel via the network. Access to an I.E.P. on a network would also increase the accuracy of a placement because the child's history would be immediately available.

***How can E.P.S.S. developers incorporate flexibility in to their tools?***

The Dynamo product developers have provided flexibility by adopting forms used in the district and by developing a number of FileMaker Pro configuration options for the district. Gibco has continually updated the forms in their software to match those used in the district. This has been a methodical process over the years, beginning approximately the second year of use. Now all of the forms used are those as specified by the district.

**Limitations of the Study**

This study was conducted under the auspices of the Director of Special Education for the county. She had approved the request for a research project, and had recommended contacting the Assistant Principals of each school for the questionnaire

distribution. When each school was contacted her name was given as official permission for requesting a meeting for distribution of the survey. She was also mentioned during the introductory statements before the actual distribution of the survey, and at times in the interviews. This connection with the administrative head of the program could have influenced the responses of the participants.

As an implementation evaluation the results of this study have limited generalizability. Readers of this type of study must determine for themselves the applicability of the findings for other related contexts (Patton, 2002).

The formulation of the specific research questions was influenced by the previous experience of the researcher. The questions unintentionally reflected issues related by other teachers during software training sessions. The questions should have been more generic, and without a bias toward finding instances of change.

### **Implications for the Development of E.P.S.S.'s**

The design of an E.P.S.S. requires the developer to make a number of choices regarding the interface design, data storage, and initial training of the users. The issues of time, training, and knowledge barriers for the respondents in this study point toward a novel way of developing the user interface.

Assume for a moment that the issue of data entry and data storage have been solved by the transition to a central server with automatic data importing. Now the teachers only have to worry about working within the E.P.S.S.. Imagine a first-year teacher attempting to use a very complex computerized I.E.P. system. Compared with a veteran teacher, they might not have as strong a mental model of the system. The experienced user will most likely have very different needs for support (and training, as evidenced by the interviews), compared to the novice user. Is there a method or mechanism that allows the user to adjust the on-screen work environment to suit his or her needs? The answer is yes.

Palettes and toolbars are familiar to anyone who has worked in Microsoft Word or in PhotoShop. They are free-standing control panels that can be placed anywhere on the display screen, or removed altogether. The beauty of this system is that the user can choose the number and placement of these controls to suit their own particular needs. Rather than having the performer conform to the structure of the interface, the interface

can be customized to the performer. The display of the document or form would still be in a WYSIWYG form, but the controls used to navigate through the databases and provide support would be arranged by the user.

Another option for development is the AOOPA system as described Douglas, et al (2003). This system is built on a three-tier architecture. This three-layer system separates the coding into the levels for user interface, business logic/processes, and database management. Having code that creates the interface separate from the code that processes the inputs facilitates reconfiguration on one level without necessarily having to reconfigure the other levels (Douglas, et al 2003). With the interface code separate from the logic/processing code, different interfaces could be built for different users. These interfaces could be developed with different structures. One system might have three distinct interfaces, all with the same data fields, but with the elements arrayed differently and with varying support elements. Each user could choose his or her own interface. The only problem with this scenario would be trying to train multiple users on different interfaces.

We now have software and hardware that can support a more individualized work environment for the user. In the future we can utilize the improved capabilities to support the user at their level of need and in a format that they find comfortable.

APPENDIX A  
STAGES OF CONCERN QUESTIONNAIRE

Concerns Questionnaire

School: \_\_\_\_\_

It is very important for continuity in processing this data that we have a unique number that you can remember. Please use:

Last 4 digits of SS#:            

The Purpose of this questionnaire is to determine what people who are using or thinking about using various programs are concerned about at various times during the innovation adoption process. The items were developed from typical responses of school and college teachers who ranged from no knowledge at all about various innovations to many years experience in using them. Therefore, a good part of the items may appear to be of little relevance or irrelevant to you at this time. For the completely irrelevant items, please circle "0" on the scale. Other items will represent those concerns you do have, in varying degrees of intensity, and should be marked higher on the scale, according to the explanation at the top of each of the following pages.

For example:

- 0 1 2 3 4 5 6  7    This statement is very true of me at this time.  
0 1 2 3  4 5 6 7    This statement is somewhat true of me now.  
0  1 2 3 4 5 6 7    This statement is not at all true of me at this time.  
 0 1 2 3 4 5 6 7    This statement seems irrelevant to me.

Please respond to the items in terms of your present concerns, or how you feel about your involvement or potential involvement with Dynamo. We do not hold to any one definition of this innovation, so please think of it in terms of your own perception of what it involves. Since this questionnaire is used for a variety of innovations, the name Dynamo never appears. However, phrases such as "the innovation", "this approach", and "the new system" all refer to Dynamo. Remember to respond to each item in terms of your present concerns about your involvement or potential involvement with Dynamo.

Thank you for taking time to complete this task.

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 R&D Center for Teacher Education, The University of Texas at Austin

SoC Questionnaire Items

0	1	2	3	4	5	6	7	
Not true of me now			Somewhat true of me now			Very true of me now		
0	1	2	3	4	5	6	7	I am concerned about student's attitudes toward this innovation.
0	1	2	3	4	5	6	7	I now know of some other approaches that might work better.
0	1	2	3	4	5	6	7	I don't even know what the innovation is.
0	1	2	3	4	5	6	7	I am concerned about not having enough time to organize myself each day.
0	1	2	3	4	5	6	7	I would like to help other faculty in their use of the innovation.
0	1	2	3	4	5	6	7	I have a very limited knowledge of the innovation
0	1	2	3	4	5	6	7	I would like to know the effect of reorganization on my professional status.
0	1	2	3	4	5	6	7	I am concerned about conflict between my interests and my responsibilities.
0	1	2	3	4	5	6	7	I am concerned about revising my use of the innovation.
0	1	2	3	4	5	6	7	I would like to develop working relationships with both our faculty and outside faculty using this innovation.
0	1	2	3	4	5	6	7	I am concerned about how the innovation affects students.
0	1	2	3	4	5	6	7	I am not concerned about this innovation.
0	1	2	3	4	5	6	7	I would like to know who will make the decisions in the new system.
0	1	2	3	4	5	6	7	I would like to discuss the possibility of using the innovation.
0	1	2	3	4	5	6	7	I would like to know what resources are available if we decide to adopt this innovation.
0	1	2	3	4	5	6	7	I am concerned about my inability to manage all the innovation requires.
0	1	2	3	4	5	6	7	I would like to know how my teaching or administration is supposed to change.
0	1	2	3	4	5	6	7	I would like to familiarize other departments or persons with the progress of this new approach.

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0	1	2	3	4	5	6	7		
Not true of me now							Very true of me now		
0	1	2	3	4	5	6	7	I am concerned about evaluating my impact on students.	
0	1	2	3	4	5	6	7	I would like to revise the innovation's instructional approach.	
0	1	2	3	4	5	6	7	I am completely occupied with other things.	
0	1	2	3	4	5	6	7	I would like to modify our use of the innovation based on the experience of our students.	
0	1	2	3	4	5	6	7	Although I don't know about this innovation, I am concerned about things in the area.	
0	1	2	3	4	5	6	7	I would like to excite my students about their part in this approach.	
0	1	2	3	4	5	6	7	I am concerned about time spent working with nonacademic problems related to this innovation.	
0	1	2	3	4	5	6	7	I would like to know what the use of the innovation will require in the immediate future.	
0	1	2	3	4	5	6	7	I would like to coordinate my effort with others to maximize the innovation's effects.	
0	1	2	3	4	5	6	7	I would like to have more information on time and energy commitments required by this innovation.	
0	1	2	3	4	5	6	7	I would like to know what other faculty are doing in this area.	
0	1	2	3	4	5	6	7	At this time, I am not interested in learning about this innovation.	
0	1	2	3	4	5	6	7	I would like to determine how to supplement, enhance or replace the innovation.	
0	1	2	3	4	5	6	7	I would like to use feedback from students to change the program.	
0	1	2	3	4	5	6	7	I would like to know how my role will change when I am using the innovation	
0	1	2	3	4	5	6	7	Coordination of tasks and people is taking too much of my time.	
0	1	2	3	4	5	6	7	I would like to know how this innovation is better than what we have now.	

## APPENDIX B

### INTERVIEW GUIDE FOR TEACHERS

1. Tell me a little about yourself, particularly your teaching experience and education.
2. Did your perception of the job of teaching change when you went from being a student to being a teacher?
3. Have you had any experience or information about the Dynamo software product?
4. Have you had any preparation, such as training, for using this product?
5. Describe how comfortable you feel using Dynamo after the training.
6. How do you feel now when you use Dynamo?
7. What are there high points and low points (pros and cons) to using this software?
8. How would you rate yourself on your ability to use Dynamo, 1 being completely unable to use it, 10 being that you have mastered all of it?
9. Why did you rate yourself that way- any specific reasons?
10. Has the use of Dynamo, by you or others, changed how you work?
11. This is a fill-in-the-blank question: the best thing about Dynamo is \_\_\_\_\_?
12. Another fill in the blank question: worst thing about Dynamo is \_\_\_\_\_?
13. Has Dynamo changed your working relationship with others?
14. Overall, do you feel that using Dynamo is a good investment of your time and energy?
15. If we had it all to do over again (adopting the use of Dynamo), what changes would you make?
16. Any comments or questions that you would like to make?

## APPENDIX C

### INTERVIEW GUIDE FOR STAFF AND SUPPORT

1. Tell me a little about yourself, particularly your work experience and education.
2. How did you come to be in your current position?
3. Have you had any experience or information about the Dynamo software product?
4. Have you had any preparation, such as training, for using or assisting others in using Dynamo?
5. Describe how you felt using or helping others with Dynamo after the training.
6. How do you feel now when you use or help others with Dynamo?
7. How does using Dynamo- either you or others- effect your work?
8. Is working with Dynamo a specific part of your job description, or an “other duties” type of responsibility?
9. Are there high points and low points (pros and cons) to using this software?
10. Have there been changes to Dynamo itself, or how you use it?
11. Please describe the best thing about Dynamo is \_\_\_\_\_?
12. Please describe the worst thing about Dynamo is \_\_\_\_\_?
13. Has Dynamo changed your working relationship with others?
14. If we had it all to do over again (adopting the use of Dynamo), what changes would you make?
15. Any comments or questions that you would like to make?

## APPENDIX D

### HUMAN SUBJECTS COMMITTEE APPROVAL MEMORANDUM



Office of the Vice President  
For Research  
Tallahassee, Florida 32306-2763  
(850) 644-8673 · FAX (850) 644-4392

#### APPROVAL MEMORANDUM

Human Subjects Committee

Date: 3/31/2003

Edward Paschall  
56 Seabreeze Dr  
Crawfordville FL 32327

Dept.: Educational Psychology

From: David Quadagno, Chair *DQ/ph*

Re: Use of Human Subjects in Research  
Evaluation of an electronic Support System

The forms that you submitted to this office in regard to the use of human subjects in the proposal referenced above have been reviewed by the Secretary, the Chair, and two members of the Human Subjects Committee. Your project is determined to be exempt per 45 CFR § 46.101(b) 2 and has been approved by an accelerated review process.

**The Human Subjects Committee has not evaluated your proposal for scientific merit, except to weigh the risk to the human participants and the aspects of the proposal related to potential risk and benefit. This approval does not replace any departmental or other approvals, which may be required.**

If the project has not been completed by **3/30/2004** you must request renewed approval for continuation of the project.

You are advised that any change in protocol in this project must be approved by resubmission of the project to the Committee for approval. Also, the principal investigator must promptly report, in writing, any unexpected problems causing risks to research subjects or others.

By copy of this memorandum, the chairman of your department and/or your major professor is reminded that he/she is responsible for being informed concerning research projects involving human subjects in the department, and should review protocols of such investigations as often as needed to insure that the project is being conducted in compliance with our institution and with DHHS regulations.

This institution has an Assurance on file with the Office for Protection from Research Risks. The Assurance Number is IRB00000446.

Cc: Dr. Robert Morgan  
HSC No. 2003.142

## APPENDIX E

### INFORMED CONSENT FORM

I freely and voluntarily, without element of force or coercion, consent to be a participant in the research project entitled “Evaluation of an EPSS for Teachers”.

This research is being conducted by Mack Paschall, M.S., a doctoral candidate at Florida State University. I understand that the purpose of his study is to better understand how computer software is disseminated to teachers. In addition, the study will explore methods for improving the use of the software by the teachers. I understand that during my participation in the study I will be asked questions regarding my knowledge and use of the software, and that I will be observed using the software.

I know that I will be asked to complete a survey which will take less than one-half hour. I also understand that I may be interviewed for one hour, be observed using software on a computer for one hour, and, and may be asked to participate in a focus group for one hour. I understand that these sessions will be tape recorded by the researcher. The researcher will keep these tapes in a locked cabinet until 6-01-2008, and then destroy the tapes.

My participation is totally voluntary and I know I may discontinue participation at any time. All of my responses and actions will be kept confidential to the extent allowed by law, and identified by a subject code number. My name will not appear on any of the results.

I understand that this information will be used to better understand how software is disseminated to teachers, and to determine methods for assisting teachers in the use of specific software. I understand there are benefits for participating in this study. The information derived from this study may improve my own use of the software, and assist other teachers in their use of software.

My consent may be withdrawn at any time without prejudice, penalty, or loss of benefits to which I am otherwise entitled. I have been given the right to ask and have had answered any inquiries concerning the study. Questions, if any, have been answered to my satisfaction.

I understand that I may contact Mack Paschall, (850) 576-5581, mpaschall@lycos.com for answers regarding this research or my rights, and for further information that I may contact the FSU Human Subjects Committee, 2035 E. Paul Dirac Dr., Box 15, 100 Sliger Bldg., Innovation Park, Tallahassee, FL 32310.

I have read and understand this consent form.

---

(Subject)

---

(Date)

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## BIOGRAPHICAL SKETCH

Edward D. Paschall, Jr.

I began my educational experience in Tallahassee, Florida. I attended public schools in the Leon County school system from 1<sup>st</sup> through 12<sup>th</sup> grade.

After graduating from high school I attended Maryville College in Maryville, Tennessee. I received a Bachelor of Arts degree in Physical Education. After traveling and working in various places, I decided to attend graduate school. I entered Springfield College in Massachusetts and earned a Master of Science degree in Physical Education.

The concept of performance has been an interest of mine for some years. After realizing that the field of Physical Education could not be substantially improved without the improvement of the overall system of education, I decided to find a program of study that focused on large scale educational change. This decision led me to apply to the Instructional Systems program at Florida State University. I could not have found a better program to prepare me for studying educational change and performance.