THE BEHAVIORTECH INSTRUCTIONAL DESIGN PHILOSOPHY

APRIL 16, 1983

Theoretical Considerations:

The goals of a successful training program should extend beyond the ability of the trainee to successfully exhibit the training repetoire under the conditions of the training environment. The hallmark of a successful training program should be the ability of the trainee to utilize the newly acquired behaviors in the workplace (retention), and exhibit them under the widely variable conditions which the work environment demands (generalization). The newly acquired behavior needs to be trained to a level of strength (mastery level) in excess of currently accepted standards in order to effectively compete with the factors present in the work environment which are absent in the training environment.

Distractors, where appropriate, should be included in the training environment to more adequately mirror the conditions under which the trainee will have to exhibit the new behaviors. The trainee should be able to exhibit the new behaviors in a variety of temporal sequences, because the natural environment will not always present opportunities to respond in a highly stylized or routine manner. Finally, most industries experience cyclical sales patterns and do a high percentage of their business volume during peak times, when time pressure may obliterate a behavior which is sequence dependent. Lack of sequence dependency or flexibility in the trained behaviors should be a criterion for training programs which hope to produce meaningful improvements in on-the-job productivity.

General Instructional Design Principles:

Rule 1 **Wherever possible use active instead of passive responding.** Behavior is shaped and perfected much more rapidly by active responding. In addition, the probability that high rates of retention and generalization will occur is significantly increased.

Rule 2 **When using examples always use sufficient exemplars to demonstrate the principle.** Generally, the rule of sufficient exemplars demands at least three examples of each concept, and preferably, four or five.

Rule 3 Initial learning occurs best under conditions of high error generation when immediate and appropriate feedback is available. Adults are typically slower learners because they are afraid to make errors, and as a result, become passive instead of active learners (Rule 1). **Encouraging high rates of errors reduces inhibition and makes the entire learning process much more reinforcing.**

Rule 4 High rates of errors, which facilitate rapid acquisition by adult learners, occur when correct responding is systemmatically reinforced and **errors are not attended to at the beginning of the learning process.** After the behavior begins to emerge errors can be addressed without harming the rate of acquisition or the rate of responding. Traditional learning systems do not discriminate between the three fundamental stages of learning and stress refinement at the improper time in the learning process. The Fluency Building stage and the Refinement Stage of learning are integral components of the Fluency II Learning System and account for a large portion of its well-documented success. These learning stages are generally ignored by traditional approaches to training.

Rule 5 **All behavior occurs in time and should be trained not only to an accuracy criterion, but a time-based one as well.** The final stage of effective learning, called Refinement or Polishing Stage, is designed so that the trainee can perform the proper response in an easy and immediate fashion. If training does not include this stage, and it usually doesn't, it is highly unlikely that the trainee will use very much learned material on the job (The response cost will outweigh the immediate reinforcers or benefits and the behavior will rapidly extinguish).

Rule 6 **Training during the initial stage of acquisition should be sequential and replete with contextual clues which will help support the new behavior as it emerges. Later subject matter should be presented in random order.** A behavior which can be exhibited under random testing will be much more durable and highly adaptable. The learner is more likely to be able to utilize information in the variety of novel situations he will encounter on the job.

Rule 7 **Wherever possible, difficult items should be trained before easy ones.** This is especially true for programs which have a short duration. Difficult items take longer to learn, and much longer to master. Starting them as early as possible improves the probability they will be mastered within the time constraints usually put on training. Similar items, which may be confused, should be trained simultaneously and clearly contrasted.

Rule 8 **Devote more attention to skills which are used a greater percentage of time in the work environment and are most essential to successful job outcomes.**

Rule 9 Not only does behavior decay rapidly, but the environment continually provides stressors and distractors which compete with the emergence of newly trained behaviors. **Criterion levels should be designed higher than needed to demonstrate mastery** in the hot-house conditions of the training environment in order to rectify this.

Rule 10 **Students in the Refinement Stage of learning should be exposed to distractors in the course of testing for mastery.** This will acclimate them to implementing the behavior under less-than-perfect conditions. These are the conditions under which they will be used in the work environment.

Rule 11 **In addition to response accuracy, mastery should be defined in terms of time-based parameters like frequency** (number per minute), **latency** (how long it takes to initiate a correct response), **and duration** (how smoothly the response was made). The use of time-based measurement greatly increases our ability to predict adequate mastery, and exponentially increases the amount of the material which will be utilized in the work environment.

Rule 12 **Verify attainment of a skill in the behavioral output channel through which it is used.** Behaviors are highly independent and exhibit widely different characteristics depending upon the form of stimulation and the mode of expression. For instance, a verbal skill cannot be reliably demonstrated by a written test. At best there is only a marginal correlation between these skills.

Rule 13 **In addition to training students to demonstrate the behaviors that are specific to the program, develop their coaching skills.** In that way they will have the ability to recognize opportunities to improve their own performance, and to effectively suggest opportunities to others. This ability significantly increases the probability that expertise will continue to develope after the formal training has been completed.

Rule 14 **Train managers to appreciate the importance of frequency as a fundamental instrument of effective management.** For a new behavior o become established in the work environment, managers should understand the need for frequent reinforcement and feedback about employee accomplishment. The more often employees practice and are encouraged to use their new skills, the more natural these skills become. This eventually leads to much higher success rates and productivity in the organization. In the interim, reinforcement density (frequency) is critical to maintaining newly trained repetoires, and keeping them from drifting or extinguishing completely.

Many of these rules for optimal learning are contrary to traditional wisdom, particularly with respect to Behavior Modeling. However they can easily be incorporated with traditional instructional models. The improvement in the rate of acquisition, and the characteristics of retention, generalization and utilization increases with the application of these principles. This produces a stronger, more profitable organization.

Most of these principles can be implemented without adding significant cost or time to training. Programs to which these rules are applied are highly cost-effective and cost-beneficial. In many cases, the improvement in training effectiveness will be accompanied by a decrease in the cost of delivery.

INTRODUCING

THE BEHAVIORTECH EVALUATION

The Search for Excellence in Training

Do you need to determine the cost-effectiveness of your training but lack the means to clearly and simply measure or evaluate your training? Most training programs lack effective measurement and evaluation systems. Their contribution to the overall performance of the firm is never known. More and more, a clear cost-benefit analysis of training is essential for selling it to upper-level management.

An effective evaluation system gives the Training Department (1) a way to communicate the precise bottom-line contributions of training programs, so that (2) the Human Resource development effort can compete for funding by justifying the expenditures in terms of profit earned.

A BehaviorTech Evaluation combines behavioral research with business analysis to produce the most cost-effective training products. We are committed to your profitability through the use of empirically derived and scientifically tested evaluation procedures.

"The most important and visible outcropping of the action bias in the excellent companies is their willingness to try things out, to experiment. There is absolutely no magic in the experiment. It is simply a tiny completed action, a manageable test that helps you learn something, just as in high-school chemistry. But our experience has been that most big institutions have forgotten how to test and learn. They seem to prefer analysis and debate to trying something out, and they are paralyzed by fear of failure, however small." (Peters and Waterman, In Search of Excellence, 1982, pp. 134-135.)

The fundamental premises of BehaviorTech's Evaluation process are easily illustrated. A friend of ours recently purchased a new hunting rifle. He's rather cautious with a dollar, so he test-fired many models before making his selection. He found that rifles produce three patterns of shot (see the illustration below.)

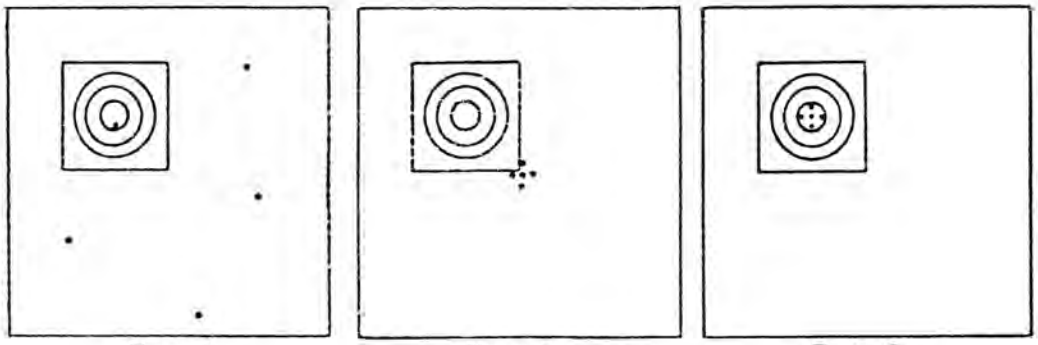

Figure A Figure B Figure C

The pattern in Fig. A was too dispersed. Sometimes the shot hit the bullseye, but there was too much variability. He concluded that rifles that produce this pattern are too unreliable. The pattern in Fig. B shows a high degree of

reliability but too little accuracy. The shots clustered together but failed to hit the bullseye he had targeted. Needless to say, our friend made his choice of rifles from those that produced the Fig. C pattern. He's satisfied that his money was well spent on a rifle that is both reliable and accurate.

In this example, we've assumed our friend is a good shot. In fact, as long as he uses a rifle that produces Fig. C patterns, he is. You find out how good a shot he really is when the distance and angle of the target keep changing, as they do in business. Compare his performance to other marksmen under those conditions, and you'll find he's one of the best. He's got the right rifle. The important things are reliability and accuracy. They are the goals, whether you're evaluating rifles, marksmen, or training programs.

BehaviorTech designs and evaluates training programs -- our own and other's. We ask the same questions in our evaluations that our rifle-buying friend asked -- and a few more. First, we're interested in reliability. Does the training always produce the same outcome or skill level, for all the trainees, each time it's administered? If not, why not? Second, we want to know the cost-effectiveness of any training program. Does it offer you the most efficient training for your money? Third, does the training program produce the right skills? Is it on target? Do the skills it teaches really improve on-the-job performance? Fourth, is training the most cost-effective means to produce the changes you want in work performance? If that performance can be obtained at a lower cost by restructuring the incentive program or providing on-the-job feedback, then they're the right prescription -- not costly training.

If the Training Department can't answer these four questions, it doesn't know if it's wasting money on unreliable, inaccurate, or unneccessary training programs. We can correct that.

Reliability of Training Guaranteed

The BehaviorTech approach to evaluation and design is based on more than 50 years of carefully controlled research, first in laboratory and then in real-world settings. In fact, their own development of effective measurement and training procedures has permitted behavioral scientists to discover and confirm the fundamental principles of effective learning. At BehaviorTech these principles are called "The Rules." They are the keys of an evaluation process that can predict the reliability of any training program. Years of research show that the results produced are directly proportional to the number of Rules employed in the program. The right Rules provide a simple, low-cost tool for determining the strengths and weaknesses of any training package. So the benefits to our clients are enormous. Mistakes are identified and corrected before costly implementation, so program effectiveness is maximized with very little effort or cost.

An evaluation system is only as good as the measurement that underlies it. Precision Measurement (TM and Patent Pending) is the foundation of BehaviorTech's Evaluation system -- it was integral to the discovery of The Rules. Precision Measurement is built on time-based measures of the target behaviors, because the skills your employees use occur in real time.

An example will illustrate why time-based measures are necessary. Another friend of ours wanted to learn conversational Spanish. He signed up for a course at a major univeristy and 16 weeks later passed with an A + and he's proud of his accomplishment. But we were cautious about how the instructor evaluated his performance. With paper-and-pencil tests graded for percentage correct, it turned out. Since his goal for taking the course was conversational fluency, we decided to test that, rather than those A + reading-and-writing skills he acquired in the course. Not surprisingly, his conversational answers to Spanish questions were very slow and awkward. They took a long time to construct -- he was translating from Spanish to English and back to Spanish. Not a very fluent performance, in our terms. Our Rules would never have let that happen.

We've found that for all new skills we've ever studied, fluency is the foundation for all exemplary performances. Dr. Arthur Jensen, a world reknowned psychologist from the University of California at Berkeley, states, *"...the faster you think, the smarter you probably are. High speed nerve functions go with high IQ scores."* (1980) Our research shows that fluency is a skill that must be trained directly through accuracy (percentage correct) and time-based response measures. Percentage correct reflects accuracy but not fluency. So we use both percentage correct and time-based measures as our training criteria, and our programs produce very accurate and fluent performances. It's in The Rules.

Every trainee can achieve fluency, but only when programs are designed to allow for individual rates of acquisition during training. We find the "special" training pace that makes the trainee both comfortable and eager, because we add new material only when fluent mastery has just been achieved for each module in the program. Those modules were designed by us to let that happen. We know that we have to do that, and we know how. That's what we sell.

Not surprisingly, we also achieve high levels of trainee satisfaction that way.

One more thing -- we've found that adding time-based criteria makes us ten times more reliable in producing fluent performances, and two to five times more reliable in producing on-the-job transfer of training, than using only percentage correct (Orgel and Bower, 1982). Our trainees' fluent mastery is a guaranteed result.

Determining Cost Effectiveness Through Experimental Analysis

We determine the cost-effectiveness of single training programs, and compare two or more programs, with a unique set of experimental designs developed by behavior analysts. They've extended scientific inquiry into open, nonlaboratory, real-world settings. BehaviorTech are those scientists. We apply our designs to empirically evaluate and assess the cost-effectiveness of a wide variety of training programs. We compare the cost-effectiveness of trainees' work performances before and after training, and we compare the cost-effectiveness of trained to untrained employees. These are the

comparisons that justify program implementation, especially to upper-level management, in the real world's basic terms -- **the bottom line.**

Perhaps the most difficult task facing the Training Department is to evaluate the cost-effectiveness of two or more programs claiming to solve the same problem. Often, they're based on differing theories of behavior change, they use different methods, and they cite widely divergent outcome measures. How can these apples and oranges be compared, so that your company makes the correct selection? You can always compare apples and oranges by asking their price per pound! Precision Measurement lets BehaviorTech make these decisions pretty much the same way, because time is our standard, and it's a fundamentally meaningful meaure. Whether we're assessing a sales-training program or an academic curriculum, the underlying standard units are rates of change per unit of time; just like price per pound. For example, acceleration -- change in speed over time -- assesses automobile performance for all makes, sizes, and models of automobiles. So does miles per gallon for their fuel efficiency. These comparisons are meaningful only with standard units. When we compare training programs, we're interested in the number of behavior changes over time, because we know they're what's needed to assess training costs.

The Rules let us (1) train people to reliably fluent performances, (2) accurately evaluate the extent their training transfers to the work setting, and (3) figure the cost-effectiveness of our own and any other training program.

Functional Task Analysis: Training to the Right Target

The rifle example provides us with a picture of three types of performances: unreliable (Fig. A); reliable but not accurate (Fig. B); and reliable and accurate (Fig. C). So far we've talked about how to develop and evaluate reliable performance. However, a training program that aims at the wrong target skill is a costly error. Our friend, the Spanish student, is an example of target failure. He was taught terrific reading and writing skills, but his goal was fluent conversation. That's the usual problem with training programs, particularly generic off-the-shelf packages. The behaviors that are taught are only partially related to the skills you require for successful performance. We've found that there's no average company. Training programs must be tailored to the needs and requirements of each client.

We analyze the work approach of your exemplary employees to pinpoint the correct target behavior. They've already discovered some of the best methods for getting the job done in your work setting. The Rules call that a **functional task analysis**, and require that we use direct observations and measurement of your employee's on-the-job performance. But we don't just look -- we analyze out the crucial things they do that leads to success, and we incorporate that into your training program. We systematically decrease the distance between program target and exemplary on-the-job performance until they're completely congruent. That kind of task analysis produces the most useful training targets and successful training programs. *"...if you want productivity and the financial reward that goes with it, you must treat your*

workers as your most important asset." (Peters and Waterman, In Search of Excellence, 1982, p. 143).

Environmental and Motivational Support System

Not all business problems can be solved by training -- even if that training is reliable and on target. Functional task analysis tells us when that's the case. A good thing, too -- training programs are costly. If work performance can be improved by other methods, then use them. Dr. Thomas Gilbert (Human Competency, 1978), a consultant to industry for over 25 years, has identified three primary sources of variability in human performance: environment, motivation, and instruction. BehaviorTech evaluates environmental and motivational factors for two reasons. First, we want to know if training is really necessary -- because it's always costly. Second, if training is necessary, then we want to know what environmental and motivational supports are available in the work setting to maintain and improve performance after training. The absence of these support systems can sabotage even the most effective training program.

Like poor instruction, the work environment can produce unreliable performance. For example, failing to tell employees how well they're performing or providing them with misleading information about what's expected produces incompetence. As The Search for Excellence points out, *"We are not talking about mollycoddling. We are talking about tough-minded respect for the individual and the willingness to train him, to set reasonable and clear expectations for him, and to grant him practical autonomy to step out and contribute directly to his job."* (1982, p. 239). Work environments that support competent performance do it by giving clear and immediate feedback to employees about their performance -- especially good performance.

Motivation is another factor that contributes to worthy performance. Generally, motivation is assumed to be something the employees bring to the work place, but behavioral research has repeatedly shown that employee motivation can be improved when incentives depend on quality performance. Yavitz and Newman put the probelm succinctly in their book, Strategy in Action: *"first our measurements must be improved, and next our rewards must be tailored to the various kinds of results we wish to achieve."* (1982, p. 178). Rewards and incentives may -- but need not be -- monetary. Tailoring incentives to the employees' needs is usually more effective. More flexible hours, opportunities for further training, and recognition of exemplary performance are powerful nonmonetary incentives often overlooked. High use of incentives, both monetary and nonmonetary, is one of the rules of excellent companies.

The Value Added by BehaviorTech to the Evaluation and Training Process can be Easily Summarized:

We are committed to solving business and training problems with the latest state-of-the-art learning technology, scientifically validated and tested in business environments.

BehaviorTech uses the right Rules -- the most effective tools for evaluating and predicting the success of any training program.

Only BehaviorTech has Precision Measurement which guarantees fluent mastery and transfer of training.

We use functional task analyses that identify the correct target behaviors for your training programs.

We evaluate the environmental and motivational support systems that insure optimal results and long-term maintenance of training.

Our system lets us evaluate and compare the cost and benefits of any two or more training programs.

We employ research designs that let the Training Department demonstrate the contribution of its training programs to organizational effectiveness.

Our detailed cost-benefit analyses let the Training Department justify funding for training to upper-level management.

BehaviorTech, a new company, stands for excellence in training. We recognize your concerns about initiating a relationship with a relatively young firm. We are not like other firms in the business, however. We offer you a technology of evaluation and training with a proven scientific history. As a scientific enterprise, applied behavior analysis has developed and evaluated training programs with an unmatched record of success for over 30 years. BehaviorTech's proximity to the Department of Human Development at the University of Kansas allows us to learn from the work of more than 75 professors and research scientists who maintain active laboratories at the frontiers of human learning in real-world settings. We were trained there -- some of us still are. The Department of Human Development has consistently been ranked number one in the country for the past ten years. Time magazine (1981) confirmed this by declaring the University of Kansas, "the finest school in the world for Behavioral Psychology."

We are so confident of the scientific validity and value of our products that we guarantee the results of the programs we produce. Call us and ask how you can benefit from a BehaviorTech Evaluation.

Sincerely,

Robert F. Orgel

THE FLUENCY II LEARNING SYSTEM

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A REVOLUTIONARY ADVANCE IN THE SCIENCE OF LEARNING.

In the past three years, our team of behavioral research scientists at the University of Kansas has made important breakthroughs in the field of human learning. We have designed a learning technology called the Fluency II ™ Learning System which, compared to the most successful training methods currently available:

Trains people up to eight times faster.

Trains people so that they retain up to five times more information.

Trains people so that they can use the information in related tasks more than four times as successfully.

Trains both individuals and groups of people so that every person achieves mastery level for all skills presented.

These impressive results are the synthesis of fifty years of research by social scientists throughout the country on how people acquire, retain and utilize information. Fluency II procedures are proving effective in applications where all others have failed. The Fluency II Learning System improves:

Management and staff development.
Selling, negotiation and supervisory skills.
The use of computer hardware.
The use of computer software.
The implementation of strategic plans.
Continuing technical education and upgrades.
Interpersonal, communication and math skills.
Instructional manuals and in-house training programs.

And what is even more impressive, **Fluency II is not complicated or expensive**. It does not require you to purchase specialized equipment or computer hardware. Existing materials are reformatted to provide more accurate and rapid learning.

The Fluency II Learning System dramatically cuts training costs while improving training effectiveness. It can reduce your current expenses for training and staff development by more than 50% while more than doubling the results they produce.

SCIENTIFIC MEASUREMENT AND A UNIQUE DESIGN STRATEGY.

Fluency II incorporates unique features found in no other learning system. Most systems define mastery or successful learning in terms of accuracy, that is, the number of correct responses per number of questions asked (percent correct). Unfortunately, accuracy as a sole criterion is insufficient to insure retention and generalization to the workplace.

Our research discovered that mastery levels should be defined in terms of the probability of high levels of retention and generalization. That is, mastery should guarantee the transfer of training to the work environment. We found that, when testing, **speed as a criterion is as important as accuracy**. Therefore, we test for the number of correct responses per unit of time.

The testing system we developed is called **Precision Measurement**. By testing for both speed and accuracy **we guarantee that mastery levels are achieved**. Thus, we insure that extremely high levels of retention and generalization are transferred to the actual work environment. Unlike other learning systems, the learning is not left at the training site.

Our research further discovered that **effective learning occurs in three separate and distinct stages**, each requiring unique and different learning strategies. One of the more important strategies is the **randomized presentation of the learning material**. This prevents the trainee from correctly answering questions based on contextual clues. Of all the systems studied, only Fluency II incorporates this three-stage, scientific design into the learning process.

By utilizing Precision Measurement and the three-stage learning strategy to their fullest advantage, **Fluency II also directly shatters the myth that adults do not learn as well as children**. The majority of developmental psychologists have believed that older people are less able to learn than younger people due to the aging process. Our research shows that Fluency II successfully overcomes any learning differences that might exist between adults and children. This makes our system uniquely applicable to all training efforts, especially those targeted to adult learners.

The Fluency II Learning System incorporates these fundamental processes necessary for successful learning and applies them to a broad range of training situations and delivery formats. **As a scientifically-based learning system, Fluency II is unsurpassed,** accomplishing what no other learning technology can.

SURPASSES THE BEST LEARNING SYSTEMS.

Fluency II is the state-of-the-art synthesis of the most successful learning systems: Precision Teaching, DISTAR, Computer-Assisted Instruction, Programmed Instruction and Behavior Analysis. Our research at the University of Kansas experimentally analyzed these diverse learning systems to determine which elements in each system accounted for its success.

Our aim was to combine the effective features of these learning systems with current innovations in the areas of Stimulus Control, Stimulus Equivalency, Generalization and Adult Learning. This creates a state-of-the-art learning technology which emphasizes the best features of each and remains highly cost-effective.

Fluency II uses the **task and frame analyses** from Programmed Instruction while eliminating the need to write or rewrite programs, artificially sequence material, or hold learning to abnormally low rates.

Fluency II uses the **effective generalization and feedback strategies** of Precision Teaching, DISTAR and Behavior Analysis and extends them by including the latest technology for arranging stimulus elements in the learning array to increase or inhibit concept formation and transfer of training.

Fluency II utilizes the technologies of Stimulus Control and Stimulus Equivalency to develop **exceptionally high levels of complex concept formation** while insuring generalization.

Fluency II stresses **active learning**. Thus, it possesses advantages over Behavioral Modeling and Video-based Instruction which are dependent on passive, observational learning.

Fluency II **simulates the operation of a complex computer program** by providing the learner with precise and immediate feedback. Conditional branching, looping and dynamic adaptation to the learning process are all made available through the Fluency II Learning System.

Fluency II **tailors learning to the individual**, as does Computer-Assisted Instruction. However, Fluency II consistently provides higher rates of acquisition, retention and generalization. And while Fluency II does not require expensive hardware, it will be programmable on microcomputer systems within the next year. Translation of the Fluency II-formatted curriculum to the microcomputer will be a simple matter.

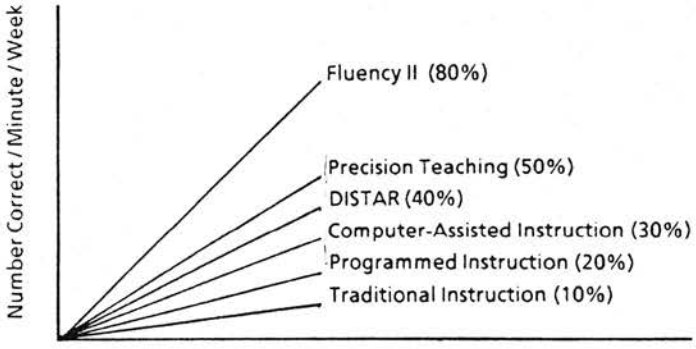
FASTER LEARNING.

When the learning rates for different learning systems are quantified and compared, **Fluency II provides an average improvement in rate of acquisition of over 80% per week, compared to 10% per week for traditional approaches to learning.**

In an experiment conducted in four industrial sites, we studied the time required to train staff in the use of data and word processing equipment.

The two companies trained with traditional instruction took 6.5 and 5.8 months to reach acceptable levels of proficiency. The two sites using Fluency II took 1.5 and .75 months to reach proficiency, producing significant reductions in cost.

In addition, the higher response rates of the Fluency II operators resulted in reduced computer time for comparable quantities of work. This eliminated computer overload and bottlenecks, enhancing the efficiency of the office operations.



Graph 1: Improvement in rate of acquisition using Leading Learning Systems.

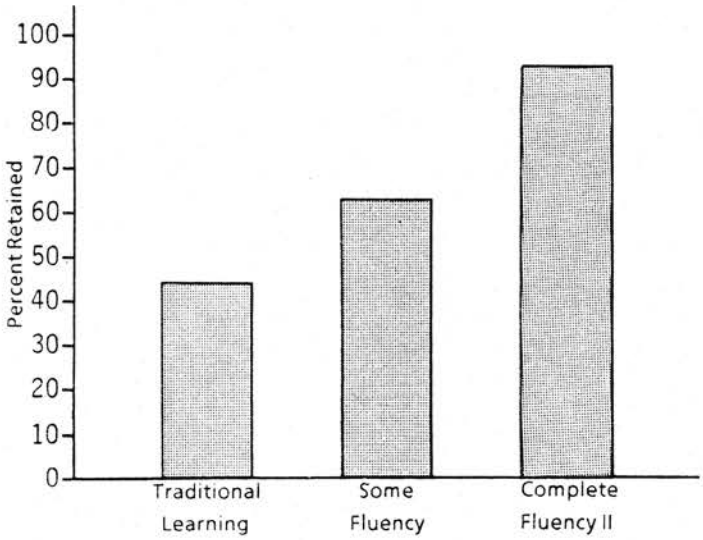
IMPROVES RETENTION.

Material learned with the Fluency II Learning System is retained for extended periods, even with disuse. The following results were obtained in a carefully controlled study at the University of Kansas:

At the end of five weeks, students trained with traditional learning techniques retained only 45% of the information. At the end of five weeks, students trained with a moderate exposure to Fluency II Training retained 62% of the learned material.

At the end of the same five-week period, students using the complete Fluency II Learning System retained 94% of the learned material.

A series of replicated experiments with a wide variety of subjects and curricula have established the differences noted as reliable, stable and general.



Graph 2: Percentage of Learned Material Retained After 5 Weeks of Disuse.

GREATER TRANSFER OF TRAINING.

The most important test of a training technology is its ability to produce generalization to more diverse and complex skills and tasks. **In a controlled study at the University of Kansas, Fluency II produced almost three times the generalization of traditional methods.** A follow-up study confirmed these results.

The generalization task in the research experiment focused on the ability of math students to do "word problems," a stumbling block for all math curricula studied.

Using the identical task, students trained with traditional methods scored 37%, while students trained with a moderate exposure to Fluency II scored 86%.

Fluency II drills provided an average improvement of 29 points, an advancement of three grades. Ninety percent of the students using Fluency II received an A for the course and none received a grade lower than a B. Traditionally-trained students had a 50% failure rate.

STATE-OF-THE-ART RESEARCH AT THE UNIVERSITY OF KANSAS.

The University of Kansas has a long tradition as one of the nation's foremost schools for Experimental Psychology. The Department of Human Development comprises more than 75 active professors and research scientists and maintains active laboratories in educational technology, generalization, stimulus control and programming.

The Department of Human Development has consistently been ranked the number one Behavioral Psychology department in the country for the past ten years. In the spring of 1981, Time confirmed this ranking by declaring the University of Kansas "the finest school in the world for Behavioral Psychology."

It's fame has come by developing effective behavioral technology in "applied" settings. These projects have served as models for similar facilities around the world. Additionally, the Journal of Applied Behavioral Analysis, one of the most respected journals in psychology, was started at the University of Kansas.

CALL US TODAY.

Fluency II is available only through BehaviorTech, a company founded by Robert Orgel. While working on his doctorate in Behavioral Psychology at the University of Kansas, Robert Orgel led the research team which designed Fluency II and used it successfully across a broad range of applications.

Many senior scientists from the University now work at BehaviorTech in program assessment, design and research. Fluency II is just the first of many products and services planned by BehaviorTech. Other services include on-going, state-of-the-art behavioral research; product/market analysis; an analysis of the match between training programs and a company's strategy; an improved forecasting technology; a behavioral model for improved managerial decision-making; and an accounting system which more adequately evaluates human factors.

BehaviorTech is committed to the profitability and competitive strength of your business. Our own business mission is to offer state-of-the-art, scientific research with sound management principles and strategies, creating unique products that add value to your products and services. Your success is our business.

To take advantage of BehaviorTech's breakthroughs in training and development, **call or write us today**. We can assess and evaluate your training programs, demonstrate current deficiencies and recommend concrete improvements based on our scientific research. We provide detailed estimates for incorporating these breakthroughs into your training programs.

Whether your immediate goal is to cut costs or build revenues, **the stakes are millions of dollars in additional profits for your company**. We look forward to working with you.

Robert F. Orgel
(913) 843-6583

The BehaviorTech Perspective

Introducing...EXCEL

the software that surmounts every barrier to effective training.

Excel is for training directors who are under pressure to produce results rather than excuses. All that money you're spending on training is going to a lost cause if the trained skills aren't going to transfer from the training environment to the workplace. If your training programs aren't increasing worker productivity, some of your training dollars are getting lost. In fact, very few training programs are designed to produce transfer of training. The notable exception is **Excel.**

Excel is instructional design for productivity skills...the kind of skills and knowledge you need to give your organization the training edge. In more than a dozen field tests conducted with over 10,000 people throughout the country, the **Excel** Learning System produced

* seven times faster learning,
* three times more retention, and
* more than two times better transfer of training

than all other learning methods. **So Excel can train seven employees in the same time and for the same money you now spend on one.** This winning combination of faster plus better learning results in ten times more productive training.

Excel will work for you today--and tomorrow. Training that's forgotten hasn't the slightest chance of producing results in the workplace. Instead it leaves an embarrassing hole in a thin training budget, robbing future dollars and respect from the training department. Excel's documented, on-the-job results foster respect for training. Management understands its "bottom-line" results. And because **Excel** is fun to use, employees readily accept the innovation and change necessary to keep your business competitive in the 80s and beyond.

We won't tell you what Excel is supposed to accomplish, **because we've designed Excel to guarantee measurable results.** The **Excel** Learning System is a state-of-the-art synthesis of the effective features from the most successful learning methods with a technology for transfer of training. Together, they **guarantee that training transfers to the workplace. Without that guarantee, no amount of money can buy more productive workers.**

We'll tell you in a minute how you can arrange to see a demonstration of your training program on **Excel**. But first let's see how **Excel** is designed to help your computer live up to its incredible potential as a training tool.

Excel breaks new ground in computer-based training. Robert Orgel, BehaviorTech's founder, developed the **Excel** Authoring System with leading researchers in human learning at the University of Kansas' Department of Human Development. This Department has been ranked the number one behavioral psychology school in the country for the past ten years.

Fifty years of research pointed to Direct Instruction and Precision Teaching as the most effective learning methods. Orgel analyzed those methods to identify the features that contribute to their effectiveness.

Meanwhile, Dr. Donald M. Baer, a world renowned behavioral psychologist at the University and head research scientist at **BehaviorTech**, confirmed that an effective technology for transfer of training existed. He identified seven widely known and well-tested methods for producing reliable generalization. Yet he found that these methods were rarely used in training program design.

Excel is training designed for maximum effectiveness. Orgel carefully crafted **Excel** to combine the most effective instructional features with the most proven technology for transfer of training. **Excel's** multiple-choice, fill-in-the-blank and data analysis modules provide the following exciting features required by intelligent HRD professionals:

* **Individualized instruction to heighten motivation**

  --continually adjusts response time criteria to each individual's unique learning rate and reading speed

* **Curricula arranged in steps progressing from easy to difficult**

  --teaches answer recognition (multiple-choice answers). Then teaches answer production (fill-in-the-blank answers), so trainees can reliably produce the skills and knowledge in the workplace.

* **Techniques to help your trainees grasp complex ideas**

  --each concept is dissected into several multiple-choice and fill-in-the-blank questions that quickly communicate the differences and relationships among relevant ideas, tasks and skills

  --all incorrect answers to multiple-choice questions are designed explicitly to differentiate relationships that are often confused with the concept. So, trainees do not become victims of common pitfalls in your field.

* **Sequence-independent learning for true mastery**

  --randomly presents multiple-choice questions after three complete sequential cycles

  --fill-in-the-blank questions always are randomized

  --can present up to 2,000 answer choice variations for each multiple-choice question

* **Fast-paced delivery to maintain attention**

  --rapidly sequences the question, answer and feedback

* **Criteria for mastery based on speed plus accuracy of responding**

  --presents each question until the learner meets its unique speed and accuracy criteria

* **Continuous, objective measurement of the learning process**

  --continuously writes response data to the disk, so data are never lost. A complete record of each response and the trainee's progress is available to guide the most efficient, effective and economical future training.

  --includes a fill-in-the-blank (answer production) posttest composed of new questions

* **Adaptive teaching sequences based on measured results**

  --drops each question after the learner has mastered its unique speed and accuracy criteria. Time is not wasted on already mastered content.

* **Immediate and continuous feedback**

  --immediately highlights the trainee's answer, before providing positive or instructional feedback

  --provides clear, immediate positive feedback for correct answers

  --provides clear, immediate instructional feedback for incorrect answers

  --acknowledges misspelled or mistyped fill-in-the-blank answers as "good tries" and lets the learner try again

  --provides corrective but positive feedback when correct answers exceed the time limit

Excel is the only training software that embodies all these tested features of effective instructional design (and more) to ensure learning that will transfer to the work environment, regardless of the content or skill being taught. In particular, **Excel** requires trainees to produce fast as well as accurate responses. These unique double criteria are why **Excel** can produce fluent knowledge.

Fluent Knowledge--Exclusively from Excel

What is **Fluent Knowledge**?

Rapid Responding + Accurate Responding = Fluent Knowledge

Orgel found that Fluent Knowledge--knowledge that is easily applied--is essential for greater retention and transfer of training. Fluent Knowledge lasts. In fact, **it's the only knowledge you'll see your people applying long after their training.** Microcomputers made it easy to monitor and record the speed of individual responses. Now **Excel** gets the most out of a microcomputer by producing Fluent Knowledge for every trainee, every course, every time.

Sample Applications

* drill and practice
* tutorials
* guided simulations

for

* industrial/technical training
* management/supervisory training
* hardware/software end-user training

Hardware Requirements

* IBM PC and PC compatibles with 128K RAM
* Two drives for double-sided, double-density, 5-1/4-inch floppy disks
* DOS 1.1, 2.0 or 2.1

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Seven Strategies That Guarantee Training Transfer

The authors follow up on their August 1984, *Journal* article, and show how to transfer training to the job and thus protect the bottom line.

By ANN I. KELLEY, ROBERT F. ORGEL and DONALD M. BAER

If you can't find bottom-line benefits in your training, it may be because you left out some well-researched strategies for producing transfer of training. And if you've done that, you've missed the boat entirely.

Several years ago, Stokes and Baer reviewed 270 studies that measure transfer of training. They wanted to see what procedures actually accomplish transfer, and found they could group them into seven categories. Drawing from their conclusions, we have uncovered seven strategies that program developers and trainers can use to produce more rapid acquisition, retention and transfer of work skills, and provided evidence from applied research demonstrating the effectiveness of these strategies—particularly some long underused work by Goldstein and Sorcher.

Discover basic skills and concepts

Specify exactly what skills and concepts trainees are expected to master, because these are the only behaviors that you want to transfer to the work setting. If, according to Goldstein and Sorcher, a trainee "is provided during the learning of task A, with general principles regarding successful completion of that task, such knowledge will aid him in more rapidly learning task B if the same or similar principles apply."

For example, what should you teach supervisors? Planning, problem solving, listening, giving feedback, writing performance standards and monitoring performance look like the basic skills supervisors need to do their job effectively. Once supervisors have mastered these basics, they should try to practice them during job-related role-plays (e.g., performance appraisal interviews or solving employees' disputes). Real basics will transfer to new problems and situations because the skills are the same—only the problem, the situation or the mode of application is different.

Basic skills and general principles can be seen as algorithms. Baer uses the square-root algorithm as an example of efficient teaching and reliable transfer of training. Once you learn the rules for computing square roots, you reliably can find the square root of any real number. He recommends that trainers look for and teach that kind of algorithm as a transfer strategy.

Using this strategy, Orgel analyzed the skills that seemed necessary to solve math word-problems. He saw those skills as: identifying the elements of word problems; translating the elements into symbols or variables; arranging the symbols into equations; and solving for the unknown variables. He tested whether his supposedly basic skills solved word problems posed to some students in a remedial math class. Other students in that class followed the traditional curriculum, which taught

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word-problem solving nonsystematically, without hypothesizing the truly basic skills. The final class exam included four novel word problems (a transfer test). More than 95 percent of Orgel's students solved the word problems; only 45 percent of the traditionally taught students did.

Orgel's strategy differs radically from the strategies used in almost all the training programs we've reviewed. Many of those programs train as though more is better: They teach 5 to 10 different skills in each training session—sometimes for 20 to 30 different sessions—without taking advantage of the inherent structure of the skills they teach. They don't build on the information learned earlier to speed subsequent learning. Their trainees may be taught as many as 100 separate skills that are left unrelated—resulting in decreased acquisition, retention and transfer. Too many skills are taught while too few are mastered.

Our research indicates that true mastery of 100 different skills does not occur reliably without speed and accuracy drills—and that true mastery is necessary for transfer of those skills to where they're needed.

So we suggest that you identify and train no more than five or six basic skills, and provide repeated practice using those skills on new problems and situations. This strategy is more efficient, speeds up learning from session to session and facilitates mastery.

Analyze, define and field test

Each item in our list of supervisory skills (planning, problem solving, listening, giving feedback, writing performance standards and monitoring performance) comprise four to five different behaviors linked together by a common outcome (e.g., to produce a plan or to solve a problem).

To discover just what components will and will not produce the desired outcome, you must, according to Michalak and Yager, task analyze them. For example, problem solving might include teaching supervisory trainees to define a problem precisely, request suggestions from their staff, write them down, prioritize them, assign tasks to individuals and set times for follow-up meetings.

Next, define these skills behaviorally. What does the behavior look like (topographical definition)? More important, what effects can it produce (behavioral definition)? The difference between these definitions is crucial.

Imagine that you're training people to open a door. You tell them to place their hands on the knob, twist it and push (a topographical definition). If you tell them to twist the knob as far as it will go, then push the door to see if it will open (and if not, to twist the knob in the other direction and push the door) and one person can pass through it, you are providing a behavioral definition. Behavioral definitions specify the results or outcome of the behavior; they define not the behavior that ought to work but the behavior that does work.

Behavioral definitions specify observable behavior, the conditions under which learning is verified and the performance or mastery criteria. For example: "Following every three practice role-plays, trainees will perform one unassisted problem-solving role-play; this cycle will continue until unassisted role-play is 100 percent accurate." The three components in this definition of joint problem-solving are the *condition* ("... Following ... unassisted"), the *behavior* ("... problem-solving role-play ...") and the *criterion* ("... until ... 100% accurate ...").

If your definitions specify observable behavior and performance criteria, they will:

- tell training program buyers what skills they're purchasing,
- help trainers recognize precisely which behaviors to reinforce,
- clarify for trainees precisely what they're expected to master in training and then use on the job.

Goldstein and Sorcher emphasize that trainers need behavioral definitions—reliably observable behaviors and their effects—to provide trainees with precise contingent feedback of their performance. They need the performance criteria to discontinue training when the criteria are met. Without performance-based criteria, trainers make decisions to discontinue training on formalistic criteria (e.g., trainees completed all the role-plays or pages of the manual—"and that should be enough") rather than the trainees' performance (e.g., all trainees correctly completed three performance appraisal interviews). Formalistic criteria—the hallmark of poor training programs—result in wide variation in trainees' acquisition, retention and transfer of the trained skills.

Trainees need behavioral definitions to know exactly what they're expected to do during role-plays and written exercises, and later on the job. In addition, Goldstein and Sorcher believe trainees need concrete performance criteria so they can monitor their own progress and earn the feedback the definitions will enable trainers to give them.

Many studies done in business and industrial settings, comprehensively reviewed by Frederiksen and Johnson, have shown the reinforcing effects of posted feedback on performance. We recommend that trainees receive a list of the behavioral definitions so they can check off each skill as they meet its mastery criteria.

Finally, analyses need field testing. Just like topographical definitions, task analyses often look complete, but fail to produce desired results reliably. Consider the following definition of problem solving: describe a problem, ask subordinates reasons for behavior, set follow-up date, agree on action plan and engage in joint problem solving.

Although the list defines observable and measurable behaviors, it meets only part of the criteria for behavioral definitions. You can't be certain that this list defines problem solving without testing it to see whether it solves problems—and the right problems. For example, this list could result in a solution to the wrong problem if a subordinate provides incorrect reasons for his behavior and his supervisor relies on those statements to solve the problem.

Training is more likely to transfer if trainees can use basic skills to solve any new problems

The effectiveness of your training program is jeopardized if you assume that you're teaching the right skills based on the belief that they look right—rather than on the results they produce. If they are the wrong skills, trainees will use them, fail to achieve the desired results and never use them again. By field testing whether task analyses and definitions produce the desired results before training, you increase successful results and credibility of the training function.

Goldstein and Sorcher's research exemplifies empirically designed and evaluated training. To teach nurses to be more empathetic, they surveyed the staffs of two hospitals to obtain the 50 most frequently reported nurse-patient problems. From those problems they constructed their pre-

and post-training evaluation measures, modeling displays and role-plays. We do not suggest that program developers must do anything that rigorous. But we do suggest that they test whether their performance criteria produce mastery of the skills they define and then produce expected and desired results.

Produce and verify mastery

How much practice produces mastery? Goldstein and Sorcher state, "When more than one skill is being taught, *negative transfer* (response interference) is likely to occur if training on the second skill is begun while the first is only partially learned." A skill should be practiced until it's mastered before a new skill that depends on it is introduced.

To determine how much practice is needed to produce mastery, you could establish mastery criteria for each skill based on your experience of how much practice is needed to teach each one. However, you cannot assume that your criteria produce mastery. You must test all the criteria to see whether they do, before you include them in your training programs. To do this, conduct a pilot training and give a retention test a week or two after training to determine whether trainees can still perform all the trained skills. If they can, trainees have received enough practice. If they can't, you must increase practice for the skills they failed to master.

However, trainees should practice each skill the way it is used on the job. For example, teach communication skills through interactive role-play, and include written practice when teaching performance standards. In addition, mastery criteria and post-tests should verify learning in the same way.

Teach basic skills and general principles

As indicated, training is more likely to transfer if trainees can use basic skills to solve new problems—perhaps during follow-up training. Teaching basic skills, first in a one- or two-day intensive program, will ensure that every trainee initially achieves the same level of mastery for basic skills before practicing them in subsequent training.

The ability to ensure that all trainees achieve the same high level of performance is a strong selling point for your training programs.

Teach trainees both correct and incorrect examples

Trainers often ask if valuable training time should be spent teaching negative or incorrect examples of a skill or concept. Our answer is a firm "yes," if two elements are present:

- criteria-based practice of correct models (Transfer Strategy 2)
- examples of realistic problems that include the correct behaviors and the positive job-related consequences they produce, and the incorrect behaviors and the negative job-related consequences they produce.

Learning research indicates that teaching both correct and incorrect examples facilitates learning. A recent article by Parry and Reich supports this. The authors say that people learn generalizations by discriminating when those generalizations do or do not apply. A 10-year study conducted by the U.S.

Department of Education compared approximately 20 teaching methods. Becker and Englemann's direct-instrumentation model, which explicitly teaches the positive and negative instances of a concept or general principle, clearly outperformed all the other instructional models evaluated in this study.

Trainees cannot be expected to remedy their incorrect behavior if they recognize neither the behavior nor the negative results it produces. Programs designed to stop people from overeating, drinking or smoking usually teach the long-term consequences of those habits. Among others, Bandura notes that when you know those consequences, it does not guarantee that you'll break the habit; it just makes it more likely that you will.

We suggest that you show trainees incorrect models and, for an exercise, have them correct the errors and state the negative job-related consequences associated with the incorrect behavior. But showing trainees either correct or incorrect behaviors doesn't guarantee they'll perform only the correct ones. It's the consequences associated with the model—not the model itself—that control whether trainees perform the models they're taught, according to Bandura.

Common sense suggests that if you teach trainees to perform correctly, you'll automatically decrease their incorrect behavior. This is a fallacy. According to separate efforts by All and Calkin, the rate of incorrect behaviors is independent of the rate of correct behavior. Their research indicates that trainees who perform skills correctly during training may not transfer those skills to their jobs unless there are positive consequences for doing so. Although program developers and trainers cannot control reinforcement in the work environment, they can prepare trainees for that environment, as Kearsley has shown, by teaching the positive consequences of performing the correct skills and the negative consequences of performing the incorrect skills.

Follow up

We previously suggested you teach [illegible] skills intensively in one or two days. Although this ensures that trainees master the basics, transfer of training requires more than momentary mastery. Most material is learned and retained if practice is spaced over time.

Again, transfer strategies (e.g., teaching basic skills using pilot-tested performance criteria) aimed primarily at producing [illegible] and Baer's train-and-probe technique.

At the start of each follow-up session trainees write down the basic skills they think are needed for solving a new problem—for example, the skills needed to conduct a performance appraisal interview. Then show them the correct list and provide feedback on their answers. This [illegible] a probe. If trainees can state the [illegible] correctly, have each of them

role-play the interview. This is another probe procedure. If they do it correctly, they don't need further training on this particular problem.

If they fail to list all the basic skills or if they perform them incorrectly, train again with a new problem. Trainees eventually will list and perform accurately the basic skills, even with new problems. When trainees can repeat the probe procedures with accuracy, perhaps for two consecutive sessions, formal classroom training should cease and training should shift to the work place.

Trainers can use this train-and-probe strategy to:

- increase the efficiency of training without sacrificing performance.
- verify that training has generalized to new, untrained problems.
- change the emphasis of follow-up training at precisely the time trainees are ready.

Make follow-up training relevant

Realistic practice is very important to the transfer of training. Goldstein and Sorcher demonstrated that the greater the number of identical elements or characteristics in the training and application settings, the greater the consequent transfer. Therefore, realistic role-play can mediate and facilitate transfer.

To ensure that training assignments are relevant, trainees should choose those related to their daily work problems. Goldstein and Sorcher stress that trainees should work together to develop strategies for completing assignments, perform them on the job and report back to the group for positive or corrective feedback. When trainees perform assignments on the job, they're more likely to experience natural reinforcement, wrote Stokes and Baer.

Trainers may be concerned about gaining trainees' compliance with on-the-job assignments. But trainees who perform job-related assignments are reinforced by doing so because they eliminate their problem, receive positive social reinforcement from their trainer and other trainees, and their job is made easier. Trainers, however, are responsible for ensuring that trainees who comply and complete assignments receive more reinforcement than those who don't—a trainer's primary function.

Training developers and trainers can also make training more relevant, reinforcing and perhaps even more professionally rewarding by teaching trainees to document their success with on-the-job assignments and report them to their supervisors. More and more training directors and senior managers want transfer of training and its cost/benefits—if there are any—documented.

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