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A Systems Approach to Performance Quality: An Application to Higher Education

Tobias LaFleur
Western Michigan University

A SYSTEMS APPROACH TO PERFORMANCE QUALITY: AN APPLICATION TO HIGHER EDUCATION

by

Tobias LaFleur

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A SYSTEMS APPROACH TO PERFORMANCE QUALITY: AN APPLICATION TO HIGHER EDUCATION

Tobias LaFleur, Ph.D.

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Graduate-student teaching apprentices (TAs) in the psychology department at a university in Michigan conducted seminars in an advanced undergraduate-level psychology course. All were members of the department's behavior analysis training system (BATS). BATS was an integrated series of courses and practicum experiences designed to achieve three main goals: recruiting, training, and maintaining the skills of competent behavior analysts. Twenty-five different tasks performed by the TAs were analyzed and measured prior to an intervention aimed at their improvement. Informal observation suggested that failure to complete these tasks reduced BATS' ability to meet its larger goals. Three well-known systems analysis models were applied, to differing degrees, in an effort to understand BATS as a system: Rummler and Brache's (1990) systems view to three levels of performance, Gilbert's (1978) behavior engineering model, and W. E. Deming's (1986) Total Quality Management (TQM) model. The application of these models to BATS was the first of its kind.

Two intervention packages were designed to enhance the reliability of TAs conducting the seminars and completing out-of-class assignments. These packages were also compared across semesters. In the first semester, the implementation of a combination of task checklists and face-to-face supervisor feedback was associated with statistically significant improvements in seminar and out-of-class performance of

the TAs.

These levels of improved performance were maintained during the second semester, with different tasks, when electronic-mail feedback was substituted for face-to-face feedback.

In addition, two intervention packages were designed to increase the number of learn units (question-answer-feedback sequences) completed by TAs. In the first semester, face-to-face supervisor feedback had no statistically significant effect on the frequency of learn units the TAs completed in the seminars during the first semester.

However, during the second semester, videotape feedback added to the face-to-face supervisor feedback was associated with a statistically significant increase in the frequency of learn units.

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CHAPTER I

A SYSTEMS APPROACH TO HIGHER EDUCATION

Introduction

America's schools are now laboring to ready themselves for the year 2000 under both the reform initiatives of the 1980s and the accountability requirements of the current decade. The reform initiatives recommended, among other things, that both proficiency standards and accountability for college training programs be increased. In the early 1990s, President George Bush called this the decade of accountability. Both initiatives came in response to an increased awareness that this country is not only falling out of the lead but rapidly falling behind other countries in educational standards (March, Peters, Schwartz, & Crisci, 1993). The static picture in terms of high rates of illiteracy, high drop-out rates, and lower standardized achievement-test scores as compared to other industrialized nations has been a problem for our nation for some time (Pennypacker, 1994). Pennypacker describes how numerous commissions have been formed and billions of dollars have been spent in an effort to produce change with little resulting effects.

While student performance in this country is falling below educational standards, teacher performance also has significant room for improvement (Aquino, 1975; Gamble, 1976). Gamble submits that many Ph.D. programs emphasize research and the scientific method while rarely providing candidates with instruction that will allow them to effectively teach. Aquino (1975) suggests that there is relatively little

research devoted to training college-level teachers, resulting in an excess of teachers insufficiently trained to teach.

Jacknicke and Samiroden (1990) interviewed student teachers who felt that the separation of theory and practice was unproductive and did not adequately prepare them to effectively teach. Borko, Eisenhart, Underhill, Brown, Jones, and Agard (1991) found that teacher educators oversimplify the reality of student teaching and disregard many of the social and pedagogical variables that can affect a novice's instructional decisions. Bullough (1990) found that the overemphasis on rating performances also results in an oversimplification of the process of teaching.

Kagen (1992) studied 40 learning-to-teach research studies published between 1987 and 1991 and found that preservice programs generally fail to provide the novice with adequate knowledge of classroom procedures and student behaviors; nor did programs provide sufficient classroom experiences.

The decline in the competency level of our teachers and students also increases the likelihood that our schools will continue to fall behind both national and international educational standards. Pennypacker (1994) suggests that the documented failure of our educational system to produce sufficient numbers of skilled workers has put our industries at a competitive disadvantage in the international marketplace. In addition, many organizations are becoming caught in a so-called incompetence trap (Brethower, 1993a, 1993b). Incompetence traps are defined by three factors:

1. An increase in global competition coupled with an increase in demand for quality has created a need for competent people in the workplace.

2. The increased competition and need for quality sometimes requires expensive and complex work processes and equipment.

3. At the same time, entry-level workers are increasingly deficient in basic reading and computing skills as well as basic work habits (Lambert, 1989). As a result, many managers are forced to deal with the decline in competence as well as cost increases. Clearly, an important step toward improving this situation would be to improve the quality of our educational system.

Total Quality Management Model

The Total Quality Management (TQM) is one well-known systems-analysis model that is applied to understand and improve the quality of systems performance (Deming, 1986). This philosophy is based upon Deming's 14 points for management:

1. Create constancy of purpose for improvement of product or service.
2. Adopt the new philosophy.
3. Cease dependence on mass inspection.
4. End the practice of awarding business on the basis of price tag alone.
5. Improve constantly and forever the system of production and service.
6. Institute training.
7. Adopt and institute leadership.
8. Drive out fear.
9. Break down barriers between staff areas.
10. Eliminate slogans, exhortations, and targets for the workforce.
11. Eliminate numerical quotas for the workforce.
12. Remove barriers that rob people of pride of workmanship.
13. Encourage education and self-improvement for everyone.
14. Take action to accomplish the transformation.

For example, the first point stresses the need for constancy of purpose and one method of creating this purpose is by developing a mission statement. The fifth point stresses the importance of continuous improvement of the system and TQM is a model that facilitates quality improvements. The 14th point suggests one take action to accomplish transformation. Manley and Manley (1996) state that this can be accomplished by using the plan-do-check-act cycle. This cycle involves four steps: (1) studying a process and deciding how to improve it, (2) developing and implementing the intervention, (3) observing the effects of the intervention, and (4) acting on the difference between the original intent and the actual outcome.

Manley and Manley (1996) state that Deming's philosophy is finding its way into education today. For example, this focus on the quality of education is embraced by the Conroe Independent School District in Texas (Sharples, Slusher, & Swaim, 1996). These authors describe how this district is attempting to optimize the performance of all units that operate within its school system. The transformation involves four phases: (1) a commitment phase, (2) an education and training phase, (3) an application and practice phase, and (4) a standardization and recognition phase. The first phase involves a strategic planning process, implementation planning process, participation by cabinet members, presentation of a TQM plan to the board, and adoption of the plan. The second phase involves TQM content and process training. The third phase involves the formulation of teams (e.g., high school department, instruction department, human resources). The last phase utilized TQM coaches, or internal trainers, to provide support on an ongoing basis and to mentor collegues. At the end of the year, all teams were able to document and present reports of their projects accomplishments. Some of the improvements included a new process to evaluate and serve students with significant gaps in reading performance, a

50% reduction in the error rate of the state-reported special education data for state funding, and the development and standardization of team meeting procedures.

Systems

The interconnecting relationships between students, faculty, and college deans highlight the importance of examining the entire educational system. Morasky (1982) describes systems as organizations that are dependent upon either a critical behavioral component or performance within the organization to function. Cleary (1996) suggests that the components and the processes within each component of quality education systems must contribute to the overall mission of such systems.

Rummler and Brache Model

Likewise, Rummler and Brache (1990) state that the degree to which a system effectively develops, produces, and/or delivers valued goods or services is the result of the effectiveness of the various component parts at the three levels of performance: (1) organizational level, (2) process level, and (3) individual level, and, the extent to which these three levels act together as an integrated whole. It is important to understand how a system's internal and external ecosystem are connected in order to improve both organizational and individual performance and Rummler and Brache's (1990) systems view to three levels of performance is a second model used to understand and improve the quality of systems performance.

Organizational Level

According to Rummler and Brache (1990), when we first examine an organization from a macro-systems point of view, we look at the variables at the

organizational level. This level contains the various functions that interact to form the basic structure of the organization, such as: organization-wide goals and measures, strategies, and the deployment of resources. Crowell and Anderson (1983) state that behavior management programs must contribute to the organizational mission to be considered socially valid and scientifically significant. Therefore, we should first examine the organization level.

Process Level

The next level of performance that Rummler and Brache (1990) examine is the process level. Melan (1992) describes processes as groups of interrelated work activities that transform inputs into outputs of greater value. He suggests that this is the main purpose of a productive process. Rummler and Brache (1990) suggest that in order for an organization to fulfill its goals, the process outputs should meet the needs of its customers; the processes themselves should be efficient, and the process goals and measures should meet the requirements of both internal and external customers from their perspective. Processes are analyzed to estimate which, if changed, will lead to the realization of both process and organizational goals.

Job/Performer Level

The third level of performance is the job/performer level. Rummler and Brache (1990) suggest that organization and process goals will not be met if process steps are not supported and if people are unable to maximally contribute to process effectiveness and efficiency. According to Rummler and Brache, the variables that must be managed at this level include: antecedents (e.g., standards, directions, feedback), equipment, job responsibilities, reinforcement, and training.

Behavioral Engineering Model

The effectiveness of each of the three levels of performance as well as the effectiveness of the entire system is determined by a number of performance variables. Gilbert's (1978) behavioral engineering model provides a framework to effectively analyze these performance variables (see Appendix A) and is especially helpful at the job/performer level. Gilbert's model will be used to analyze systems performance at the job/performer level in the current research. The analysis of performance and performance deficiencies is an important step in quality improvement (Juran, 1993). This model is an elaboration of the familiar Antecedent - Behavior - Consequence model widely used by behavior analysts to examine performance contingencies as illustrated in Appendix A.

The model is divided into six cells. In the first cell, the antecedent conditions are examined. Are there prompts, standards, feedback and/or direction provided? Do the staff know what to do and when to do it? What type of feedback is provided? In the second cell, the equipment and procedures in the setting are examined. Are the job procedures efficient and do they assure quality? In the third cell, motivating contingencies are analyzed. What are the contingencies for performance (e.g., pay, promotion, reprimand)? In the fourth cell, the repertoires of the individuals are analyzed. Do they have the proper job skills? Is training adequate and does it match the demands of the job? In the fifth cell, Gilbert examines the prerequisite physical and verbal skills of the individuals for deficits (e.g., illiteracy). The last cell analyzes whether or not the programmed consequences function as reinforcers for job performance. This behavior engineering model is a tool for integrating the many factors involved in improving performance. Elements of the three models were

applied, to varying degrees, to a university-level educational system in an effort to analyze performance and identify performance discrepancies.

Behavior Analysis Training System

A university-level instructional system, the Behavior Analysis Training System (BATS), was analyzed by applying Rummler and Brache's (1990) systems model. In addition, the TQM model was also used to analyze the organizational level of BATS. Furthermore, the behavioral engineering model was used to analyze the job/performer level of BATS, as will be discussed in the following paragraphs.

BATS functions within, and is supported by behavior-analytically oriented undergraduate and graduate programs (Malott, Vunovich, Boettcher, & Groeger 1995). It typically is staffed by a faculty member, three BA, nine MA, and three Ph.D. students. BATS' mission is to help recruit, train, and maintain the skills of effective behavior analysts. Harrington (1991) suggests that effective organizations develop an overall mission and a strategy to achieve their goal. BATS consists of a number of subsystems (e.g., undergraduate courses, training, recruitment, behavioral academic career counseling) to be described in more detail in the following sections.

BATS is comprised of 15 different subsystems. Subsystems are portions of a larger system or superordinate system that carry out a specific task or function. Morasky (1982) defines two classes of subsystems: (1) in-line subsystems, and (2) adjunct subsystems. In-line subsystems output to other systems or subsystems but do not receive inputs from those systems to which their outputs flow. Adjunct subsystems, however, can receive inputs from the same system to which it outputs. The interrelations between these subsystems were not investigated for they were not germane to this study.

Systems Analysis of BATS

A systems analysis was conducted at all three levels of performance using Rummler and Brache's (1990) Model. In addition, several TQM principles were applied to the organizational level of BATS.

The organizational level of BATS was examined first. Rummler and Brache (1990) state that modest improvements in performance can be produced by managing the organizational level. Furthermore, job/performer and process-level efforts will be counterproductive without organizational-level management.

The first step in this analysis involved the development a total performance system diagram (see Figure 1).

BATS is a system made up of inputs, outputs, and feedback at the organizational, process, and job/performer levels. The total performance system diagram demonstrates those five processes through which this system and its components operate.

First, BATS converts various resource inputs (e.g., new students and technology) into product and service outputs (e.g., competent behavior analysts and research). Second, BATS which it provides these products and services to receiving systems (e.g., customers). "Receiving system" is a term not commonly used in the systems literature, although the concept occurs and the need exists for a descriptive label (Brethower, 1972). Identification of customers and their needs are important steps in quality planning (Juran, 1993).

Third, while being guided by its own internal standards and feedback, BATS is ultimately driven by feedback given by its market. The concept of "feedback loop" is often used in the quality control literature (Juran, 1988). This loop is has four

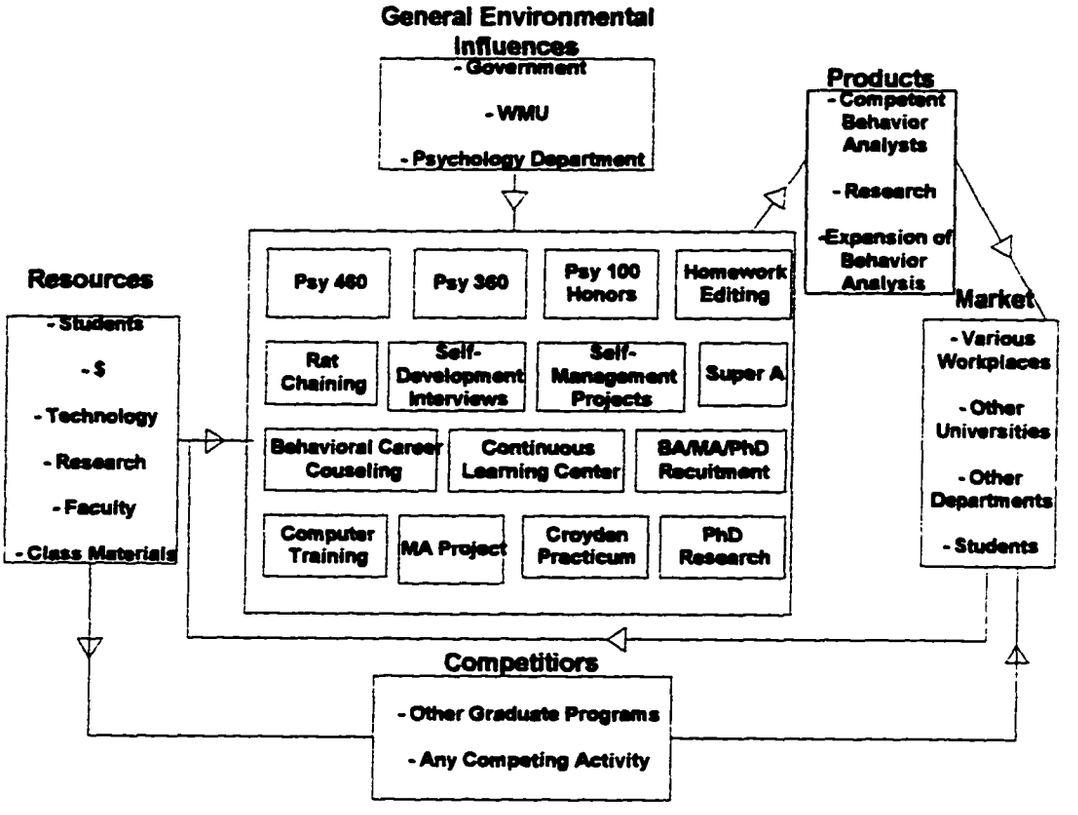


Figure 1. Total Performance System Diagram for BATS.

steps: (1) a goal is established for the performance of an individual or system; (2) a sensor measures the actual performance; (3) a collator compares the actual performance to the goal; and (4) if actual performance differs from the goal by more than a predetermined tolerance, the feedback loop is closed, actuating the means for restoring the status quo.

Fourth, all this time, the competition is also drawing on the same resources and providing its products and services to the market. Fifth, these sequences of events are all influenced by the social, economic, and political environment.

Within BATS, various subsystems or components convert the inputs they receive into outputs. These 15 subsystems are comprised of the following: (1) an undergraduate-level psychology course, namely, Psy. 100 honors; (2) Psy. 360; (3) Psy. 460; (4) masters-level projects; (5) editing of course materials by masters students; (6) rat chaining projects; (7) self-development interviews; (8) doctoral and masters-level self-management projects; (9) Super A (for advanced undergraduate students); (10) behavioral academic career counseling; (11) continuous learning center; (12) new student recruitment; (13) computer training; (14) Croyden practicum (undergraduate and masters-level students working with developmentally-disabled children); and (15) doctoral-level research. All of these components have similar systems characteristics as the total system.

One subsystem of BATS was selected for closer analysis; this subsystem consisted of six sections of an advanced undergraduate psychology course, Psy. 460: Survey of Behavior Analysis Research. The superordinate system in this case is BATS, and the subordinate system is Psy. 460. For example, Psy. 460 can receive various inputs from BATS (e.g., undergraduate students with little exposure to applied behavior analysis) and produce outputs (e.g., students exposed to applied behavior analysis) for Psy. 460 or for other subsystems within BATS. These undergraduates may now have the skills required to participate as researchers in Psy. 460 or in other subsystems within BATS. In addition, some may choose to continue graduate work in BATS and may then have an opportunity to conduct Psy. 460 seminars as TAs.

Psy. 460 sections are conducted in a seminar-style, as opposed to lecture format. In other words, TAs do not lecture, but facilitate class discussion involving the homework chapters. In the twice-weekly Psy. 460 seminars, students are seated

in a semicircle around a teaching apprentice, alphabetically by first name. The faculty member, namely Dr. Richard Malott, rotates between sections, so that each section is taught by the faculty member every fifth seminar. On these occasions, the TA observe Dr. Malott's performance from the back of the class and take notes. Each section typically holds between 15 and 20 students. Students are taught the advanced applied principles of behavior analysis. Student grades are based on performance in the following four categories: (1) quizzes, (2) homework, (3) seminar participation, and (4) a final presentation. Students are given a quiz every seminar. Quizzes cover definitions of behavioral concepts and principles and are worth 20 points each. Review quizzes are administered about once per month and are worth 20 points each. Students are given flashcards of the quiz terms and use the flashcards to study the definitions before each quiz. The terms are on one side of the flashcards and the corresponding definitions are on the other side. Students are required to complete one homework assignment prior to each seminar. The homework chapters were developed by Dr. Richard Malott and cover behavioral topics such as performance management, cultural change, parenting, and autism. The homework for each chapter is worth 20 points. Text in the homework chapters is integrated with multiple-choice questions, short answer questions, and contingency diagrams. These questions are regularly interspersed within the text every two or three paragraphs. These homework chapters constitute the only reading for the course.

In the seminars, a student reads a question coming from the homework, and the teaching apprentice asks all of the students to show the answers they had in their homework by raising marked index cards corresponding to those answers. The cards are color-coded and either have the letters A, B, C, or D on the front of them. In addition, the response cards labeled with the letters A and B can be used to reply to

yes or no questions. In the case of a disagreement between the teaching apprentice and a student, the teaching apprentice will ask a student to explain his or her answer and then provide the student with feedback relevant to the answer. The entire homework assignment is covered in class and then students are given a 5-minute break. After the break, students are given the scheduled 20-point multiple-choice quiz. Students can accumulate a total of 20 additional points for participation in the seminars. Students receive participation scores based on active participation during the seminars (i.e., answering questions, showing response cards, and participating in seminar discussion) as measured subjectively by the TAs. Furthermore, at the end of the semester, students are required to complete a three page paper on a behavioral topic or performance-management project and deliver an oral presentation to the class. Students spent approximately 4 hours in class and between 6 and 8 hours studying outside of the classroom, as estimated by the systems manager (the graduate-student course supervisor). A grade of 92%, or above, in each of three categories (quizzes, homework, seminar participation) is required for an A in the course. In the event that a student's grade fell below a 92% during the semester, the TA would speak with the student after the seminar and suggest a performance-management intervention, most typically performance contracting, to increase their study time.

It was believed that Psy. 460 greatly contributed towards the accomplishment of the overall mission of BATS (i.e., to recruit, train, and maintain the skills of competent behavior analysts) and the analysis focused on this subsystem for five reasons.

First, due to the high number of seniors enrolled in the course, approximately two thirds of students enrolled in the Psy. 460 sections as estimated by informal

observation, intervening in Psy. 460 provided an excellent occasion to increase recruitment into behaviorally-oriented graduate programs or careers. By increasing the number of students recruited into behavior analysis, large steps would be taken towards accomplishing the first step element of BATS' overall mission.

Second, it was believed that by improving the course across a wide variety of variables, student behavior might be influenced in two areas. First, student learning might increase. Psy. 460 affected the quality of the BA and MA behavior analysts produced (i.e., undergraduate students and teaching apprentices). In this course, students were taught the advanced principles of behavior analysis. This course was typically one of the final courses taken by an undergraduate before graduation.

Furthermore, a great deal of research and practicum related projects were offered to students in Psy. 460. Both factors allowed students opportunities to improve their behavioral repertoires. Consequently, these factors would contribute to the second part of BATS' mission.

Third, student evaluations might improve with respect to the course and behavior analysis in general, thereby increasing the probability that students would want to continue in the field either in graduate school or in a behaviorally-oriented career.

Fourth, by involving students in behavioral research and practicum work in BATS, large steps would also be taken towards placing these students in graduate school or in a behavior-oriented career. These factors would improve the chances that these students would continue to work in the field and increase the number of behavior analysts in general. Consequently, the third part of the overall mission of BATS would be accomplished.

Fifth, Psy. 460 offered large room for improvement across a variety of levels (e.g., increased TA reliability in seminar and out-of-class task completion, and learn units per hour), as will be discussed in the following paragraphs. Not only was there room for improvement, but there was potential for improving performance in an efficient manner. I also served as the systems manager for Psy. 460 and was readily available to work with this subsystem of BATS. Other components provided opportunities to affect the overall mission of BATS to differing extents and some offered large room for improvement in an efficient manner. However, it was concluded that no other subsystem could affect the overall mission and offer the most room for efficient improvement to this extent.

As a result of this organizational-level analysis, four variables were chosen by the systems manager to be measured throughout both interventions: (1) the number of competent BA/MA behavior analysts produced as measured by scores on three pretests and posttests, (2) the number of BA students who report that they want to pursue behavior analysis academically and as a career in the future, (3) the number of course material mistakes, and (4) the number of system disconnects. Rummler and Brache (1990) identify disconnects as missing, extraneous, or illogical steps (e.g., between subsystems, within a process, between a subsystem and a customer).

Based on an analysis using Rummler and Brache's (1990) model, the primary process-level variable chosen for analysis in this research was the recruitment process. The total number of researchers recruited for the 15 BATS subsystems was low prior to the first intervention. At most, two or three researchers were recruited, and 15 researchers were needed (i.e., one researcher per subsystem). In addition, increasing the number of students involved in behavioral research would help to

accomplish the overall mission of BATS. Psy. 460 offered an effective arena to recruit students for behavioral research due to the large numbers of junior and senior-level students enrolled in the course. There was no recruitment process, however, at the beginning of the intervention. The development of process features is an important step in quality planning (Juran, 1993).

Due to my relative lack of hands-on knowledge of TQM, solutions for the job/performer level relied primarily on behavior engineering techniques. Based on an analysis using Gilbert's (1978) behavior engineering model, 25 different staff tasks on the job/performer level were chosen as areas for performance improvements (see Appendix B). Tasks were often omitted when conducting seminars even though there were written procedures detailing how seminars should be conducted. This procedures manual, however, was not often referred to by the teaching apprentices. The TAs were also given little performance feedback. Additionally, there was no formal training for new TAs and no programmed consequences for either good or poor performance. There appeared to be no deficiency in the capacity of the staff to complete their jobs. All of the staff possessed the prerequisite physical and verbal skills. In summary, it appeared first that there were deficits in antecedents (e.g., performance feedback, job procedures, and training) that needed correcting. Second, there were no programmed consequences for seminar and out-of-class tasks or frequency of learn units. In addition, there were no standards for job/performer-level tasks (see Table 1).

Work procedures (i.e., task checklists) and performance feedback were the strategies chosen to improve performance at both the process level and the job/performer level. Providing strategies for improving performance is an important step in quality improvement (Juran, 1993). The strategies chosen here have been

demonstrated to effectively improve performance, and could be implemented easily, with little cost in staff time as discussed in the following paragraphs.

Table 1

Performance Problems in BATS and Potential Solutions Using the Behavior Engineering Model

Antecedents	Behavior Prerequisites	Consequences
Information/Directions • lack of direction (task checklists) • lack of feedback (3 types of performance	Equipment/Procedures • equipment is accessible • nonefficient procedures (checklists/out-of-class procedures)	Contingencies • small but cumulative and improbable consequences
Knowledge • no training	Capacity • prerequisite abilities present	Motives • subjects not motivated by job consequences

Due to time constraints, additional intervention components were not simultaneously introduced. It was decided that if these interventions failed to produce the desired effects, other options (i.e., performance training, programmed consequences) would be implemented in future interventions. For a list of the systems problems and proposed interventions for BATS see Table 2. The intervention components listed in this table will be described in detail in the method section.

Table 2

System Problems and Proposed Interventions for BATS

	Organizational Level	Process Level	Job/Performer Level
Systems Problems	(1) no method for assessing the number of undergraduates who wish to pursue behavior analysis, (2) no method for assessing competency of undergraduates other than course grades, (3) high number of course material errors, and (4) high number of system disconnects	(1) low number of undergraduate researchers	(1) low reliability of seminar task completion, (2) low reliability of out-of-class task completion, and (3) low frequency of learn units completed by TAs
Proposed Interventions	(1) TPS diagram, (2) measurement systems, and (3) procedures to edit course materials and identify systems disconnects	(1) recruitment process, and (2) process goals	(1) task checklists, (2) face-to-face supervisor feedback, (3) e-mail feedback, and (4) videotaped feedback

Techniques for Improving Performance

Task Checklists

Task checklists involve changing the antecedents for task completion by specifying the task components or task sequence. Gilbert (1978) suggested that a checklist system is a viable and cost-effective strategy for improving staff

performance. Consequently, a task checklist system was prepared to correct the deficit in antecedents (see Appendix B).

Bacon, Fulton, and Malott (1983) suggested that task definition, recording responses on checklists, and supervisor review are the three components of a checklist system that are important for affecting performance improvements. However, the establishment of a checklist does not necessarily ensure performance improvements. It does not even ensure that individuals will use the checklists. Bacon et al. (1983) suggested, however, that individuals will utilize task checklists if the checklists facilitate completion of tasks by clarifying criteria and improving task discrimination. By requiring employees to provide specific information about completed tasks (e.g., employee signatures, completion times) on a task checklist, they may be more likely to complete the job and less likely to provide false information. Furthermore, the probability that individuals will utilize a task checklist is more likely with the addition of supervisor review (i.e., supervisors monitoring task and checklist completion).

The effects of self-monitoring (e.g., via task checklists) have been examined with performance issues such as punctuality and time on task (Lamal & Benfield, 1978), customer assistance (Komaki, Waddell, & Pearce, 1977), cleaning behaviors of hotel employees (Anderson, Crowell, Sponsel, Clarke, & Brence, 1982), and banquet staff performance (LaFleur & Hyten, 1995).

Performance Feedback

The second method chosen to correct the deficit in antecedents was to provide relevant and frequent feedback to the staff. The term "feedback" has been given many definitions. Prue and Fairbank (1981) define feedback as information

provided to individuals about the quality or quantity of their past performance. Morasky (1982) defines feedback as: "information coming to a system about various variables both within the system and within the receiving systems."

Performance feedback is a well-documented procedure that has produced performance improvement in such areas as counselor training (Bernstein & LeComte 1979), safety (Sulzer-Azaroff & De Santamaria, 1980), implementation of Statistical Process Control (SPC) quality control training programs, and the reduction of machine setup time (Wittkopp, Rowan, & Poling, 1990).

Literature reviews (Balcazar, Hopkins, & Suarez, 1986; Prue & Fairbank, 1981) have suggested that providing employees with feedback on their performance is the most commonly used strategy for modifying employee behavior. According to Prue and Fairbank (1981), performance feedback can vary along several dimensions, including: the type of mechanism used to transmit the performance data (e.g., public posting of performance information), the content of the feedback (e.g., the comparison of an individual's performance against a standard), the recipients of the feedback (e.g., several employees), the source of feedback (e.g., supervisor), and the frequency of the feedback delivery (e.g., daily). Several characteristics, such as simplicity and flexibility of implementation, low economic cost, an emphasis on positive consequences, rapidity of effects, and the capacity to be combined with other interventions, make feedback an attractive strategy for improving performance (Fairbank & Prue, 1982).

System Levels

Potentially, performance problems can occur at the organizational, process, and job/performer levels in an organization. Consequently, we must clearly specify

the desired outcomes and identify those areas where there is: (a) potential for improving performance in an efficient manner, and (b) opportunity for positively impacting the overall organizational goals. The three levels of performance can be interdependent. It is important to realize that interventions targeted at performance problems on one level might affect other levels.

As a result of the systems analysis of BATS, I chose to intervene at both the process and the job/performer levels, with emphasis on the 25 staff tasks at the job/performer level.

The effects of one intervention package consisting of task checklists and face-to-face supervisor feedback were examined on the staff performance (i.e., conducting undergraduate-level psychology seminars, completing out-of-class assignments, completing learn units) of a group of graduate TAs. Four organizational measures were also taken: (1) undergraduate performance on two pretests and posttests, (2) course and staff evaluations, (3) number of system disconnects, and (4) number of course material mistakes. In addition, one process-level measure was taken (i.e., number of undergraduate researchers recruited). All of the TAs were members of BATS at Western Michigan University and assisted in the supervision of Psy. 460 seminars.

CHAPTER II

PERFORMANCE MANAGEMENT SYSTEM 1: METHOD

The research method used in both interventions might best be called an engineering or systems-analysis research-and-development approach, as opposed to an experimental-laboratory approach. The general goal of a systems-analysis approach is to work toward the overall improved functioning and output of an ongoing system, in a realistic, cost-effective manner. This essentially entails using quasi-experimental designs where the input, processes, and output of the system are measured as carefully as possible, but where it is neither practical nor feasible to conduct the experimental controls needed to rule out all alternative explanations of changes in functioning and outputs (the dependent variables) observed. Such a design is characteristic of most systems research and development in ongoing organizations whose main goal is something other than laboratory research.

Participants

Four MA students in the psychology department participated in this study. They served as TAs for four undergraduate sections. All TAs signed consent forms before the intervention began.

Design and Procedure

The Psy. 460 seminars were held on each Monday and Wednesday. Dr. Malott, the four TAs, and I all met before each seminar for 2-hour staff meetings.

The systems manager served as the researcher. The homework and quiz for the day would be reviewed and all out-of-class assignments would be checked for completion by the systems manager.

The systems manager observed the seminar performance of each TA for a full seminar, on a rotational basis between the four sections. In other words, the seminar performance of each TA was observed, for the entire class, sequentially, that is, a different TA was watched each seminar by the systems manager. Twenty-five staff tasks at the job/performer level were measured during each seminar using task checklists. Task completion percentages were calculated for conducting the seminars and out-of-class assignments. The total number of learn units per hour were also counted. Greer (1994) defines a learn unit as follows:

1. A student is presented an unambiguous antecedent (e.g., a homework question) and attends to the relevant attributes of the stimulus.

2. The teacher provides an appropriate interval for the student to respond (e.g., to answer the question).

3. The student responds or does not respond.

4. The teacher corrects the response if incorrect or approves the response if the response was correct.

In addition, four organizational measures and one process measure were also taken (see Table 3).

TAs were told that the researcher's role was that of a supervisor and were not informed of the nature of the intervention. The intervention package was introduced after two months.

Table 3

System Problems and Measures for BATS

	Organizational Level	Process Level	Job/Performer Level
Systems Problems	(1) no method for assessing the number of undergraduates who wish to pursue behavior analysis, (2) no method for assessing competency of undergraduates other than course grades, (3) high number of course material errors, and (4) high number of system disconnects	(1) low number of undergraduate researchers	(1) low reliability of seminar task completion, (2) low reliability of out-of-class task completion, and (3) low frequency of learn units completed by TAs
System Measures	(1) a student evaluation, (2) three types of competency tests, (3) the number of errors as measured by TAs with checklists, and (4) the number of disconnects as measured by systems manager	(1) the number of researchers registered for credits	(1) task checklists completion percentages (2) reliability of tasks and frequency of learn units as measured by systems manager with checklists

Organizational-Level Intervention

The organizational-level intervention consisted of the development of goals and measures. The first goal was to increase the number of competent behavior analysts. Competency would be measured by delivering three varieties of pretests and posttests to the students. These tests were independent of the regularly scheduled tests on which the course grade was based. The first test involved writing 10 key

definitions taught in the course (see Appendix C). A second test involved 50 multiple-choice questions covering key concepts in the course (see Appendix D). A third test involved 13 short-answer questions, worth a total of 30 points, covering key conceptual material taught in the class (see Appendix E). The third test was only given to the students in the second intervention due to time constraints. Pretests were given at the end of baseline and posttests were given at the end of the intervention phase.

The second goal was to increase the number of BA students who reported that they wanted to pursue behavior analysis academically or as a career in the future. Questionnaires were given at the end of the baseline and intervention phases (see Appendix F). The final organizational goals were to decrease both the number of course material mistakes and the number of system disconnects (i.e., missing, extraneous, or illogical steps).

Process-Level Intervention

The TQM model holds that development of units of measures and goals are important steps in quality control (Juran, 1993). Consequently, the process level intervention consisted of two steps: (1) establishment of process goals and measures, and (2) the development of a "should" process map.

The overall process goal was to recruit one undergraduate-level student as a researcher in each of the components of BATS. Each of the undergraduate researchers was required to enroll for three college credits of research before the university enrollment deadline. Therefore, all process steps needed to be completed in advance of this deadline and each step, consequently, had a deadline for completion.

An "Is" process map shows the current chain of tasks which produce the product or service required by the ultimate customer (Rummler & Brache, 1990). Because there was no current recruitment process, no "Is" process map could be developed. Therefore, a "Should" process map was developed (see Figure 2). The "Should" process map depicts a process for achieving the overall process goal(s).

This process involved the following tasks: (a) developing a behavioral research questionnaire (see Appendix H), (b) determining the number of students who were enrolled in the Psy. 460 sections, (c) printing off the required number of questionnaires, (d) distributing the questionnaires to the students, (e) completing the questionnaires, (f) returning the questionnaires, (g) selecting the top candidates, (h) interviewing the top candidates and assigning these students to subsystem projects, (I) acceptance or rejection of the assignments by the undergraduate students, (j) distributing registration forms, (k) completing the forms, (l) collecting the forms and distributing the call number for registration, and (m) registering for the research credits.

Intervening at the process level mid-semester is similar to what practitioners of TQM refer to as on-line quality engineering. Fowlkes (1995) states that on-line engineering involves processes that occur during production, while off-line quality engineering occurs during the design and development of products.

The criteria for selecting a student as an undergraduate researcher included: (a) a grade point average of at least 3.5 out of 4.0, and (b) a high interest in the field of behavior analysis as measured by a five-point rating scale.

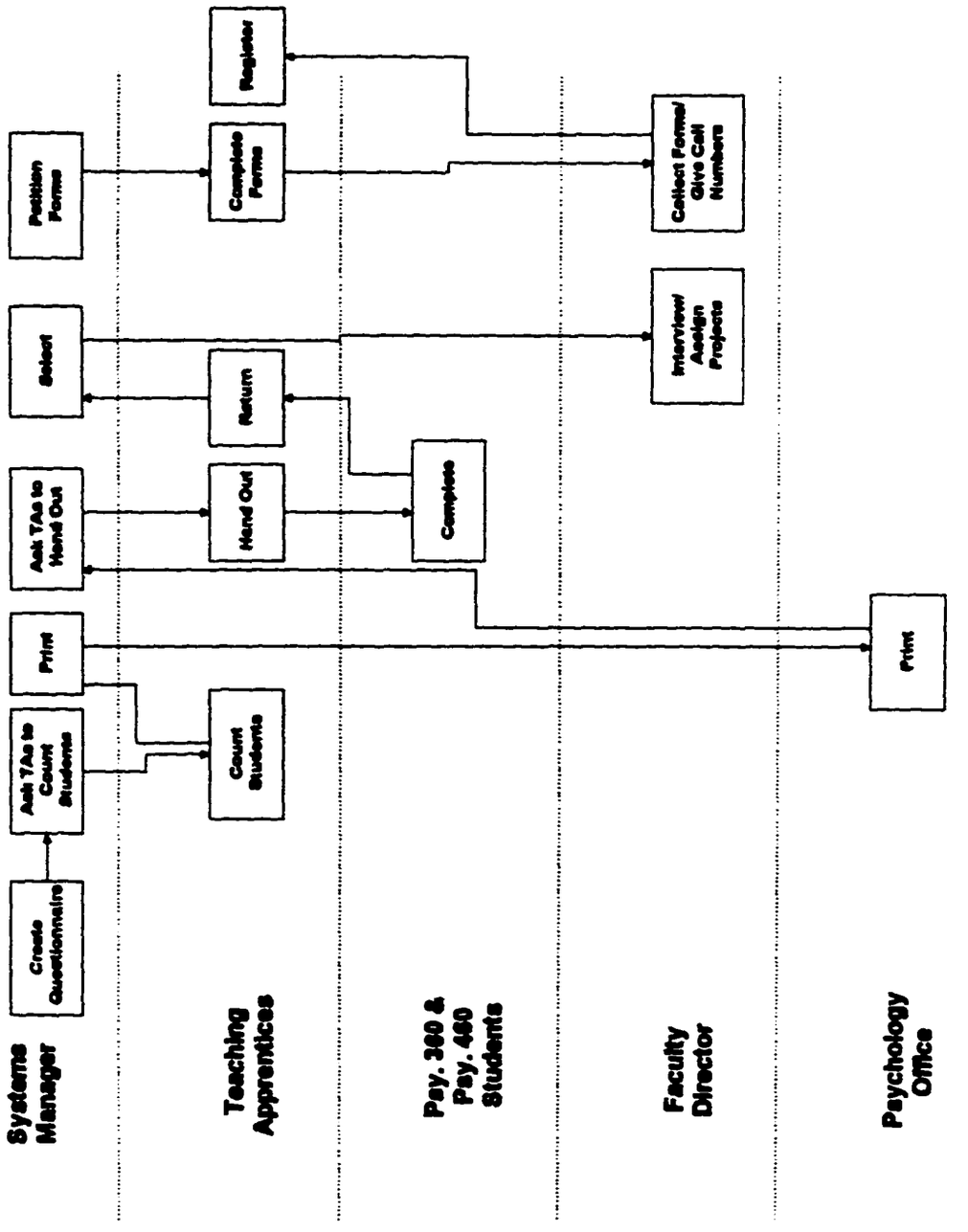


Figure 2. "Should" Process Map of the Recruiting Process in Psy. 460.

Job/Performer-Level Intervention

The job/performer level consisted of the following steps: (a) the development of clear task specifications and a measurement system (i.e., task checklists); and (b) the development of performance feedback (i.e., supervisor, electronic-mail, and videotape feedback).

The three job/performer-level variables measured were: (1) the completion of out-of class tasks by individual TAs, (2) the number of learn units completed per hour by each TA, and (3) the completion of Psy. 460 seminars by the TAs.

Conducting the seminars involved 15 more or less specific tasks. These tasks included: (1) placing chairs in a semi-circle, (2) setting up the audiovisual equipment, (3) returning class materials to the desktops, (4) posting the grade sheet, (5) beginning class on time, (6) projecting and reviewing the agenda transparency, (7) asking students to get out standard materials, (8) asking if the students had any questions regarding materials previously covered, (9) asking if the students had questions regarding the current chapter, (10) discussing the current materials, (11) allowing the students a five-minute break, (12) handing out the quizzes, (13) asking the students to leave their classwork on their desks, (14) picking up all course materials, and (15) conducting any necessary self-development interviews with students.

Out-of-class staff tasks included eight recurring tasks and individually assigned non-recurring tasks to be completed by the TAs. Recurring tasks were separated into two parts to make the workload more manageable for the TAs. The first set of tasks consisted of the following: (a) reviewing the upcoming chapter for important concepts and any errors, (b) reviewing the upcoming flashcards for errors,

(c) counting the number of points possible for the upcoming chapter, (d) reviewing the upcoming quiz for errors, and (e) creating the next staff meeting agenda. These tasks were to be completed by one TA. The second set of tasks consisted of the following: (a) revising the flashcards from the previous chapter, (b) revising the quiz from the previous chapter, and (c) creating the chapter key for the current chapter. These were completed by a second TA. The TAs assigned to complete this sequence were responsible for bringing the products and/or information to each staff meeting to be used by the entire staff. TAs were assigned recurring tasks on a rotational basis. Non-recurring tasks were assigned randomly by the faculty member.

The number of incorrect answers was measured during the seminars. If a student asked a question relevant to the homework and the TA answered incorrectly, this was marked as an incorrect response on the checklist. The number of incorrect answers given by the TAs was very low in both semesters, however, and these measurements were not included in the results section.

The number of learn units completed per hour was also measured during the seminars due to recent research suggesting its importance in improving student and teacher performance (Greer, 1994). Greer submits that learn units are critical measures of teaching behavior. The number of learn units is a measure of teacher productivity first of all. Second, accuracy in delivering learn units is important to increasing the quality or effectiveness of teaching because student learning increases when accuracy is improved. Several authors (Albers & Greer, 1991; Ingham & Greer, 1992) showed that once the teacher increases the number of learn unit presentations, student correct-answer rates dramatically increase while incorrect rates remain low.

Some research also suggests that the quantity of learn units completed effectively predicts student achievement (Greer, 1994). In other words, the more learn units completed, the more the student learns. In addition, increasing the number of learn units completed per hour likely increases learning for teachers. Greer states that these measures are utilized to teach and assist both students and teacher. Greer suggests that measures of teacher productivity and accuracy are needed to improve teacher effectiveness.

Task checklists were given to the TAs and the intervention was described in detail to them. The checklists were identical to those used covertly during the baseline phase. TAs were asked to fill out the checklists as they completed each activity during the seminar.

Performance feedback was given to the TAs by the systems manager at the end of each monitored seminar. During this time, the systems manager would compare the checklist filled out by the TA with a second identical checklist filled out by the systems manager. The seminar completion percentage, as measured by the systems manager, was then given to the TA. This percentage was computed by dividing the total number of seminar tasks by the number of seminar tasks completed. Any discrepancies between the two checklists were analyzed. In addition, the number of learn units completed that hour, as measured by the system manager, was also verbally presented to the TA. The primary measures examined at this stage were the number of learn units completed per hour by the TAs and the various tasks involved in conducting the seminars. TAs were not given explicit goals for the seminar and out-of-class tasks or the frequency of learn units, although implicit goals may have been present. For example, TAs were asked to complete a high number of learn units but no specific number was given. This strategy was chosen in order to closely

examine the effects of the feedback component and to avoid confounding the data with the possible effects of goal-setting. Data were not included if a seminar could not be directly observed for an entire hour or the seminar did not last for an entire hour.

A variety of undergraduate-student performance scores were also analyzed across conditions. Undergraduate students were given a 10-question pretest at the end of the baseline phase and a posttest at the end of the intervention phase covering the same material. This test consisted of 10 definitions covered in the course. One definition was chosen from approximately every two to three homework chapters in the course. Students were also given a 50-question pretest at the end of the baseline phase and the identical posttest at the end of the intervention phase. This test consisted of multiple-choice questions which covered key concepts taught in Psy. 360 and Psy. 460. Psy. 360 is the prerequisite class for Psy. 460 and covers the basic principles of behavior analysis. Some of the students had taken the 50-question test the previous semester. The data are only for those students who had not taken Psy. 360 the previous semester.

TA and course questionnaires were also collected from students once at the end of the baseline phase and a second time at the end of the intervention phase. Questionnaires covered topics including TA performance, various aspects of the course, and the students' academic and career plans.

CHAPTER III

PERFORMANCE MANAGEMENT SYSTEM 1: RESULTS AND DISCUSSION

Three job/performer variables were measured in both interventions: (1) seminar tasks, (2) out-of-class tasks, and (3) frequency of learn units.

First, the seminar process consisted of 15 staff tasks (e.g., reviewing the agenda, discussing homework, collecting materials). Seminar task-completion percentages are displayed in Table 4. Percentages increased from a range of 65% to 68% during the baseline condition to 85% to 100% during the intervention condition. The differences in seminar task-completion percentages between baseline and intervention phases were statistically significant according to a correlated-samples *t* test ($p \leq 0.002$). (The correlated-samples *t* test was used because the percentages of the TAs' completed tasks were expected to co-vary from the baseline to the intervention phase.) Generally, the completion of seminar tasks during baseline was low, but during intervention it was not as low.

Second, out-of class tasks consisted of nine staff tasks (see Appendix B). Out-of-class completion percentages increased from a range of 65% to 70% during the baseline condition to 90% to 100% during the intervention condition (see Table 4). The differences between out-of-class percentages between phases were statistically significant according to a correlated-samples *t* test ($p \leq 0.004$). Again, the completion of seminar tasks during baseline was low, but during intervention it was not as low.

Table 4

Performance Management System 1: Range and Mean Performance Rating Under Each Condition

Variables	Cond	Range and Mean				2-Tail Prob.	*df*
		S1	S2	S3	S4		
seminar %	base	range 79–86% mean % 81%	range 58–71% mean % 68%	range 58–75% mean % 67%	range 50–82% mean % 65%		
seminar %	int	range 100–100% mean % 100%	range 86–93% mean % 89.5%	range 85–85% mean % 85%	range 90–100% mean % 95%	.002*	3
out-of-class %	base	range 0–100% mean % 63%	range 43–100% mean % 65%	range 57–71% mean % 65%	range 50–100% mean % 70%		
out-of-class %	int	range 100–100% mean % 100%	range 80–100% mean % 90%	range 100–100% mean % 100%	range 100–100% mean % 100%	.004*	3
# of learn units per hour	base	range 53–90 mean 68	range 14–61 mean 40	range 24–49 mean 34	range 47–67 mean 56		
# of learn units per hour	int	range 16–21 mean 18.5	range 37–50 mean 43.5	range 40–55 mean 47.5	range 14–38 mean 26	.363	3

*Significant at the .05 level.

Third, the number of learn units completed per hour varied considerably between subjects during both the baseline and intervention phases (see Table 4). Overall group performance levels did not differ significantly between phases according to a correlated-samples *t* test ($p \geq 0.363$). The variability between TAs suggests that there was still considerable room for performance improvement during intervention for some TAs.

There was one process-level variable measured during both semesters; the number of undergraduate researchers recruited into BATS projects. Thirteen undergraduate students were recruited to participate in a variety of research projects in BATS as a result of the new recruitment process in the first semester, as compared to the estimate of the previously typical number of one or two students per semester, at most. These data strongly suggest that the high number of researchers recruited is the result of this new process and not the result of simply asking the students to assist in research, as had been done in previous semesters.

Five organizational-level variables were measured during both semesters: (1) the number of course material errors, (2) the number of system disconnects, (3) the number of competent behavior analysts trained as measured by three types of competency tests given to undergraduates, (4) the number of undergraduates who wish to pursue behavior analysis professionally and academically, and (5) undergraduate ratings of course variables.

First, the number of errors in the instructional material we gave to the students was measured. The instructional material was constantly being updated with new additions by both the faculty member and the MA students. Occasionally, words, sentences, or even pages were duplicated and/or missing. On other occasions, words were misspelled, and so on. They may be taken as a baseline measure of the

performance of the Psy. 460 subsystem prior to this intervention. In the semester prior to this intervention, there were an average of 6.4 mistakes per homework chapter, 1.5 mistakes per quiz, and 6.1 mistakes per chapter of definition flashcards—sufficient to warrant the efforts to correct them during the present intervention. These variables were measured throughout the next semester and can be taken as a result of the current intervention. The results are: an average of 1.5 mistakes per homework chapter, 0.5 mistakes per quiz, and 1.8 mistakes per chapter of definition flashcards. The two semesters are compared in Figure 3. While this magnitude of improvements might have occurred without the intervention of checklists and feedback, the systems manager doubts it.

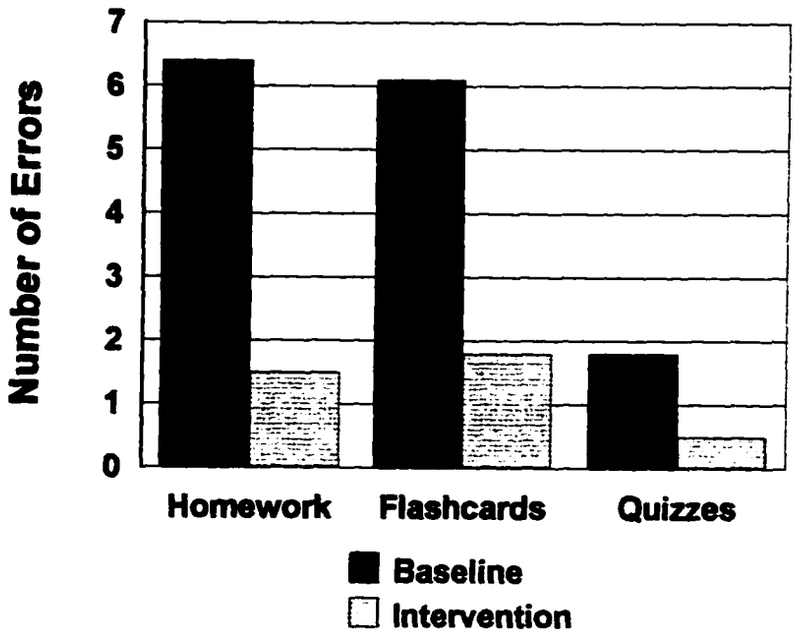


Figure 3. A Comparison of the Number of Course Material Errors Across Semesters.

Second, there were a total of 13 system disconnects were measured in this first intervention. The following is a list of those disconnects: (1) failure to distribute

and collect student mark-sense sheets (NCS forms), (2) failure to distribute student quizzes consistently, (3) no flashcard editing system, (4) no quiz editing system, (5) no organization of the Psy. 460 and Psy. 360 computer files, (6) no computer backup system, (7) no final quiz and flashcard review for the course packet, (8) no method of determining why some course material editing was not completed, (9) no clear directions for undergraduate students for the Chapter 11 quiz, (10) no recruitment system, (11) student grades not brought to staff meetings, (12) no lecture for Chapters 6 and 7, and (13) Chapter 24 was not completed. The number and seriousness of these disconnects suggested room for improvement.

Third, undergraduate test scores are displayed in Table 5. Tests were delivered halfway through the semester and during the final week of the semester. The 10-question definition test was based on terms taught in Psy. 460 for the first time. Forty-two out of 58 undergraduate students scored higher on this posttest after the intervention condition. Overall undergraduate performance levels differed significantly between phases according to a correlated-samples *t*-test ($p \leq 0.001$). The overall baseline mean score for all undergraduate students was 5 points. The overall intervention mean score was 7.7 points. Although there was considerable improvement from the baseline to the intervention, there was still considerable room for more improvement.

As mentioned earlier, Psy. 360 is a prerequisite of Psy. 460. The Psy. 360 50-question multiple choice test was given to the students in Psy. 460, though most of these concepts were not explicitly taught in Psy. 460. Thirty-four out of 65 undergraduate students scored higher on the posttest after the intervention condition, and overall performance did not differ significantly between conditions according to a correlated-samples *t* test ($p \geq 0.055$). The overall baseline mean score for all

Table 5

Performance Management System 1: Student Performance

Performance Variable	Baseline Mean	Intervention Mean	Student Improvement	2-Tail Prob.	*df*
10-question posttest	5	7.7	42/58=72%	.001*	56
50-question posttest	42.7	44	34/65=52%	.055	57

*Significant at the .05 level.

undergraduate students was 42.7 points. The overall intervention mean score was 44 points. We may consider this a positive result, in that the performance on the Psy. 360 test was fairly high both at the beginning and end of the semester in Psy. 460; it did not decrease during that semester. This suggests that the use of the Psy. 360 concepts in Psy. 460 *may* have maintained that fairly high level of performance.

Fourth, during baseline, 67% of the students (39 out of 58) stated that they wished to pursue behavior analysis academically and 81% (47 out of 58) after the intervention condition. During baseline, 74% of the students (43 out of 58) stated that they wished to pursue behavior analysis in a career and 84.5% (49 out of 58) during the intervention condition (see Table 6). While the percentages are good, even during baseline, they appear to be even better by the end of the course.

Fifth, students were asked to rank the importance of various course variables. The final rankings in terms of the percentage of students ranking each item as most important were: (1) quality of the materials (39%), (2) quality and quantity of learn units (28%), (3) mastery of the materials by the TA (17%), and (4) seminar

Table 6

Performance Management System 1: Students' Academic/Career Plans

Evaluation Variable	Condition	Percentage
% of students who want to pursue behavior analysis in academics	baseline	39/58 = 67%
	intervention	47/58 = 81%
% of students who want to pursue behavior analysis in a career	baseline	43/58 = 74%
	intervention	49/58 = 84.5%

management (16%). These data are feedback from the BATS' customers and can provide BATS with information regarding organizational strengths and/or problems. This feedback serves as a measure of the degree to which BATS' products and services meet the students' needs and provides direction for organizational strategy and performance.

Interobserver Agreement

Interobserver agreement was determined for checklist data during the intervention phase (during baseline only the student investigator collected data). The systems manager checked the reliability of every checklist that the TAs had completed and determined the seminar completion percentage, number of learn units, and incorrect answers. The performance of each TA was observed three times in the baseline phase and two times during the intervention phase. Observers were considered in agreement if each of the tasks listed as completed by one corresponded to the identical tasks listed by the other. Agreement between the systems manager

and the four TAs occurred on 100% of seminars measured during the intervention phase.

In addition, another doctoral student joined the student investigator in independently checking the number of learn units completed per hour by TAs two out of eight possible seminars during the intervention phase. The interobserver agreement percentage was calculated according to the formula: [Agreements/(Agreements + Disagreements)] × 100. Agreement between the systems manager and the second doctoral student occurred on 94% of seminars measured during the intervention phase. Data collected by the systems manager were used in all graphs and tables.

CHAPTER IV

PERFORMANCE MANAGEMENT SYSTEM 2: CONTINUATION OF SYSTEM IMPROVEMENTS

Introduction

In the first semester, the addition of task checklists combined with face-to-face feedback significantly improved the reliability of graduate student teaching apprentices (TAs) conducting seminars and completing out-of-class assignments. Therefore, the faculty course supervisor and I decided to maintain both task checklists and supervisor feedback in the second semester as part of a systems-improvement plan. However, in the second semester, performance feedback would be given weekly via electronic-mail (e-mail), instead of face-to-face, as discussed in the following paragraphs.

Therefore, one goal was to compare the effects of task checklists and supervisor feedback used in the first semester in an across-semester comparison with an intervention package of task checklists and e-mail feedback in the second semester. Again, seminar performance and completion of out-of-class assignments would be the dependent variables.

Also, in the first semester, face-to-face supervisor feedback had no significant effect on the number of hourly learn units during the seminar. Therefore, a second goal was to examine the effects of an intervention package consisting of both face-to-face supervisor feedback, and videotape feedback, with the hope that the addition of the videotape would significantly increase the number of learn units. Learn units were

again chosen due to their importance as rated by our undergraduates and as indicated by the research literature (Greer, 1994).

The same organizational and process-level dependent variables were studied as during the previous semester (i.e., number of competent behavior analysts produced, number of undergraduates who wish to pursue behavior analysis, number of course material errors, number of system disconnects, and the number of undergraduate researchers recruited).

Before looking at the details of the intervention in this semester, let us examine the research literature relevant to the two new components of this second intervention—e-mail feedback and videotaped feedback.

E-mail Feedback

Computer-mediated communication differs from other communication in time, space, speed, ease of use, audience, and opportunity for feedback (Kiesler, Siegel, & McGuire, 1984). Picot, Klingensberg, and Kranzle (1982) found that electronic communication users viewed this form of communication as less confidential, more accurate, more formal, more dependable, less private, and less stimulating as compared to face-to-face communication. Steinfield (1986) argued that little systematic research is being done on non-office contexts and suggested that educators might benefit from further research on the application of electronic communication.

Kiesler et al. (1984) provide one of the few empirical studies on this aspect and demonstrated that the use of e-mail versus face-to-face interactions had significant effects on communication efficiency, participation, interpersonal behavior, and decision making. The authors provide two tentative explanations for these

results: (1) absence of social-influence cues for controlling discussion, and (2) depersonalization from lack of nonverbal involvement and absence of norms.

In the second semester, we attempted to establish the feasibility of using electronic communication for providing performance feedback.

Videotaped Feedback

Various methods have been employed to reliably measure, assess, and train effective teacher behavior. While no definitive study has experimentally examined the effects of various videotaped interventions on learn units completed per hour, the following is a sampling of representative studies that have examined the use of videotape in various aspects of teacher training. Whitman (1988) cites role playing, manuals, written exercises, and videotape technology as components of various teacher training programs.

In addition, McKnight (1971) recommended the use of videotapes in teacher training because they provide a standard example of exemplary teacher performance that can be reviewed at any time by teacher trainees.

Since the 1960s, video technology has paved the way for the application of behavior modification techniques to teacher training. Videotape overcomes many observational obstacles; it allows immediate and repetitive replay, accurate performance recording, and total availability for analysis. Video technology has been a component of a number of educational strategies (e.g., microteaching, self-assessment, discrimination training, and videotaped feedback combined with supervisory feedback). The influence of videotaping on teacher behavior and attitudes towards teaching have been reported (e.g., McGarvey & Swallow, 1986; O'Brien &

Korth, 1991; Orme, McDonald, & Allen, 1966). In the following section, the impact of various videotaping methods on teacher training will be examined.

Videotaping Methods and Teaching

Videotaped Feedback and Microteaching

Videotaping strategies have been utilized in a great deal of research involving microteaching. Microteaching is a small practice-teaching situation first conducted in 1963 at Stanford University (McGarvey & Swallow, 1986). One important concept of microteaching is that the teaching act is composed of a number of teaching skills. Furthermore, these teaching skills can be measured, evaluated, and trained. Microteaching involves a trainee watching a video of another teacher. The trainee then practices these skills by teaching a 5- to 10-minute lesson to a small group of students (e.g., 6 to 10) while being videotaped. Video feedback is next given to the trainee by supervisors, or from trainees themselves with the aid of an evaluation form.

Friebel and Kallenbach (1968) demonstrated the efficacy of a videotape feedback intervention package (i.e., instructional films, model films, microteaching, and videotape feedback) for significantly increasing the number of questions asked by university-level student teachers which required longer student responses and fewer questions that could be answered by yes or no or with a single word ($p < .05$).

Johnson and Sulzer-Azaroff (1978) examined the effects of watching and evaluating role-playing by college TAs on the use of general prompts during quiz evaluations. Use of general prompts increased from 50% before training to 90% after training.

Videotaped Feedback and Self-Assessment

Research findings also support the use of videotape feedback in conjunction with a number of other strategies. One effective strategy is to have teachers evaluate their own performance in the classroom after conducting a teaching session in either simulated or actual classroom settings.

For example, Acheson (1964) examined the effects of videotape feedback on the frequency of episodes of teacher-student interactions for teacher trainees who observed their own teaching behavior via videotaped recordings during supervisory conferences. Forty-eight teacher interns were videotaped two times each for a period of 20 minutes. Videotaped feedback produced significant decreases ($p = 0.05$) in the amount of teacher dialog and significant increases in the amount of student participation.

McConnell and Fages (1980) compared the effects of videotape feedback on reports of self-confidence and specific teaching skills (i.e., conducting structured lessons) for preservice physical education teachers in two different settings: a college laboratory setting, and a field experience setting. Students rated the effectiveness of videotaped feedback on a Likert scale, with 1 representing very effective, and 5 representing not effective. The authors found significant differences ($p = 0.05$) in ratings for the group that received videotape feedback in the field setting. The mean rating for the field-setting group was 1.5, while the mean rating for the laboratory group was 2.3.

Mertz (1972) examined the effects of three sessions of split-screen videotaping (one camera directed towards the students and one toward the teacher) on the verbal and nonverbal behavior of 17 sixth, seventh, and eighth grade teachers.

The teachers in the experimental conditions showed significant improvements ($p = 0.05$) in their verbal and nonverbal behavior as judged by administrative evaluators. These effects continued for a period of 4 months, without the use of videotaping, as assessed by a follow-up measure.

Videotaped Feedback and Discrimination Training

A third strategy has been to examine the effects of videotaped feedback in conjunction with discrimination training (as described later).

For example, Orme et al. (1966) compared the effects of written feedback to video feedback on the effectiveness of teacher training. The authors found that teachers completed more so-called probes (e.g., clarification, prompting, and redirection of student answers) after viewing the videotape feedback ($p < .10$). The authors suggest that probing should be used in lessons where student participation is prerequisite to the goals of instruction. However, the researchers also found that the greater changes were produced when a supervisor who provided discrimination training participated in the videotape feedback sessions than when the teachers viewed their performances alone.

Legge and Asper (1972) conducted an experiment to examine the effects of videotape methods in improving preservice teachers' discrimination abilities. They found that preservice teachers who viewed their own teaching performance were able to view and rate a film of another teacher's performance significantly closer ($p = .025$) to the ratings of a group of master teachers than those preservice teachers who attended the same course but did not view their own teaching performances. In other words, the teachers learned to discriminate more accurately between good and bad teacher performance.

Videotaped Feedback and Supervisory Feedback

A fourth strategy used in teacher training is to examine the effects of videotape feedback (in conjunction with self-analysis) in combination with supervisory feedback. Hartshorn and Prather (1988) suggested that combining video and supervisor feedback has the potential to both increase the uniformity of teacher assessment, and provide effective feedback for teachers.

For example, Jensen and Young (1972) had student teachers deliver practice lessons and then view a videotape of their performance in conjunction with supervisor feedback given during the evaluation. A control group received no videotape feedback. Both groups were then evaluated three times during student teaching in real public-school classrooms. The group of teachers who received the video feedback received significantly higher ratings ($p = 0.5$) on five of six rating scales as compared to the control group with a general increase during later evaluations.

Ford (1984) compared the effects of supervisor feedback and videotape feedback, used singularly and in combination, on teaching skills (i.e., teaching dining, dressing, and bathing) of paraprofessionals in a mental retardation facility. Mean performance ratings ranged from 19% to 61% during baseline conditions. Percentages increased to a range of 30% to 100% during the supervisory feedback sessions. The highest performance ratings were obtained in the supervisor and videotape feedback combination with a range of 74% to 100%.

Olivero (1964) attempted to answer the following three questions regarding teacher performance:

1. Does feedback from supervisors who observe televised recordings of classroom performance produce more changes in teacher trainees' behaviors than feedback from supervisors who observe the lesson taught in the classroom?

2. Do teacher trainees need to have feedback from supervisors in order to change teacher trainees' behavior?

3. Does verbal and videotape feedback from supervisors produce more change in teacher trainees' behaviors than verbal supervisor feedback alone?

Ninety intern-teachers and/or student teachers from a secondary education program were chosen for the study and were assigned to nine groups. All of the teacher trainees had four practice-teaching opportunities, taught a 5-minute lesson that was videotaped, received one of the nine treatments, and retaught the same 5-minute lesson to a different group. Results showed that feedback from supervisors who observe televised recordings of classroom performance do not produce more changes in teacher trainees' behaviors as compared to feedback from supervisors who observe the lesson taught in the classroom. However, the results showed that teacher trainees do need some form of feedback and that the combination of videotape and verbal supervisor feedback is more effective than verbal supervisor feedback alone in improving teacher performance ($p < 0.05$).

The present research extends Olivero's (1964) findings by examining the effects of an intervention package consisting of both face-to-face supervisor feedback, and videotape feedback on learn units completed per hour, with the hope that the addition of the videotape would significantly increase the number of learn units. These results are then compared with the face-to-face supervisor-feedback-alone intervention conducted during the first semester in an across-semesters comparison.

CHAPTER V

PERFORMANCE MANAGEMENT SYSTEM 2 : METHOD

Participants

There were two TAs in this phase of the intervention. Both were members of the Behavior Analysis Training System. Neither TA participated in the first intervention.

Design and Procedure

The seminars were held on each Monday and Wednesday. The faculty systems supervisor, the systems manager, and both TAs met before each seminar for 2-hour staff meetings. I served as the systems manager again. The homework and quiz for the day would be reviewed and all out-of-class assignments would be checked for completion by the systems manager.

The systems manager measured the seminar performance of each TA for a full seminar on a rotation basis between the four sections. Twenty-five staff tasks at the job/performer level were measured during this period using task checklists. TAs were not informed of the nature of the intervention. Task completion percentages were calculated for conducting the seminars and out-of-class assignments. The total number of learn units per hour were calculated. In addition, the identical organizational and process measures were also taken.

The organizational-level variables measured in this intervention were identical to those measured in the first intervention and included: (a) number of competent BA/MA behavior analysts produced (i.e., scores on three pretests and posttests); (b) number of BA students who report that they want to pursue behavior analysis academically and as a career in the future; (c) the number of course material mistakes; and (d) the number of system disconnects. The process-level variable measured was the recruitment process. The job/performer-level variables measured included: (a) the completion of out-of class tasks by individual TAs (e.g., one TA is assigned to bring the appointed quiz to each staff meeting); (b) the number of learn units completed per hour by each TA, and (c) the completion of seminars by the TAs.

Task checklists and e-mail feedback were introduced in the first week of the course and were in effect the entire semester as part of a systems-improvement plan. This part of the intervention examined the effects of the preceding intervention package on seminar performance and completion of out-of-class assignments by TAs. Seminar completion and out-of-class completion percentages, as measured by the systems manager, were electronically mailed to both TAs once per week. TAs informed the systems manager the following staff meeting on whether they received and reviewed the e-mail feedback. TAs were subjectively graded by Dr. Malott on their seminar performance.

Supervisor and videotape feedback were introduced in a single-organism multiple-baseline design. Nineteen data points were collected across both phases on the performance of each participant. The effects of this intervention package were examined only on the number of learn units completed per hour by the TAs.

Videotaping began the first week of the course, and teaching apprentices were told that the taping was part of a quality improvement intervention and were not

informed of the nature of the intervention.. Cameras were set up in the rear of the classroom on a tripod. This equipment was provided by the audiovisual department of the university. Seminar sections were taped on each Monday and Wednesday. Each seminar was taped for one hour. Data were not included if the entire seminar was not directly observed or if the seminar lasted less than an hour, as was the case on 3 out of 22 occasions. The systems manager (current researcher) reviewed the tapes during the week and counted the number of learn units per hour completed by TAs. Interobserver reliability was also checked by the same doctoral student checked reliability in the first intervention.

During the intervention phase, TAs individually viewed their performance from the previous seminar for 10 minutes. The feedback sessions during this intervention were more comprehensive than those conducted in the first intervention. Sessions were conducted approximately a half an hour before the seminars. In the first feedback session, the systems manager provided the TAs with the definition of a learn unit and provided several examples. During each feedback session, the TAs were asked to verbally identify when a learn unit was completed on the tape. The systems manger then provided immediate feedback. The TA was informed as to whether the identification of the learn unit was correct or incorrect and the rationale. In the event that a learn unit was completed on the tape and the TA failed to identify it, the systems manager stopped the tape, rewound it to the relevant point and replayed the tape where the completed learn units occurred.

A variety of undergraduate student performance scores were also measured by phase. Undergraduate students were given a 10-question pretest at the end of the first baseline phase and the same test at the end of the intervention phase. This test consisted of 10 randomly chosen definitions covered in the course. Second, students

were also given a 50-question pretest at the end of the first baseline phase and an identical posttest at the end of the intervention phase. This test consisted of multiple-choice questions which covered key concepts taught in Psy. 360 and Psy. 460. Psy. 360 is the prerequisite class for Psy. 460 and covers the basic principles of behavior analysis. In addition, a 13-question short-answer conceptual test, worth a total of 30 points, was administered at the end of both the baseline and intervention phases (see Appendix E). This test covered more advanced concepts taught in the course and was in a short-answer format.

TA and course questionnaires were also collected from students once at the end of the first baseline phase and a second time at the end of the intervention phase. Questionnaires covered topics including: TA performance, various aspects of the course, and academic and career plans.

CHAPTER VI

PERFORMANCE MANAGEMENT SYSTEM 2: RESULTS AND DISCUSSION

As mentioned earlier, three job/performer variables were measured in both interventions: (1) seminar tasks, (2) out-of-class tasks, and (3) frequency of learn units. First, the seminar process consisted of the same 15 staff tasks as in the first semester (e.g., reviewing the agenda, discussing homework, and collecting materials). Percentage completion of seminar tasks ranged from 85% to 100% for subject 1 and from 89% to 100% for subject 2 (see Table 7). The seminar process results obtained in the intervention phases of both semesters did not differ significantly from each other in a t test ($p \geq 0.261$). Furthermore, seminar process results obtained in the intervention phase in the second semester were significantly better than the baseline results in the first semester ($p \leq 0.008$).

Second, out-of class tasks consisted of the same nine staff tasks as in the first phase (e.g., reviewing the next chapter, revisions). Out-of-class completion percentages were 100 % during this phase of the intervention for subject 1 and ranged from 80 % to 100 % for subject 2 (see Table 7).

The out-of class task results obtained in the intervention phases of both interventions were compared and did not differ significantly in a 2-sample t test ($p \geq 0.734$). Furthermore, out-of-class results obtained in the intervention phase in the second semester were significantly better than the baseline results in the first semester ($p \leq 0.002$). All of this suggests that the satisfactory performance obtained

for both the seminar process and out-of-class tasks during the first semester, with face-to-face feedback, was also obtained during the second semester, with e-mail feedback.

Table 7

Performance Management System 2: Range and Mean Performance Rating Under Each Condition

Variables	Cond	Range and Mean		2-Tail Prob.	*df*
		S1	S2	Within Semester Comparison	
seminar %	intervention	range 85–100% mean % 96.6%	range 89–100% mean % 97.2%		
out-of-class %	intervention	range all 100%	range 80–100% mean % 97.1%		
# of learn units per hour	baseline	range 5–38 mean % 18.5	range 3–45 mean % 23.9		
# of learn units per hour	intervention	range 22–80 mean % 44.4	range 39–59 mean % 48	0.023*	1

*Significant at the .05 level.

Third, the number of learn units completed per hour by TAs across experimental conditions is shown in Figure 4. The mean number of learn units completed per hour increased from 18.5 during baseline to 44.4 during the intervention phase for subject 1 and 23.9 to 48 for subject 2 (see Table 7)—a significant improvement according to a correlated-samples t test ($p \leq 0.023$). This suggests that the videotape feedback was effective in increasing the number of learn units, especially because face-to-face supervisory feedback did not produce a significant increase during the previous semester. This across-semester comparison is somewhat clouded, however, by the failure of an independent-samples t test ($p \geq 0.069$) to obtain a significant difference in the amount of improvement between the two semesters and thus between the face-to-face and videotape feedback.

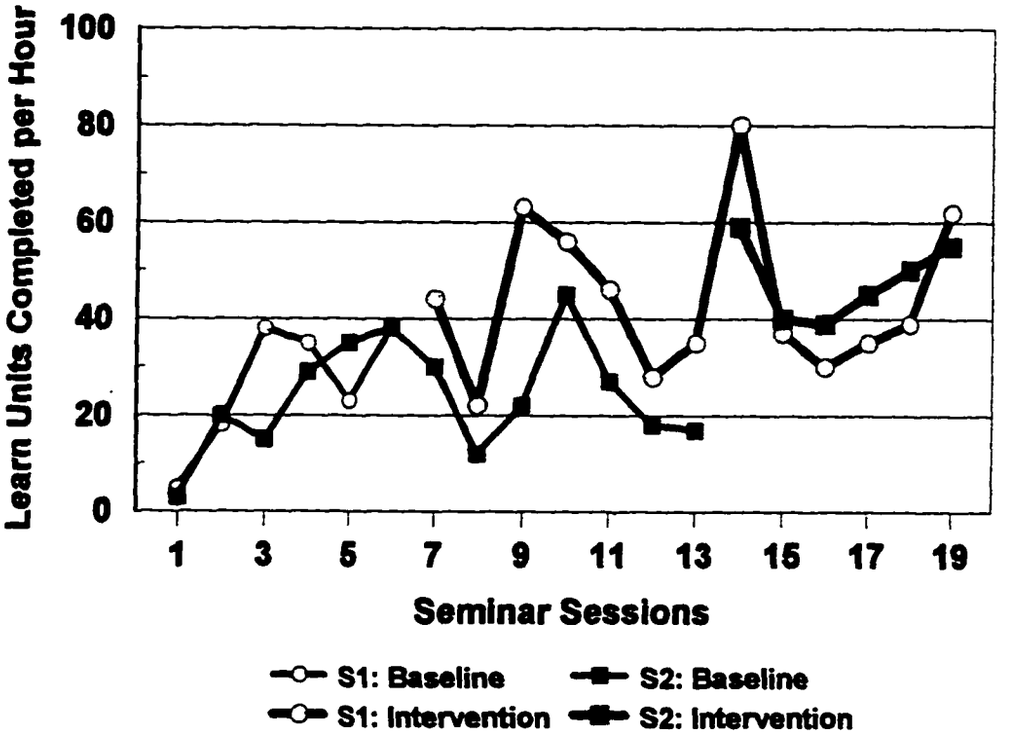


Figure 4. Performance Management System 2: Learn Units Completed per Hour.

There was one process-level variable measured during both semesters: the number of undergraduate researchers recruited into BATS projects. Thirteen additional undergraduate researchers were recruited to participate in the research projects in BATS as a result of the recruitment process, an important replication of the previous semester's results, especially when contrasted with the very low estimated recruitment rate from earlier semesters.

Four organizational-level variables were measured during both semesters: (1) the number of system disconnects, (2) the number of competent behavior analysts trained as measured by three types of competency tests given to undergraduates, (3) the number of undergraduates who wish to pursue behavior analysis professionally and academically, and (4) undergraduate course variable ratings.

First, a total of 3 system disconnects were found in this second intervention as compared to 13 system disconnects found in the first semester. The 3 disconnects found were: (1) no method of determining why some course material editing was not completed; (2) student grades not brought to staff meetings; and (3) as in the previous semester, no lecture for chapters six and seven. This would appear to be an important decrease in disconnects.

Second, as Table 8 shows, 27 out of 32 students scored significantly higher on the 10-question definition test after the intervention phase, with a mean pretest score of 2.8 questions correct and a mean posttest score of 6.2 correct according to a correlated-samples t test ($p \leq 0.001$). However, there is still more room for socially and statistically significant improvement.

Table 8 also shows that 28 out of 32 students scored higher on the 50-question Psy. 360 multiple-choice test after the intervention, with a mean pretest

score of 36.3 questions correct and a mean posttest score of 39.4 correct, a significant improvement according to a correlated-samples *t* test ($p \leq .001$).

Table 8 further shows that 30 out of 34 undergraduate students scored higher on the 13-question conceptual test after the intervention, with a mean pretest score of 12.3 points and a mean posttest score of 20.1 points out of 30, a significant improvement according to a correlated-samples *t* test ($p \leq 0.001$). While there is still considerable room for improvement, considerable learning would also seem to have occurred.

Table 8

Performance Management System 2: Student Performance

Performance Variable	Baseline Mean	Intervention Mean	% Improvement	2-Tail Prob.	*df*
10-question posttest	2.8	6.2	27/32 = 83.4%	≤.001*	31
50-question posttest	36.3	39.4	28/32 = 87.5%	≤.001*	31
13-question conceptual posttest (30 points)	12.3	20.1	30/34 = 88.2%	≤.001*	33

*Significant at the .05 level.

Third, during baseline, 45% of the students (15 out of 33) stated that they wished to pursue behavior analysis academically; this increased to 62% (18 out of 29) at the end of the intervention. During baseline, 48.5% of the students (16 out of 33)

stated that they did wish to pursue behavior analysis in a career academically; this increased to 73.3% (22 out of 30) at the end of the intervention (see Table 9).

Table 9

Performance Management System 2: Students' Academic/Career Plans

Evaluation Variable	Condition	Percentage
% of students who want to pursue behavior analysis in academics	baseline	15/33 = 45%
	intervention	18/29 = 62%
% of students who want to pursue behavior analysis in a career	baseline	16/33 = 48.5%
	intervention	22/30 = 73.3%

Fourth, students were asked to rank the importance of four course variables on an evaluation (see Appendix F). The final rankings in terms of the percentage of students ranking each item as most important were: (1) quality of the materials (29%), (2) quality and quantity of learn units (27%), (3) mastery of the materials by the TA (27%), and (4) seminar management (17%). An across-semester comparison shows that the relative rankings of these variables did not change. The percentage of students who ranked quality of the materials as most important, however, dropped from 38% to 29%. It is possible that decreases in the percentage of students who ranked course materials as most important may be associated with the considerable editing improvements in the materials completed by the TAs. In the first semester, approximately one fourth of the undergraduate students, as estimated by the systems manager, verbally complained to TAs about the high number of errors in the course materials. These complaints could not be specifically voiced in this evaluation

because no question specifically addressed complaints. In retrospect, this issue should have been more closely assessed. Therefore, many of these complaining students may have ranked the importance of the quality of course materials highly to ensure that future students would receive instructional materials with far fewer mistakes. The percentage of students who complained about material quality decreased 9% across semesters. In addition, the relative importance of this variable, as measured by the evaluations in the second semester, decreased.

Future social validity measures might assess if the decreased percentages in the quality of materials variable was due to a decrease in the number of errors or because students felt other variables played a more important role in learning. Data obtained from part of the evaluation is being analyzed as part of a separate study and will not be presented.

Interobserver Agreement

Interobserver agreement was determined for checklist data during both the baseline and intervention phases. The systems manager checked the accuracy of every checklist that the TAs had completed and determined the seminar completion percentage, the out-of-class assignment completion percentage, and the number of learn units completed per hour. The performance of each TA was observed on 19 occasions. Observers were considered in agreement if each of the critical items listed as completed by one corresponded to the identical items listed by the other. Agreement between the systems manager and both TAs occurred on 100% of the seminars during both the baseline and intervention phases.

In addition, a doctoral student joined the student investigator in independently checking the number of learn units completed per hour by TAs 10 out of 38 possible

seminars across both phases. The interobserver agreement percentage was calculated according to the formula: [Agreements/(Agreements + Disagreements)] × 100. Agreement between the systems manager and the second doctoral student occurred on 89% of the seminars during both phases. Data collected by the systems manager were used in all graphs and tables.

CHAPTER VII

GENERAL CONCLUSIONS

Rummler and Brache's (1990) systems model holds that the degree to which any system effectively fulfills its mission in society is the result of the effectiveness of the various components at the organizational level, the process level, and the job/performer level and the extent to which they act together as an integrated whole. These three levels of performance are interdependent; so interventions targeted at performance problems on one level may affect other levels. As a result of a systems analysis of BATS, the interventions described here were aimed at both the process and the job/performer levels, with emphasis on the 25 staff tasks at the job/performer level. Performance was also measured at the organizational level.

The effectiveness of each level of performance is affected by a number of variables. Gilbert's (1978) behavioral engineering model provides a framework for effectively analyzing these performance variables, especially at the job/performer level. Gilbert listed six areas (clusters of performance variables) in the behavior engineering model in which interventions might yield large returns in improved performance. An analysis of the performance variables is required to determine which areas are causing the performance problems and thus which interventions will yield the best results. In many cases, not all six areas need improvement.

The Behavior Analysis Training System (BATS) was analyzed by applying the systems view to the three levels of performance. The job/performer level was analyzed using the behavioral engineering model. Additionally, one subsystem of

BATS, sections of an advanced undergraduate psychology course (Psy 460), was selected for closer analysis.

In the current study, there appeared to be no deficiency in the capacity of the Psy. 460 staff, physically or verbally, to complete seminar and out-of-class tasks and learn units. However, there appeared to be deficiencies in the other five performance areas, as determined by the behavior engineering model. First, TAs received little performance feedback/direction. Second, tasks were often omitted when conducting seminars even though there were written procedures detailing how seminars should be conducted. However, the procedure manual was rarely used by the TAs. Third, there was no formal training for new TAs. Fourth, there were no programmed consequences for either good or poor performance. However, small but cumulative and/or improbable consequences were occasionally delivered. For example, if a TA failed to complete an assigned task, a mild reprimand might be delivered. In other cases, the incomplete task might not be monitored by the systems manager or faculty member and a systems disconnect could result. Fifth, these small but cumulative and/or improbable consequences did not effectively motivate TAs.

As a result of an analysis of the performance variables, the intervention addressed two of these areas: directions and procedures, which seemed to have the greatest potential for improvement with the resources available. The introduction of the antecedent component (i.e., task checklists) was designed to correct the direction deficits. The assignment of specific staff to certain tasks listed on checklists was designed to improve out-of-class procedures. In addition, a variety of performance feedback techniques were also utilized in each semester. These strategies have been demonstrated to effectively improve performance, and could be implemented easily, with little cost in staff time. Furthermore, the introduction of performance feedback

may be placed in either the information/direction, contingencies, or training cell as will be discussed in the following paragraphs. The problem areas and the interventions are indicated in the table of the behavioral engineering model (see Table 1).

Job/Performer Level Summary

Seminar and Out-of-Class Performance

In the first semester, the implementation of a combination of task checklists and face-to-face supervisor feedback was associated with statistically significant improvements in seminar and out-of-class performance of the TAs. This level of improved performance was maintained during the second semester, with different TAs, when e-mail feedback was substituted for face-to-face supervisor feedback.

A component analysis was not possible during the intervention phases due to time constraints. Therefore, it is not clear whether either task checklists or supervisor feedback alone or the combination produced and maintained increases in seminar and out-of class completion percentages. However, it would be worthwhile to perform a brief theoretical analysis to better comprehend the behavioral processes underlying checklists and feedback.

Checklists

Task checklists may have functioned as warning stimuli, increasing the frequency of seminar and out-of-class behaviors that had in the past been under the control of rule-governed analogs to avoidance (e.g., avoidance of the loss of the opportunity for praise and avoidance of reprimands). Such analog contingencies are

suggested by the three-contingency model (Malott, 1992): the checklist may have combined with noncompletion of the checklist tasks to function as a conditional, learned-aversive stimulus. The TA then escaped the aversive stimulus by completing the listed seminar and out-of-class tasks. In addition, the TAs, thereby, avoided the delayed delivery of negative feedback from the systems manager and faculty member and avoided the loss of the opportunity for praise from those supervisors.

This is an alternative to the more traditional analysis by Bacon et al. (1983) who suggested that the effects of checklists may be a function of a general history of reinforcement for following instructions from authorities. The present analysis also brings into question the suggestion by Bacon et al. (1983) that the outcome of viewing a checklist, recalling details of the task, and recording those details on the list may acquire some (positive) reinforcing properties. Instead, the three contingency model would suggest negative reinforcing properties.

The three-contingency model also suggests why the on-the-job checklist might be more effective than an off-the-job procedure manual or earlier oral instructions: Looking at the checklist might more reliably evoke a statement of the rule describing the tasks and standards, and this rule statement could then combine with the noncompletion of the tasks to more reliably generate the conditional, learned-aversive stimulus that the TA would escape by completing the tasks. In everyday terms, the checklist would increase the likelihood the TAs would remember what to be worried about.

Feedback

Both face-to-face supervisor and e-mail feedback may also have contributed to the high seminar and out-of-class completion percentages. The present data

suggest that the introduction of checklists in conjunction with both face-to-face supervisory feedback and e-mail feedback was associated with significant improvements in seminar and out-of-class completion percentages. Again, because a component analysis was not conducted, it is difficult to determine the effects of each of these components independently.

There are several interpretations for the effects of face-to-face supervisor and e-mail performance feedback. As many authors have indicated, to label information as "feedback" does not clearly identify its role in controlling behavior (Duncan & Bruwelheide, 1986). Peterson (1982) has called for the elimination of the term "feedback" because it does not clearly specify a single function, and hence is ambiguous. Peterson suggests that when feedback is used in research, it should be specifically identified and operationalized as an independent variable. For example, rather than stating "feedback was used to . . . ," it might be better to say "the use of individual TA electronic-mail posting was used to . . ." In other words, one does not explain the behavioral functions of the information provided by simply stating that feedback was delivered. Information about an individual's past performance might act as an establishing operation, reinforcer, punisher, discriminative stimulus, conditional stimulus, or play some role in the establishment of rule-governed behavior (Wittkopp et al., 1990).

Feedback stimuli are often categorized as reinforcers or discriminative stimuli (Peterson, 1982). However, Agnew and Redmon (1992) stated that feedback would have to be correlated consistently with the presentation of a reinforcer and would have to evoke behavior immediately in order to function as a discriminative stimulus. Also, in their analysis, feedback would not only have to increase the probability of behavior in the future but also follow past instances of that behavior immediately for

that feedback to be considered a reinforcer (or perhaps more precisely, for the underlying process to be considered reinforcement). In other words, these contingencies must be direct-acting contingencies in order to be reinforcement contingencies.

Malott (1992) defined the *direct-acting contingency* as one in which immediate consequences directly reinforce or punish behavior. An effective contingency with an outcome that is too delayed to directly reinforce or punish the behavior is an *indirect-acting analog contingency.* According to Malott, an indirect-acting contingency can control behavior only when it is described by a rule; thus behavior under the control of indirect-acting contingencies must be rule-governed.

Several authors (Agnew & Redmon, 1992; Malott, 1992; Peterson, 1982) suggested that many examples of feedback can be explained in terms of rule-governed behavior. Malott, Shimamune, and Malott (1992) argued that procedures based on rule-governed analogs to direct-acting contingencies are used more frequently in organizational behavior management research as compared to procedures based on direct-acting contingencies alone. Agnew and Redmon (1992) stated that rules describe behavioral contingencies and that behavior is evoked by the events described by the rules. Malott (1992) suggested that people readily follow rules describing indirect-acting contingencies, in spite of the delay, provided the outcomes are sizable and probable.

In this study, the TAs received rules describing the indirect-acting contingencies (i.e., delayed performance feedback). For example, TAs were told: "The number of completed tasks for each seminar will be used to calculate a seminar completion percentage you will receive via e-mail at the end of the week."

Based on an analysis of rules as contingency-specifying stimuli by Blakely and Schlinger (1987), Agnew and Redmon (1992) suggested that rules enhance the effectiveness of a variety of stimuli in the immediate environment, and it is those altered stimuli which now directly control the behavior. They suggested that rules can alter the evocative function of discriminative stimuli, the reinforcing or punishing function of consequent stimuli, and the function of stimuli in respondent relations. For example, the task checklists could function as discriminative stimuli which affect the amount of work done, and completed out-of-class assignments and checklists could function as reinforcing stimuli. According to this interpretation, such stimuli might maintain superior performance after the statement of the rule.

Continuing with the rule-governed analysis, begun with the discussion of the checklist, the same behavioral processes underlie the effectiveness of delayed feedback. The indirect-acting feedback contingency directly reinforces task completion by escape from the conditional learned aversive stimulus of the checklist combined with noncompletion of the checklist tasks. The TA then escapes the conditional learned aversive stimulus by completing the listed seminar and out-of-class tasks and marking the checklist. In this analysis, the immediate events are primarily negative reinforcing contingencies.

But what role does the feedback play? For example, TAs were told: "If you complete all of the assigned tasks while conducting a seminar, you will receive a 100% seminar completion percentage (or a lower percentage, if you complete fewer tasks) at the end of the week." This statement made prior to the seminar (even at the beginning of the semester) is a verbal analog to a pairing procedure; the conditional stimulus (incompleted tasks, task checklist, and proximity to the deadline) is paired with the loss of the opportunity for high percentage-complete feedback, and it is also

paired with the receipt of lower percentage-complete feedback. In that way the conditional stimulus (incompleted tasks, task checklist, and proximity to the deadline) becomes a learned-aversive stimulus. This is analogous to the direct pairing of the warning-stimulus buzzer and the shock in a traditional, direct-acting, cued-avoidance procedure—the pairing then causes the buzzer to become a learned aversive stimulus, the rat escapes, according to the two-factor theory (Mowrer, 1947).

Note that this verbal, rule-governed analog pairing process can occur prior to the opportunity to do the tasks. The feedback itself, could serve to provide additional analog pairings.

In summary, both interpretations agree that rules work to make delayed consequences more effective. Agnew and Redmon (1992) suggested that rules influence behavior by changing the function of a variety of stimuli. Malott (1992) suggested that rules make delayed consequences more effective through the creation of aversive stimulation that is escaped when the rule is followed.

After the introduction of the antecedent components, it is possible that seminar and out-of-class behaviors were influenced by the rules provided at the beginning of each intervention phase or by rules the TAs developed on their own. These rules specified relations between performance and the delayed outcomes. In so doing, they altered the function of a crucial conditional stimulus (incomplete tasks combined with the checklist and proximity to the deadline) allowing for direct control over the occurrence of the relevant behavior. It appears then, that the increase and maintenance of completion percentages may have resulted from a combination of the antecedent components (task checklists and feedback), the resulting rules (complete the tasks properly and in a timely basis to receive good feedback), and the indirect-acting contingencies (the relation between task and delayed performance feedback).

Similar issues were raised in regards to the effects of videotaped feedback on the number of learn units completed by TAs.

Learn Units

During the first semester, face-to-face supervisor feedback had no statistically significant effect on the frequency of learn units (question-answer-feedback sequences) the TAs completed in the seminars. However, during the second semester, videotaped feedback added to the face-to-face supervisor feedback was associated with a statistically significant increase in the frequency of learn units. It may appear that instead of an intervention effect, there was an upward trend (see Figure 4). However, if the data points for the first session are dropped (a common practice to eliminate "warm-up" effects), there appears to be considerably less of an overall upward trend. In the first semester, TAs were simply told the number of learn units that had been completed in a seminar. In the second semester, TAs were shown videotape footage of actual classroom performance. Continuing with the rule-governed analysis, begun with the discussion of the checklist and delayed supervisor feedback, the same behavioral processes would seem to underlie the effectiveness of delayed videotape feedback.

The delivery of videotaped feedback might also be considered a form of training. Odiorne and Rummler (1988) suggest that videotape is not only an effective strategy to be utilized in training, but that the resulting videotapes might then be disseminated within and outside of the system for marketing and client relations.

It is important to note, however, that both supervisor and videotaped feedback were confounded with giving the definition of a completed learn unit to the TAs at the beginning of each intervention phase. This would have been avoided had

the definition been provided at the beginning of each baseline phase. While performance did increase from baseline to intervention in the second semester, no significant increases in completed learn units were found in the first semester. These findings suggest that providing the definition of a completed learn unit at the beginning of the intervention phases may not have affected performance.

The lack of significant findings in the number of learn units in the first semester may have been due to the type of feedback provided. In the first semester, TAs were simply given the total number of learn units completed that seminar as opposed to viewing videotaped footage of their performance. However, different groups of TAs and students participated in each semester. So this comparison between face-to-face supervisor and videotape feedback needs to be examined more closely using a methodology that tests the effect of the confounding variables separately.

Overall, job/performer-level performance improved across all three dependent variables. Improvements in performance (i.e., increased reliability of conducting seminars and completing out-of-class tasks, increased frequency of learn units) likely affected the competency level of the TAs, thereby contributing to the second component of the organizational goal of BATS (i.e., production of competent behavior analysts). The first component of the organizational goal of BATS (i.e., recruitment of BA, MA, and Ph.D. students into behavior analysis) was addressed at the process-level.

Process-Level Summary

Researcher Recruitment

Thirteen undergraduate researchers were recruited in each semester to help conduct behavioral research in BATS in comparison to two or three in previous semesters. As a result, the process goal of recruiting one undergraduate researcher for each subsystem in BATS was achieved. In addition, accomplishing this overall process goal contributed to the recruitment component of the overall organizational goal of BATS.

The number of undergraduate researchers, however, that were recruited by BATS in the semester following the completion of the second intervention declined to four. This may be due to several reasons. First, the current systems manager was not provided directions regarding the recruitment process from myself and may not have been provided instructions or direction from the faculty member. Second, the number of researchers needed by the various subsystems may have declined since the end of the current intervention. Third, the number of researchers needed may not have been assessed. In retrospect, a maintenance plan should have been included as part of this intervention.

Organizational-Level Summary

If a behavior management program is to be socially valid as well as scientifically significant, it must be carefully designed to help achieve the mission of a system (Crowell & Anderson, 1983). Therefore, the performance goals at both the job/performer and process-levels of BATS were designed to increase the likelihood BATS would achieve its overall mission. Four organizational-level variables were

tracked throughout both semesters and the results will be discussed in the following paragraphs.

Undergraduate Performance

First, undergraduate performance significantly increased from baseline to intervention on one of two types of posttests during the first semester and on all three posttests in the second semester. Undergraduate performance on the 50-question definition test did not significantly improve across conditions in the first semester but did in the second semester. This may be due to the fact that there was less room for improvement from baseline to intervention in the first semester as compared to the second semester. Overall mean scores increased from 42.7 during baseline to 44 in the intervention condition of the first semester. In the second semester, overall mean scores increased from 36.3 during baseline to 39.4 in the intervention condition.

While there were no significant improvements on the 50-question test in the first semester, the overall mean scores in both phases were higher in comparison to the overall mean scores in the second semester. This was also the case for the 10-question definition test. Overall mean scores increased from 5 during baseline to 7.7 in the intervention condition of the first semester. In the second semester, overall mean scores increased from 2.8 during baseline to 6.2 in the intervention condition. Additionally, while there were no significant increases in learn units from baseline to intervention in the first semester, the overall number of learn units completed by all TAs in the first semester (41.7) was higher than the overall number in the second semester (33.7). This may be accounted for by the fact that the group of TAs in the first semester had been in BATS for a full year prior to this research while the second group of TAs were new graduate students. The association of higher overall scores

by undergraduates with a higher overall number of learn units in the first semester may lend some support to Greer's (1994) contention that the more learn units presented by a teacher, the more the student learns. While these data are far from conclusive, they suggest follow-up research on the effects of learn units on student performance to determine if a higher frequency of learn units completed by teachers improves student performance.

Undergraduate Evaluations

Second, the percentage of undergraduate students who reported that they would pursue behavior analysis academically and/or in a career also increased. The percentage of students who would pursue behavior analysis academically increased by 14% from baseline to intervention in the first semester and 17% in the second semester. The percentage of students who would pursue behavior analysis in a career increased by 10.5% from baseline to intervention in the first semester and by 24.8% in the second semester.

Again, these improvements may be due to nonintervention variables. It may be possible, however, that improvements in the seminars (i.e., seminar completion percentages, fewer course material errors), in the preparation level of the TAs (i.e., out-of-class assignments), and in the number of learn units completed may have affected undergraduate evaluations.

Course Material Errors

Third, the average number of mistakes per chapter found by Tas, including homework quizzes and flashcards, dropped dramatically from the 14 per chapter the first semester to the 3.8 per chapter in the second semester. This drop in errors was

likely the result of an increase in the rate of completing out-of-class tasks (i.e., specifically course material editing by TAs) which significantly improved in both interventions.

System Disconnects

Fourth, the number of system disconnects also decreased across semesters. There were a total of 13 system disconnects measured in the first semester as compared to 3 system disconnects in the second semester. It is likely the case that the improved out-of-class procedures helped the TAs, systems manager, and faculty member identify and correct systems disconnects more readily. It is recommended that the current and future Psy. 460 systems managers continue to monitor the number and type of systems disconnects. Currently, system disconnects are not being measured, suggesting a need for a maintenance program and top management support which quality improvement literature suggests is vital to ongoing improvement efforts.

Wolverton (1996) suggests that an over-reliance on tradition and maintenance of the status-quo can create a system that is resistant to change. In addition, quality improvements require time, money, and effort. For this reason, Wolverton suggests that quality improvement interventions require the ongoing endorcement of organizational leadership. For example, college deans might encourage faculty members to seek quality improvements by allowing faculty members to assess the needs for improvements; then the dean might help by providing additional funding for quality improvements. He continues by suggesting that faculty members can continue this process with students through competency-based assessment, assessment for improvement, and self-assessment.

Recommendations

Five recommendations are suggested by the results of the present study and the three models used to guide its direction.

First, future research should attempt to affect the third component of the overall mission of BATS: maintaining competent behavior analysts. Steps should be taken to determine how many graduating students are being placed in behavioral programs and careers. Also, organizations should be contacted to determine their requirements with respect to the skill-levels of potential graduate students and current employees. For example, graduate programs might require a particular behavioral repertoire of incoming graduate students. The subsystems within BATS should also be analyzed to determine if these skills are being effectively taught. An intervention to aid in student placement should be developed. In addition, close contact with those successfully-placed students should be maintained. This might provide a mechanism for future placements as well as assist in the maintenance of placed students.

Second, the number of recruits dropped so dramatically following the high levels of research recruits obtained during the present intervention that future systems interventions involving BATS should address the status of the undergraduate-researcher recruitment process. The recruiting process contributes to the overall mission of BATS and should be analyzed, especially in this system manager's observation, to identify the disconnects. If the decline in the number of researchers recruited into BATS continues, the 15 subsystems will themselves perform less effectively and efficiently, due to the lack of research assistants to run them. In addition, as current MA students graduate, it will take more time to train new MA

students who have no prior research experience in BATS than those new MA students who have previously contributed to the research in the BATS subsystems. Finally, there will be more opportunity for systems competing for BATS' resources to recruit these same students.

The current BATS subsystems must be evaluated to determine the need for researchers and process goals must be set. Then, the current systems manager can begin analyzing the process by constructing an "Is" map and then possibly developing a new "Should" map. Comparing actual performance to performance goals and taking appropriate actions is an important strategy in quality control (Juran, 1993).

Third, from the point of view of educational research, the effects of the frequency of learn units in the seminar on undergraduate performance on the conceptual posttest should be examined more closely. The current results suggest that learn units may play a role in improving student performance, although the data are far from conclusive. Therefore, an experiment might be performed where the number of learn units is varied and the effect on conceptual test performance is measured.

Furthermore, goals or standards should be set for the frequency of learn units completed by TAs as well as for seminar and out-of-class tasks. Standards might be based on the performance of the current TAs. Each chapter of homework might have a single number or range of learn units as the criterion for performance appraisals.

Fourth, a variety of videotape interventions should be compared. The introduction of videotaped feedback in the present study was associated with significant increases in learn units. This study could be replicated with some adjustments. First, the definition of a learn unit could be provided initially, instead of at the beginning of the intervention condition to eliminate this possible confound.

Second, the effects of the duration of videotaped feedback could be examined. It may be that a longer feedback session might improve performance more.

TAs might be provided with training videos of models rather than videotaped feedback of their own performance before seminars. From a cost/benefit analysis, if training tapes were found to be as effective as videotaped feedback, this could save time. For example, training tapes might be used once at the beginning of the semester instead of providing videotaped feedback twice a week. Also, future TAs might view their performance without supervisor feedback. This would save the systems manager time.

Finally, additional performance variables listed in the behavior engineering model might be included in future interventions. For example, various types of training interventions might be possible, including modifications of this videotape intervention. Furthermore, programmed consequences might be introduced. It is possible that other leverage points (i.e., performance variables listed in the behavior engineering model) might be more effective at improving performance in a more cost effective manner.

Even more important, to extend the impact of such research to bear more directly on the larger issues concerning the performance of our educational system as a whole, all future interventions should examine the effects these areas have on the three levels of performance (i.e., organization, process, and job/performer levels).

Appendix A

Behavioral Engineering Model

ANTECEDENTS	BEHAVIOR PREREQUISITES	CONSEQUENCES
Information/Directions • Good prompts and direction? • Proper feedback?	**Equipment/Procedures** • Equipment accessible? • Efficient procedures?	**Contingencies** • Favor desired performance?
Knowledge • Proper training?	**Capacity** • Prerequisite abilities?	**Motives** • Subjects motivated by job consequences?

Appendix B

Behavioral Checklist

SEMINAR PROCESS: Chapter: Date:	TA:	Reliability
- Chairs in a semi-circle		
- AV equipment setup		
- Materials returned on desktops		
- Grade sheet posted		
- Begin class on time		
- Project & review agenda transparency		
- Ask students to get out standard materials		
- Ask for any questions on previous H.W.		
- Ask for any questions on current H.W.		
- Discuss present H.W. (including transparencies)		
- 5 Minute break		
- Ask students to leave H.W., scantrons & quizzes		
- Hand out quizzes		
- Pick up materials		
- Conduct any necessary SDI's		
OUT OF CLASS ASSIGNMENTS:		
- Review Chp.		
- Review Flashcards		
- Number of points _____		
- Review Quiz		
- Agenda		
- Revise Flashcards		
- Revise Quiz		
- NCS Key		
- Number of mistakes for Chp. ___, Flashcards ___, and Quiz ___		
- Assigned/Completed Tasks		
LEARN UNITS	Researcher	Reliability
- Number of Learn Units		

Appendix C

10-Question Definition Test

Score__/10 TA____ First Name:____ Last Name:____

Psy. 460/597

Review Terms from *ELEMENTARY PRINCIPLES OF BEHAVIOR*

1. Discriminitive stimulus (1) -
2. Reinforcer (1) -
3. Establishing operation (1) -
4. Conditioned stimulus (1) -
5. Warning stimulus (1) -
6. Rules that are hard to follow (1) -
7. Rule-governed analog to reinforcement by the presentation of a reinforcer (1)-
8. External validity (1) -
9. Extinction (1) -
10. Behavior analysis (1) -

Appendix D

50-Question Multiple-Choice Test

GENERAL BEHAVIOR ANALYSIS EVALUATION

Select the most specific and most technically correct answer. Mark your answers on the answer sheet, not on this sheet. Also mark your name etc. on the answer sheet. Thanks.

1. ___a stimulus, event, or condition, immediately following a response, that will increase the likelihood of that type of response, in the future.
   a. reinforcer
   b. repertoire
   c. borderline bulimia
   d. a behavioral intervention

2. ___a view of human behavior that the behavior is a mere symptom of an underlying psychological condition.
   a. behavior analysis
   b. behavior analyst
   c. medical model
   d. none of the above

3. ___response-contingent, immediate presentation of a reinforcer resulting in an increased frequency of that response.
   a. behavioral connection
   b. bribe
   c. delayed gratification
   d. reinforcement

4. ___the occasion for a response, the response, and the outcome of the response.
   a. behavioral connection
   b. behavioral contingency
   c. gestalt
   d. reinforcement by the presentation of a reinforcer

5. ___response-contingent presentation of an aversive condition resulting in a decreased frequency of that response.
   a. punishment
   b. reinforcement
   c. extinction
   d. avoidance

6. ___any stimulus, event, or condition that will increase the future likelihood of a response, if the **termination** of that condition immediately follows the response.
   a. alternative stimulus
   b. aversive condition
   c. positive reinforcer
   d. terminational stimulus

7. ___the replacement of a maladaptive response with an adaptive response that produces the same reinforcing outcome (i.e., either the removal or reduction of an aversive condition or the presentation of a reinforcing condition).
   a. differential reinforcement of alternative behavior
   b. symptom substitution
   c. punishment by the presentation of an aversive condition
   d. the sick social cycle

8. ___When a resident trashed the ward of an institution, the behavior analyst required that she make the ward even better and cleaner than before.
   a. negative reinforcement
   b. positive reinforcement
   c. overcorrection
   d. extinction

9. ___the removal of access to reinforcers, contingent on a response, with a resulting decreased likelihood of that response.
   a. prevention
   b. escape
   c. punishment by the presentation of aversive conditions
   d. time-out

10. ___the effects of our actions determine whether we will repeat them.
    a. controverted effect
    b. the adverse effect
    c. the law of effect
    d. actional effect

11. ___stopping the reinforcement or escape contingency for a previously reinforced response causes the response rate to decrease
    a. control condition
    b. extinction
    c. forgetting procedure
    d. punishment

12. ___temporary reappearance of extinguished behavior.
    a. control condition
    b. forgetting process
    c. spontaneous recovery from extinction
    d. temporary resurgence

13. ___reinforcing one set of responses and not reinforcing another set of responses increases the rate of the reinforced set of responses, relative to the other set.
    a. complex behavior analysis
    b. differential reinforcement
    c. multi-element design
    d. selective reinforcement

14. ___set of responses that either are similar on at least one response dimension, or serve the same function (produce the same outcome), or share the effects of reinforcement and punishment.
    a. common set
    b. crucial group
    c. response class
    d. response differentiation

15. ___using reinforcers to reinforce responses that more and more closely resemble the terminal response
    a. minimal response method
    b. shaping with reinforcers
    c. terminal behavior or terminal response development

16. ___a procedure that affects learning and performance with respect to a particular reinforcer or aversive condition.
    a. establishing operation
    b. Premack procedure
    c. procedure of reinforcer specificity
    d. sensitization

17. ___if one activity occurs more often than another, the opportunity to do the most frequent activity will reinforce the less frequent activity
    a. added (extrinsic) reinforcement contingency
    b. principle of deprivation and satiation
    c. establishing operation
    d. Premack principle

18. ___a reinforcer for which repeated exposure is an establishing operation.
    a. addictive reinforcer
    b. adjunctive reinforcer
    c. early stimulus reinforcer
    d. other-delivery reinforcer

19. ___a learned reinforcer that is a reinforcer, because it was paired with a wide variety of other reinforcers, when the organism has been deprived of those other reinforcers.
    a. deprivational reinforcer
    b. variegated reinforcer
    c. paired reinforcer
    d. none of the above

20. ___a system of learned generalized reinforcers in which the organism that receives those generalized reinforcers can save them, and exchange them for a variety of backup reinforcers, later.
    a. token economy
    b. backup system
    c. bribery
    d. none of the above

21. ___a stimulus in the presence of which a response will be reinforced or punished.
    a. S^D
    b. prompt
    c. S^Δ
    d. warning stimulus

22. ___reinforcing or punishing a response in the presence of one stimulus and extinguishing it or allowing it to recover in the presence of another stimulus
    a. discrimination training procedure
    b. intervention design
    c. reversal design
    d. alternating design

23. ___the organism emits the same response to a different stimulus
    a. class differentiation
    b. common stimuli
    c. stimulus generalization
    d. undefinable stimulus control

24. ___the use of a fading procedure to establish a discrimination, with essentially no errors during the training
    a. errorless discrimination procedure
    b. establishment procedure
    c. gradual change procedure
    d. gradual dimension

25. ___imitating the response of a model without previous reinforcement of the imitation of that response
    a. generalized imitation
    b. the nonreinforcement procedure
    c. transfer of imitation
    d. verbal stimulus method (verbal approach)

26. ___selecting a "variable" comparison stimulus equal to a sample stimulus.
    a. equal selection
    b. matching to sample (stimulus matching)
    c. physical approximation method (physical approach)
    d. stimulus selection

27. ___after a response is reinforced, no responding occurs for a period of time, then, ABRUPTLY responding occurs at a high, steady rate until the next reinforcer is delivered
    a. continuous-reinforcement responding
    b. fixed-ratio responding
    c. variable-interval responding
    d. variable-ratio responding

28. ___the way reinforcement occurs, as a result of the number of responses, time between responses, and stimulus conditions
    a. availability schedule of reinforcement
    b. schedule of reinforcement
    c. the schedule of occasional reinforcement
    d. the reinforcement matrix

29. ___a reinforcer is delivered after the passage of a fixed period of time, INDEPENDENTLY of the response
    a. independence programming
    b. fixed-interval schedule of reinforcement
    c. fixed-time schedule of reinforcement
    d. extinction training

30. ___reinforcement is available for only a limited time.
    a. independence programming
    b. fixed-interval schedule of reinforcement
    c. limited hold
    d. no correct answer in this list

31. ___more than one contingency of reinforcement or punishment is in effect at the same time.
    a. behavioral relativity
    b. concurrent contingencies
    c. differential reinforcement of incompatible behavior
    d. multiple schedule

32. ___the relative rate of responding on two concurrent schedules of reinforcement equals the relative rate of reinforcement on those two schedules.
    a. behavioral relativity
    b. concurrency principle
    c. underlying causes
    d. matching law

33. ___If you get rid of one behavior, another will take its place, until you get rid of the underlying cause of the problem.
    a. behavioral relativity
    b. concurrent contingency
    c. underlying causes
    d. symptom substitution

34. ___the establishment of the final link in a stimulus-response chain, with the addition of successive links, until the first link is acquired.
    a. backward chaining
    b. forward chaining
    c. successive linkage
    d. the first link last method

35. ___With differential reinforcement of low rate, a response must occur before the reinforcer is delivered.
    a. true
    b. false

36. ___a neutral stimulus acquires the eliciting properties of an unconditioned stimulus through pairing the unconditioned stimulus with a neutral stimulus.
    a. acquisitional conditioning
    b. establishing operation
    c. habituation
    d. respondent conditioning

37. ___combining relaxation with a hierarchy of fear-producing stimuli, arranged from the less to the most frightening.
    a. acquisitional conditioning
    b. decondtioning
    c. higher-order conditioning
    d. systematic desensitization

38. ___a description of a behavioral contingency
    a. contingency control
    b. descriptive contingency
    c. independent variable
    d. rule

39. ___behavior under the control of a rule
    a. controlled behavior
    b. dependent variable
    c. rule-governed behavior
    d. subjective behavior

40. ___the phase of the experiment where the dependent variable is measured in the absence of the intervention
    a. baseline
    b. contingency control
    c. independent variable
    d. nonintervention phase

41. ___number of instances of behavior over time.
    a. numerosity
    b. rate or frequency
    c. relative frequency
    d. latency

42. ___In behavioral psychology, what is usually placed along the horizontal axis of a graph?
    a. hypothetical construct
    b. intervening variable
    c. independent variable
    d. dependent variable

43. ___an experimental design in which the replications involve baselines of differing durations and, therefore, interventions of differing starting times
    a. component analysis
    b. differential-baseline design
    c. method of response repetition
    d. multiple-baseline design

44. ___private behavior (not visible to the outside observer)
    a. covert behavior
    b. intuitive control
    c. mystical behavior
    d. none of the above

45. ___a written rule statement describing the desired or undesired behavior, the occasion when the behavior should or should not occur, and the added outcome for that behavior.
    a. performance contract or contingency contract
    b. written rule statement
    c. specification sheet
    d. the accounting of occasions or accountancy agreement

46. ___pay (usually with money or the equivalent) is contingent on specific agreed-upon achievements.
    a. pay for performance
    b. the immediate change method
    c. bribery
    d. achievement programming

47. ___Add a reinforcement contingency to increase the rate of behavior. Then the behavior will frequently contact built-in reinforcement contingencies. And those built-in contingencies will maintain that behavior.
    a. the incremental method
    b. the principle of the behavior trap
    c. the built-in procedure
    d. the frequent contact method

48. ___the goals, procedures, and results of an intervention are socially acceptable to the client, the behavior analyst, and society.
    a. social validity
    b. internal validity
    c. external validity
    d. consential validity

49. ___reliability between observations of two or more independent observers.
    a. internal validity
    b. external validity
    c. consential validity
    d. interobserver agreement

50. ___The rate of a response is a typical example.
    a. hypothetical construct
    b. intervening variable
    c. independent variable
    d. dependent variable

Appendix E

13-Question Short-Answer Conceptual Test

Psy. 460 Conceptual Test

Name: _____Date:_____TA:_____
Score: ___*/30*
Please answer the following questions to the best of your ability.

1. (2 pts) Provide an original example of an Avoidance-of-an-Aversive-Condition Contingency and an Avoidance-of-Loss Contingency.

2. (2 pts) Explain why some rules are hard to follow and others are easy to follow and provide an example of both types of rules.

3. (2 pts) Why should Performance Management Contingencies designed to increase behavior be Analog-to-Avoidance Contingencies?

4. (2 pts) Define and provide an original example of a Goal-directed Approach (Top-Down Approach).

5. (2 pts) In the business world, why is it often important to intervene on the process and not just the product?

6. (6 pts) Define the six steps of Behavioral Systems Analysis and provide a short example for each step.

   1)

   2)

   3)

   4)

   5)

   6)

7. (2 pts) Describe a behavioral contingency and explain how this example could either be under contingency control or rule control.

8. (2 pts) Provide an original example of the Two-Factor Theory of Avoidance.

9. (2 pts.) Provide an example of the Error of Reification.

10. (2 pts) What are three problems with Labels (e.g., John is an "aggressive" child.)?

    1)

    2)

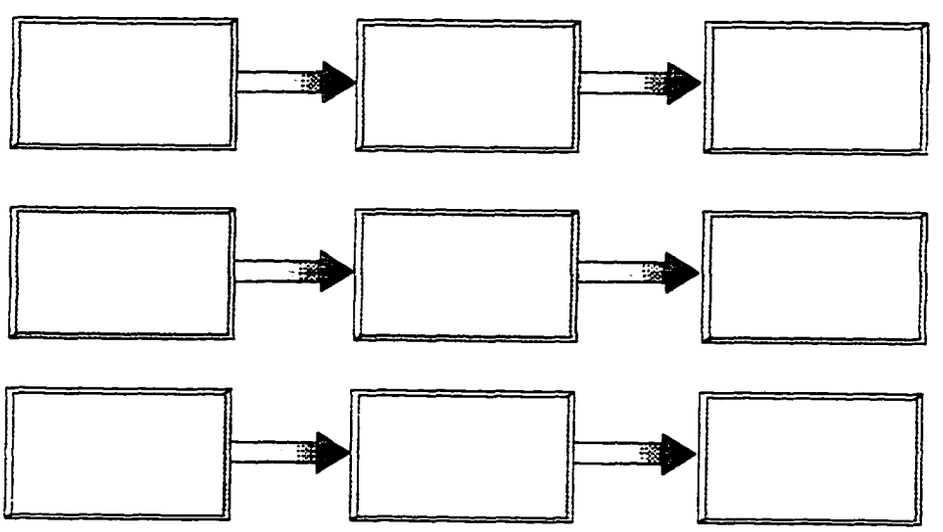
    3)

11. (2 pts) Do we treat the "feelings of depression" by changing the feelings or by changing the contingencies? Do an armchair behavioral analysis and provide a likely cause for the "feelings of depression."

12. (2 pts) Describe the details of a realistic procedure for addressing a behavioral problem particularly relevant or of interest to you (e.g., driving too fast, not practicing safe sex).

13. (2 pts) Please diagram the three-contingency model for your procedure.

Three- Contingency Diagram



Appendix F

Evaluation Psy. 460

Evaluation P460

Please evaluate each of the following items and comment according to your personal view. Do not put your name on this form.

Semester:_____ Year:_____Course Assistant:_____

Please rate the following questions:

1. What's your overall evaluation of the course?
   Great 1 2 3 4 5 Bad
2. What's your overall evaluation of the materials utilized in this course (e.g., textbook, and flashcards)?
   Great 1 2 3 4 5 Bad
3. How well does your teaching assistant facilitate learning the material (e.g., prompting, providing corrective feedback or reinforcement for responses)?
   Well 1 2 3 4 5 Little
4. How well does your teaching assistant demonstrate mastery of the material?
   Well 1 2 3 4 5 Little
5. How well does your teaching assistant run your seminar (e.g., room setup, grade sheets posted, answering difficult questions from previous homework, providing a break before quizzes, and returning corrected material in a timely manner)?
   Well 1 2 3 4 5 Little

Please rank the following items in terms of importance:

1.

- ❑ Mastery of the course materials on the part of the TA
- ❑ The quality of the course materials
- ❑ Facilitation of learning (e.g., prompts and questions by the TA and clear feedback)
- ❑ The manner in which the seminar is conducted

Please answer the following questions to the best of your ability:

1. Do your future academic plans involve behavior analysis? _____
2. Do your future career plans involve behavior analysis?_____

Appendix G

Protocol Clearance From the Human Subjects Institutional Review Board

Human Subjects Institutional Review Board

Kalamazoo, Michigan 49008-3899
616 387-8293

WESTERN MICHIGAN UNIVERSITY

To: Dr. Richard Malott
Tobias LaFleur

From: Richard A. Wright, Chair
Human Subjects Institutional Review Board

Richard A. Wright

Subject: HSIRB Project # 96-09-03

Date: September 13, 1996

This is to inform you that your project entitled "Psy. 460: A Systems Analysis," has been approved under the exempt category of research. This approval is based upon your proposal as presented to the HSIRB, and you may utilize human subjects only in accord with this approved proposal.

Your project is approved for a period of one year from the above date. If you should revise any procedures relative to human subjects or materials, you must resubmit those changes for review in order to retain approval. Should any untoward incidents or unanticipated adverse reactions occur with the subjects in the process of this study, you must suspend the study and notify me immediately. The HSIRB will then determine whether or not the study may continue.

Please be reminded that all research involving human subjects must be accomplished in full accord with the policies and procedures of Western Michigan University, as well as all applicable local, state, and federal laws and regulations. Any deviation from those policies, procedures, laws or regulations may cause immediate termination of approval for this project.

Thank you for your cooperation. If you have any questions, please do not hesitate to contact me.

Project Expiration Date: September 13, 1997

Appendix H

Conducting Behavior Analysis Research and Development Projects

Conducting Behavior Analysis Research and Development Projects

Name:_____

Please answer the following questions to the best of your ability.

1. On a scale from 1 (Very Interested) to 5 (Not Interested), how interested are you in attending graduate school?___

2. On a scale from 1 (Very Interested) to 5 (Not Interested), how interested are you in eventually obtaining a MS (or Ph.D.) degree in psychology?___

3. On a scale from 1 (Very Interested) to 5 (Not Interested), how interested are you in attending graduate school at Western Michigan University?___

4. On a scale from 1 (Very Interested) to 5 (Not Interested), how interested are you in Behavior Analysis?___

5. Are you interested in helping to conduct a behavioral research and development project probably related to Psy. 460?(Y)/(N)___

6. Are you a member of the honors college?(Y)/(N)___

7. Overall G.P.A.? ___

8. Phone Number: ___

BIBLIOGRAPHY

Acheson, H. A. (1964). *The effects of feedback from television recordings and three types of supervisory treatment.* Unpublished manuscript, Stanford University.

Agnew J. L., & Redmon, W. K. (1992). Contingency specifying stimuli: The role of rules in organizational behavior management. *Journal of Organizational Behavior Management, 12,* 67–76.

Albers, A., & Greer, R. D. (1991). Is the three-term contingency trial a predictor of effective instruction? *Journal of Behavioral Education, 1*(3), 337–354.

Anderson, D. C., Crowell, C. R., Sponsel, S. S., Clarke, M., & Brence, J. (1982). Behavior management in the public accommodation industry: A three-project demonstration. *Journal of Organizational Behavior Management, 4,* 33–67.

Aquino, J. (1975). The preparation of college teachers. *Journal of Teacher Education, 25,* 78.

Bacon, D. L., Fulton, B. J., & Malott, R. W. (1983). Improving staff performance through the use of task checklists. *Journal of Organizational Behavior Management, 4,* 17–25.

Bailey, G. D. (1978). Improving classroom instruction: Is there a better model? *NASSP Bulletin, 1,* 52–59.

Balcazar, F. E., Hopkins, B., & Suarez, Y. (1986). A critical, objective review of performance feedback. *Journal of Organizational Behavior Management, 7,* 65–89.

Bartalo, D. (1988). Turn "B" teachers into A+s." *The School Administrator, 11*(45), 15–17.

Bernstein, B. L., & Lecomte, C. (1979). Supervisory-type feedback effects: Feedback discrepancy level, trainee psychological differentiation, and immediate responses. *Journal of Counseling Psychology, 26,* 295–303.

Blakely, E., & Schlinger, H. (1987). Rules: Function-altering contingency-specifying stimuli. *The Behavior Analyst, 10,* 183–187.

Bolton, D. (1973). *Selection and evaluation of teachers.* Berkeley, CA: McCutchan Publishing Corporation.

Borko, H., Eisenhart, M., Underhill, R. G., Brown, C. A., Jones, D., & Agard, P. C. (1991). *To teach mathematics for conceptual and procedural knowledge: A dilemma of learning to teach in the "new world order" of mathematics education reform.* Paper presented at the annual meeting of the American Education Research Association, Chicago.

Brethower, D. L. (1972). *Behavioral analysis in business and industry: A total performance system.* Kalamazoo, MI: Behaviordelia.

Brethower, D. L. (1993a). Strategic Improvements of Workplace Competencies I: Breaking out of the incompetence trap. *Performance Improvement Quarterly, 5*(2), 17–28.

Brethower, D. L. (1993b). Strategic Improvements of Workplace Competencies II: The economics of competence. *Performance Improvement Quarterly, 5*(2), 29–42.

Bullough, R. V., Jr. (1990). Supervision, mentoring, and self-discovery: A case study of the first year teacher. *Journal of Curriculum and Supervision, 5,* 338–360.

Calabrese, R. (1986). Effective schools and classroom instruction. *The Clearing House, 59*(6), 272–274.

Cleary, B. A. (1996). Relearning the learning process. *Quality Progress, 4,* 79–85.

Crowell, C. R., & Anderson, C. D. (1983). Systemic behavior management: General program considerations. *Journal of Organizational Behavior Management, 5,* 129–163.

Deming, W. E. (1986). *Out of the crisis.* Cambridge, MA: Massachusetts Institute of Technology Center for Advancement of Engineering Study.

Duncan, P. K., & Bruwelheide, L. R. (1986). Feedback: Use and possible behavioral functions. *Journal of Organizational Behavior Management, 7,* 91–114.

Fairbank, J. A., & Prue, D. M. (1982). Developing performance feedback systems. In L. W. Frederiksen (Ed.), *Handbook of behavior management,* (pp. 281–290). New York: Wiley.

Ford, J. E. (1984). A comparison of three feedback procedures for improving teaching skills. *Journal of Organizational Behavior Management, 6,* 65–77.

Fowlkes, W. Y. (1995). *Engineering methods for robust product design: Using taguchi methods in technology and product development.* Addison-Wesley.

Friebel, A. C., & Kallenbach, W. (1968). *Effects of videotape feedback and microteaching as developed in the field test of minicourse I with student teachers.* Unpublished manuscript, Far West Laboratory for Educational Research and Development, Berkeley.

Gamble, M. (1976). *College teacher training: Myth or reality?* Unpublished manuscript, Queens College.

Gilbert, T. F. (1978). *Human competence: Engineering worthy performance.* New York: McGraw-Hill.

Greer, R. D. (1994). The measure of a teacher. *Behavior Analysis in Education: Focus on measurably superior instruction.* Pacific Grove, CA: Brooks/Cole.

Harrington, H. J. (1991). *Business process improvement: The breakthrough strategy for total quality, productivity, and competitiveness.* New York: McGraw-Hill.

Hartshorn, R. L., & Prather, J. P. (1988). Examination of Tennessee teachers' attitudes toward videotape-jury reviews as an alternative for career ladder evaluation. *Education, 108*(4), 433–442.

Ingham, M., & Greer, R. D. (1992). Functional relationships between supervisors' observations of teachers in observed and generalized settings. *Journal of Applied Behavior Analysis, 25,* 153–164.

Jacknicke, K. G., & Samiroden, W. E. (1990). Some perceptions of an internship program. *Alberta Journal of Educational Research, 37,* 99–118.

Jacobsen, W. (1987). The rewards of instructional leadership. *National Association of Secondary School Principals Bulletin, 71*(498), 57–58, 60–66.

Jensen, L. C., & Young, J. I. (1972). Effect of televised simulated instruction on subsequent teaching. *Journal of Educational Psychology, 63,* 368–373.

Johnson, K. R., & Sulzer-Azaroff, B. (1978). An experimental analysis of proctor prompting behavior in a personalized instruction course. *Journal of Personalized Instruction, 3*(3), 122–130.

Juran, J. M. (1988). *Juran's quality control handbook.* New York: McGraw-Hill.

Juran, J. M. (1993). *Quality planning and analysis: From product development through use.* New York: McGraw-Hill.

Kagen, D. (1992). Professional growth among preservice and beginning teachers. *Review of Educational Research, 62*(2), 129–169.

Kiesler, S., Siegel, J., & McGuire, T. W. (1984). Social psychological aspects of computer-mediated communication. *American Psychologist, 39,* 1123–1134.

Komaki, J., Waddell, W. M., & Pearce, M. G. (1977). The applied behavior analysis approach and individual employees: Improving performance in two small businesses. *Organizational Behavior and Human Performance, 19,* 337–352.

LaFleur, T., & Hyten, C. (1995) Improving the quality of hotel banquet staff performance. *Journal of Organizational Behavior Management, 15,* 69–93.

Lamal, P. A., & Benfield, A. (1978). The effect of self-monitoring on job tardiness and percentage of time spent working. *Journal of Organizational Management, 1,* 142–149.

Lambert, J. R. (1989). *The workforce challenges of the 21st century.* Washington, DC: CUE/NAM.

Legge, W. B., & Asper, L. (1972). The effect of videotaped microteaching lessons on the evaluative behaviors of pre-student-teachers. *Journal of Teacher Education, 23*(3), 363–366.

Malott, R. W. (1992). A theory of rule-governed behavior and organizational behavior management. *Journal of Organizational Behavior Management, 12,* 43–64.

Malott, R. W., Shimamune, S., & Malott, M. E. (1992). Rule-governed behavior and organizational behavior management: An analysis of the literature. *Journal of Organizational Behavior Management, 12,* 103–116.

Malott, R. W., Vunovich, P. L., Boettcher, W., & Groeger, C. (1995). Saving the world by teaching behavior analysis: A behavioral systems approach. *The Behavior Analyst, 18,* 341–356.

Manley, R., & Manley, J. M. (1996). Sharing the wealth: TQM spreads from business to education. *Quality Progress, 6,* 51–55.

March, J. K., Peters, R. H., Schwartz, M., & Crisci, P. E. (1993). *The long-term impact of a staff development program on student performance in an urban setting.* Paper presented at the annual meeting of the American Educational Research Association, Atlanta.

McConnell, A., & Fages, S. (1980). Videotaped feedback in physical education methods class. *Journal of Physical Education and Recreation, 51,* 64–65.

McGarvey, B., & Swallow, D. (1986). *Microteaching in teacher education training.* Crrom Helm.

McGreal, T. (1988). Evaluation for enhancing instruction: Linking teacher evaluation and staff development. In S. Stanley and W. J. Popham (Eds.), *Teacher evaluation: Six prescriptions for success* (pp. 1–29). Alexandria, VA: Association for Supervision and Cumulative Development.

McKnight, P. C. (1971). Microteaching in teacher training: A review of research. *Research in Education, 6,* 24–28.

Melan, E. H. (1992). *Process management: Methods for improving products and service.* New York: McGraw-Hill.

Mertz, D. C. (1972). *The effects of split-screen videotaping as a vehicle to encourage teacher self-analysis.* Unpublished manuscript, University of Toledo.

Morasky, R. L. (1982). *Behavioral systems.* New York: Praeger.

Mowrer, O. H. (1947). On the dual nature of learning—A reinterpretation of "conditioning" and "problem-solving." *Harvard Educational Review, 17,* 102–148.

O'Brien, G. E., & Korth, W. W. (1991). Videotaping: A tool for enhancing the teacher's understanding of cognitive science and teacher self-development. *Journal of Science Teacher Education, 2*(4), 90–93.

Odiorne, G. S., & Rummler, G. A. (1988). *Training and development: A guide for professionals.* Chicago: Commerce Clearing House, Inc.

Olivero, J. L. (1964). *Video recordings as a substitute for live observations in teacher education.* Unpublished doctoral dissertation, Stanford University.

Orme, M. E. J., McDonald, F. J., & Allen D. W. (1966). *The effects of modeling and feedback variables on the application of a complex teaching strategy.* Unpublished paper. (ERIC Document Reproduction Service No. ED 014 441)

Pennypacker, H. S. (1994). A selectionist's view of the future of behavior analysis in education. *Behavior analysis in education: Focus on measurably superior instruction.* Pacific Grove, CA: Brooks/Cole.

Peterson, N. (1982). Feedback is not a new principle of behavior. *The Behavior Analyst, 5,* 101–102.

Picot, A., Klingensberg, H., & Kranzle, H. (1982). Office technology: A report on attitudes and channel selection from field studies in Germany. In M. Burgoon (Ed.), *Communication yearbook 6.* Beverly Hills, CA: Sage.

Prue, D. M., & Fairbank, J. A. (1981). Performance management in organizational behavior management: A review. *Journal of Organizational Behavior Management, 3,* 1–15.

Rummler, G. A., & Brache, A. P. (1990). *Improving performance: How to manage the white space on the organizational chart.* San Francisco: Jossey-Bass.

Schlinger, H. D., Blakely, E., Fillhard, J., & Poling, A. (1991). Defining terms in behavior analysis: Reinforcer and discriminative stimulus. *The Analysis of Verbal Behavior, 9,* 153–161.

Sharples, K. A., Slusher, M., & Swaim, M. (1996). How TQM can work in education. *Quality Progress, 5,* 75–78.

Steinfield, C. (1986). Computer-mediated communications systems. In M. E. Williams (Ed.), *Annual review of information science and technology.* White Plains, NY: Knowledge Industry.

Sulzer-Azaroff, B., & De Santamaria, M. C. (1980). Industrial safety hazard reduction through performance feedback. *Journal of Applied Behavior Analysis, 13,* 287–295.

Whitman, N. A. (1988). *Peer teaching: To teach twice is to learn twice* (ASHE-ERIC Higher Education Report No. 4). Washington, DC: Association for the Study of Higher Education.

Wittkopp, C. J., Rowan, J. F., & Poling, A. (1990). Use of a feedback package to reduce machine set-up time in a manufacturing setting. *Journal of Organizational Behavior Management, 11,* 7–22.

Wolverton, M. (1996). The zealots and the old guard. *Quality Progress, 6,* 65–71.