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## Comparing Traditional and Integrative Learning Methods in Organizational Training Programs

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## Abstract

Previous research and anecdotal reports have suggested that when certain teaching approaches are utilized, students not only learn more, but also experience greater satisfaction with the training process. This study examined the effects of Integrative Learning-based (IL) training relative to lecture-based training. Employees enrolled in a three-day Manufacturing Resource Planning training course were randomly assigned to either IL or traditional training. Subjects reacted more favorably to IL-based training. Trained subjects performed significantly better than those in a no-treatment control group but no differences were noted between training interventions.

## Keywords

CAHRS, ILR, center, human resource, job, worker, advanced, method, labor market, satisfaction, employee, work, manage, management, training, program

## Disciplines

Business | Human Resources Management

## Comments

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**Comparing Traditional and Integrative  
Learning Methods in Organizational Training Programs**

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Working Paper #91-29

**\*\* Forthcoming in Journal of Applied Psychology \*\***

This paper has not undergone formal review or approval of the faculty of the ILR School. It is intended to make results of Center research, conferences, and projects available to others interested in human resource management in preliminary form to encourage discussion and suggestions.

**RUNNING HEAD: COMPARING TRAINING METHODS**

## **Comparing Training Methods 2**

### **Abstract**

Previous research and anecdotal reports have suggested that when certain teaching approaches are utilized, students not only learn more, but also experience greater satisfaction with the training process. This study examined the effects of Integrative Learning-based (IL) training relative to lecture-based training. Employees enrolled in a three-day Manufacturing Resource Planning training course were randomly assigned to either IL or traditional training. Subjects reacted more favorably to IL-based training. Trained subjects performed significantly better than those in a no-treatment control group but no differences were noted between training interventions.

**Comparing Traditional and Integrative**

**Learning Methods in Organizational Training Programs**

By all accounts, training in U.S. organizations is big business. Over 90% of all private organizations have some type of systematic training program (Goldstein, 1986), and virtually all organizations with more than 1000 employees systematically train managerial personnel (Saari, Johnson, McLaughlin, & Zimmerle, 1988). It is estimated that over \$44 billion per year are spent on training initiatives (Carnevale & Gainer, 1989). Moreover, employee training and development is often identified as the most critical priority organizations will need to address in the coming decade (e.g., Goldstein, 1991; Milkovich & Boudreau, 1991). However, in spite of this perceived importance, training methods are often seen as fads, training program evaluation is rare, and rigorous evaluation is virtually non-existent (Goldstein, 1986, 1991).

A training approach referred to as Integrative Learning (also referred to as Accelerated Learning, or Super Learning) has been used for many years in educational settings. For example the United Nations Education and Scientific Cultural Organization (UNESCO) has reported dramatic results using IL in foreign language courses (Rose, 1985). Additionally, public school systems in Finland, Chicago, IL; Detroit, MI; Boston, MA; Jacksonville, FL; and Brooklyn, Oswego, Syracuse, Rochester, and Utica, NY have implemented IL-based curriculums (Martel, 1989). Moreover, IL is being increasingly utilized in U.S. industry. Many organizations (both public and private) believe that training programs based on the Integrative Learning (IL) approach may offer substantially better learning and retention rates than

## Comparing Training Methods 4

those achieved by traditional training methods. IL-based training initiatives are in place in dozens of U.S. government agencies and embassies, and in several large organizations, including Alcan, Apple, AT&T, Bell Atlantic, Eastman Kodak, General Motors, Hilton Hotels, Johnson Controls, Sandia Laboratories, Shell Oil, and US West, among others (A.L. Network News, 1989; Martel, 1989; Rose, 1985).

The IL approach is firmly rooted in Lewin's (1951) equation  $B = f(P,E)$  -- behavior is a function of the person and the environment. In fact, because the learning environment is viewed as so important, IL places extreme emphasis on creating environmental conditions believed to maximize learning potential. IL is based on a belief that environments which minimize or eliminate traditional barriers to learning allow students to use more of their cognitive potential and cause greater learning and retention to occur. Learning barriers include negative reinforcement, fear of failure, boredom, and anxiety. IL proponents argue that most educational institutions and corporate training programs are characterized by environments that impose, rather than eliminate, these barriers.

The IL approach relies on the "combination of physical relaxation, mental concentration, guided imagery, suggestive principles, and baroque music" to replicate the environments in which children learn basic life skills (Druckman & Swets, 1988, p. 6). A wide variety of instructional components are utilized to make the learning environment more relaxing and enjoyable. These include supportive comfortable surroundings, music, rhythmic mnemonics, games, stories, poetry, background posters and peripherals, and group interactions. Performance is enhanced through self-monitoring, data

## Comparing Training Methods 5

feedback, and positive reinforcement. Advanced organizers, student participation, and timing of instructional elements provide a structure that prepare the students to learn, get them involved in the learning, and allow for both mental and physical "practice". Enjoyable and positive learning experiences are then supposed to lead to further learning.

Many of these IL instructional components have been shown to effectively increase learning. For example, the ability to remember information about objects can be improved through guided imagery, and also appears to be enhanced by songs and rhythm (Paivio, 1971; Paivio & Desrochers, 1979). Cooperative learning exercises, in which students work together to learn and then present the material (Slavin, 1983), and the use of advanced organizers -- an overview of what is to come (Mayer, 1979), also appear to enhance learning. A critical component of IL-based training, the repetition of material using diverse media, is based on research showing that long-term memory is enhanced when material is repeated at optimal intervals rather than under massed practice conditions (Crowder, 1976; Goldstein, 1986). Additionally, heavy reliance on student-generated elaboration of the material, rather than trainer-generated explanations, facilitates learning (Reder, Charney, & Morgan, 1986) as would be expected under conditions that allow additional practice (e.g., Digman, 1959).

IL instructional components appear to work through their impact on affectivity. The IL classroom atmosphere and the mix of instructional components are designed to minimize learning barriers (negative reinforcement, fear of failure, boredom, anxiety) and to create positive affect among participants. Although intense emotional states tend to interrupt

normal processing of information (e.g., Simon, 1967), mild positive affective states have been shown to change not only the content of thoughts but also the nature of the cognitive process itself. Recent research indicates that positive affect influences the manner in which information is organized and improves the ability to integrate divergent information (Isen, & Daubman, 1984; Isen, Johnson, Mertz, & Robinson, 1985).

Recently, Ree and Earles (1991) reported that general cognitive ability was the best predictor of training success. However, the philosophy underlying IL rejects the commonly held understanding of intelligence. In the IL framework, general cognitive ability or psychometric *g* (Jensen, 1986), is seen as only one of many faculties that meet the criteria for "intelligence" (Martel, 1989). IL proponents accept the premise that seven separate and distinct intelligences exist and that people can learn and express their knowledge in linguistic, logical-mathematical, musical, spacial, bodily-kinesthetic, interpersonal, or intrapersonal ways (Gardner, 1983). They argue that traditional instructional techniques which focus on linguistic, mathematical and logical abilities, to the exclusion of the others, limit the learning that occurs by neglecting the other intelligences. Moreover, students are purported to be differentially affected depending on their dominant learning style. That is, students with primarily visual/auditory learning styles may be less affected by this neglect than students with primarily kinesthetic learning styles. IL instructional methods purport to "integrate" the power of multiple intelligences thereby allowing exponential increases in learning and retention.

The popular press has reported remarkable success with IL-based instruction. For example, UNESCO claimed that this approach allowed



## Comparing Training Methods 7

students to "absorb and retain a two year language course in as few as 20 days" (Rose, 1985, p. 3), and Ostrander and Schroeder (1975, p. 15) reported that just the suggestive principles employed in IL increase learning "from five to fifty times, increase retention,[and] require virtually no effort on the part of students". Several research studies have attempted to document reports such as these. However, while the principles are appealing and the claims ambitious, the empirical support has been less than convincing. Kirkpatrick (1959) suggested that evaluation procedures could consider four levels of criteria; reaction, learning, behavior, and results. Most of the support for the IL approach is based on reaction measures. Testimonials abound, and examinations of learning criteria have typically utilized experimental designs that lack the control necessary to eliminate alternative explanations.

Perhaps the most frequently cited testimonial regards the rejuvenation of Chicago's Guggenheim School, an inner-city school, grades K-8. Prior to 1985, the school was plagued by poor student performance. The entire teaching staff was trained in IL methods and began applying IL techniques in 1986. Reports indicated that average reading performance doubled, mathematic performance increased by approximately 50% and the school's ranking, based on student performance, within its district increased dramatically (Martel, 1989). However, while it is possible that the introduction of the IL techniques caused the increase, it is also possible that the results were due to administrative changes that accompanied the transition, teacher enthusiasm, or Hawthorne effects.

The research that has addressed IL has been criticized for several reasons. First, almost all of the experimental studies that exist failed to

## Comparing Training Methods 8

control for instructor (e.g., Schuster & Prichard, 1978; Gasser-Roberts, 1985) and/or Hawthorne (e.g., Knibbeler, 1982) effects that may have confounded the instructional effects. Second, weak experimental designs (e.g., post-test only or one-group designs) have lead to uninterpretable and insupportable conclusions (Cook & Campbell, 1979). Finally, small sample sizes typically have not provided the statistical power to detect significant differences that might have actually existed.

Limited evidence exists regarding the application of IL techniques in corporate training programs. For example, Bell Atlantic recently converted two customer service training courses from traditional teaching methods to an IL-based format. Gill and Meier (1989, p. 63) reported that "... the satisfaction of students and trainers greatly improved, as did their job performance". However, the results are difficult to interpret since the performance increases were inferred from post-test only supervisory responses to the question "... do your newly-trained employees perform better, the same, or worse than those previously trained?". The absence of pretests and control groups, combined with the informational campaign that accompanied the new training intervention, makes it impossible to determine if the use of IL caused increased performance. What is clear, and consistent with other studies, is that reaction measures indicated that students like this type of training. It is not clear whether participant reactions lead to any tangible differences in learning, retention, behavior, or impact.

In 1984, the National Academy of Sciences (NAS) began to examine the potential of several approaches, including IL-based techniques, that were purported to enhance human performance (Druckman & Swets, 1988). The

## Comparing Training Methods 9

NAS committee concluded that while the approach was based on sound instructional components that should improve learning (e.g., imagery, cooperation, repetition), the research to date was sufficiently flawed to prevent sound conclusions from being drawn regarding the effectiveness and/or the utility of IL-based training programs. The committee called for scientifically controlled studies in applied settings. The current study responds to that call by directly comparing IL-based and traditional training methods using an experimental design in an organizational setting.

### Hypotheses

Direct comparison of training interventions yields many testable hypotheses. The current study focuses on the issues that have received the most attention and appear to be most central to the IL approach -- student reaction and student learning. Research, though inconclusive, and the plethora of testimonials indicate that IL-based training will lead to greater comprehension. These sources also strongly suggest that participants react very favorably to IL-based training. Therefore,

- H1: Students trained using IL methods will learn more than students trained with traditional methods.
- H2: Students in IL-based training will have more positive reactions to the training than will students trained with traditional methods.

### Method

#### Setting

Technical Educational Resources (TER) at Kodak is responsible for supplying training to Kodak divisions in a timely, competitive fashion. One

## Comparing Training Methods 10

of the major on-going training initiatives at Kodak during the late 1980s and early 1990s has been Manufacturing Resource Planning (MRP-II). MRP-II is a method for effectively planning, coordinating, and integrating the use of all resources of a manufacturing company (Wallace, 1985).

As is true of most subject matter, MRP-II training can be delivered at introductory, intermediate, or advanced levels, depending on the individual's needs and the organization's goals. Successful full-scale implementation of MRP-II depends upon each employee understanding and following procedural guidelines. The three-day training program assessed in this study had been designed to provide employees with an introduction to MRP-II, and to transmit the fundamental knowledge necessary to contribute to implementing the system. This training is particularly important to Kodak because the organization views successful full-scale implementation necessary to maintain its competitive advantage over the coming decade.

At the time planning for this study began (mid 1989), the three-day MRP-II training program was being offered in both traditional and IL-based formats, and TER officials estimated that approximately 10,000 Kodak employees would be receiving MRP-II training over the next two years. Kodak was contemplating converting all MRP-II training from a traditional to an IL-based format. Because of the scope of the training, the perceived importance of MRP-II in Kodak's business plan, and the potential benefits IL purported to offer in terms of greater learning and attitudinal improvements, Kodak officials were interested in rigorous documentation of the effects of IL relative to the traditional manner (lecture) in which MRP-II training was being delivered. To achieve this objective, the principal investigator served as an

impartial mediator in a series of meetings during which the hypotheses to be tested, the research design, the measures, and the procedure were agreed to by the proponents of both traditional and IL-based training. This method, in which the concerned parties jointly design the study, has been shown to be an effective method for resolving scientific disputes (Latham, Erez, & Locke, 1988).

The traditional method of teaching was a lecture-based delivery of the primary elements of MRP-II. It incorporated the use of many examples, and allowed participants to ask questions as they arose. The content of the IL-based approach was derived from the traditional approach and covered exactly the same material. However, while the content of the courses was similar, the delivery of the material was radically different.

Each IL-based training session began with a series of activities intended to create a relaxed, positive environment for learning. Before the students arrived, the facilitators (trainers) removed the desks and tables from the room, put up several posters containing important MRP-II elements and concepts, and set the chairs into a circle. The intent was not only to improve communication between students, but also to suggest that the facilitator was only one of many potential sources from which to learn. Upon arriving, subjects first engaged in a relaxation exercise that involved tossing a ball around the room. The person catching the ball introducing him/herself and told the group something "good or new" that had happened in the past couple of days. Then, students were asked what MRP-II meant to them, and attempts were made to reaffirm their beliefs (show them that their preconceptions were "correct") and unite the group around a common

## Comparing Training Methods 12

understanding of MRP-II. Finally, the facilitators provided a global overview of MRP-II. This overview was intended as a framework, upon which the students could organize the material that would follow.

The major portion of the IL-based course focused on the primary elements of MRP-II. Each element was presented in a module (lasting from 20 minutes to one and one-half hours) that included facilitator explanation of the concepts, followed by an activity intended to reinforce the concepts in a fun or relaxing way. The activities included group discussions, games (e.g., Win-Lose-or-Draw and Charades), stories and poetry, and an elaborate business game that involved producing and distributing a product. The nature and complexity of each activity was matched to the nature and complexity of the MRP-II element which it reinforced.

Another primary segment of the IL-based training involved student presentation of the material. One to two hours on the afternoon of the second day, and again on the morning of the final day, were set aside for groups of students to prepare skits or games depicting "life at the shop both before and after implementation of MRP-II". A significant portion of the final day was set aside for group presentations.

Each day of training ended with a concert session in which the facilitator, to the accompaniment of background Baroque music, read a story that incorporated the important elements discussed that day. The tempo and intonation of the story were matched to that of the music. The final day of training concluded with a session requiring each student to set goals regarding specific MRP-II activities and outcomes they planned to accomplish over the

next six months. Finally, facilitators reviewed MRP-II, discussed the audit process for certification, and ended with a concert.

### **Research Design**

A Solomon four-group research design was utilized (Cook, Campbell, & Peracchio, 1990). This design controls for most threats to internal and external validity and represents a significant improvement over typical training evaluation designs (Goldstein, 1986, 1991). The groups consisted of (1) a group that received pre-tests, IL-based training, and post-tests, (2) a group that received pre-tests, traditional training, and post-tests, (3) a group that received IL-based training and post-tests only, and (4) a group that received traditional training and post-tests only. Since the hypotheses concerned the effects of IL relative to traditional training methods, it was determined that the most appropriate control group was traditional training rather than no-treatment. However, a no-treatment group was included so that the absolute effects of the training might be ascertained. Membership in groups 1 through 4 was determined by random assignment. The organization was unwilling to randomly assign employees to a no-treatment group. Therefore, the no-treatment group consisted of volunteers (all from TER), and was significantly smaller than the treatment groups.

### **Subjects**

Group size was determined through power analysis. One hundred and eighty employees were scheduled to be trained, and 172 actually completed the training. Twelve subjects in the no-treatment group brought the total sample size to 184. With this sample size, if the reports of extraordinary improvements over traditional methods were true, assuming Cohen's (1988)

## Comparing Training Methods 14

convention of a large effect size (one which explains 14% or more of total variation in the dependent variable), power to detect the effect at the .05 level of significance would be greater than .95. Assuming a moderate effect size, again relying on Cohen's convention, (one which explains approximately 6% of the variance), at the .05 level of significance, power to detect the effect would be approximately .70 to .80 (Cohen, 1988).

Subjects were a representative sample of the Kodak population that was expected to be trained in MRP-II. They were mostly male (73%), currently married (74%), and predominantly white (91%). Average age was 42 years and average tenure with Kodak was 18 years. All subjects were high school graduates, most (53%) had attended some college, and 26 percent were college graduates. Average educational attainment was 14.5 years. Job levels were distributed throughout the organizational hierarchy and salaries ranged from \$16,500 to \$98,000 with an average of \$37,227.

### Measures

To measure the amount of material learned, it was necessary to create a test that assessed the subset of MRP-II knowledge addressed in this particular training program. Standardized examinations currently existed for MRP-II certification purposes. However, because this course covered only a portion of possible MRP-II subject matter, existing competency examinations contained extraneous information that this training program did not contain. Therefore, these examinations were not suitable for determining learning in this context.

To create an appropriate test, an MRP-II expert within Kodak, who had had several years experience teaching MRP-II and designing,



## Comparing Training Methods 15

implementing, and evaluating MRP-II in Kodak facilities worldwide, reviewed the course content and choose approximately 100 multiple choice items from those on the certification examinations. These items were then reviewed with four other MRP-II experts who were familiar with the content of the three-day training program. Because testing was very uncommon in this organization, and because we were instructed to keep testing time to a minimum, it was determined that no more than 30 minutes could be dedicated to assessing learning. Therefore, with input from the other four experts, Kodak's primary MRP-II expert chose 40 items which best represented the content of the 3-day training program.

This examination was pilot tested by administering it to 40 individuals who had been certified as MRP-II facilitators at some time in the past (subject matter experts) and a random sample of 40 other Kodak employees who had had no formal MRP-II training. The experts averaged 81% correct (Range 24 to 37; SD = 3.38) compared to 50% correct (Range 8 to 29; SD = 5.18) for the untrained sample ( $T(df=78) = 11.63, p < .01$ ). No member of the novice group scored above the expert group mean and no member of the expert group scored below the novice group mean. Since the untrained group did significantly better than chance, it appeared that the test may have been somewhat lenient. However, since MRP-II training is an on-going initiative and MRP-II knowledge is considered valuable within Kodak, it is believed that employees acquire some MRP-II knowledge on their own. Since the experts averaged only 81% correct, it appeared that the exam items might have been measuring something other than MRP-II knowledge. However, this was determined to be unlikely for three reasons. First, the items were

selected on the basis of content validity, as suggested by Nunnally (1978). Second, when the expert sample was constrained to include only those who used MRP-II regularly as a part of their current job, the average score rose to 87.5% (SD = 1.41, n = 20). Third, item analysis indicated that the discrimination coefficients on all items were positive, as were the item-total correlations generated by the reliability analysis ( $\alpha = .75$ ). Therefore, on these bases, it was determined that the examination demonstrated sufficient content validity and reliability to warrant its use (Ackerman & Humphreys, 1990; Kerlinger, 1986; Nunnally, 1978).

The G.M. Faces scale (Kunin, 1955), was modified to elicit reaction to the training intervention. Specifically, it asked "Which face comes closest to expressing how you feel about the training program you are currently attending?". The scale was anchored by six faces, arranged from sad to happy, and the subject was instructed to check the face that best portrays how he/she felt about the training. To control for the possibility that attitudes about training in general might confound responses to this question, another item, also based on the Faces scale format, asked "Which face comes closest to expressing how you feel about your training opportunities at Kodak?".

The reliability of single-item measures is often questioned. However, single-item responses are most appropriate when the use of faceted measures might reasonably omit some aspect of the phenomenon (e.g., when the dimensionality of a construct is unknown or not clear), or when individuals are asked to make summary judgments about their own level of satisfaction or affect (Scarpello & Campbell, 1983). Scarpello and Campbell (1983) concluded that the Faces scale was not unreliable as a single-item measure of

job satisfaction. Moreover, a modification of the Faces scale has also been shown to be a reliable and valid measure of life satisfaction (Andrews & Withey, 1976; Judge & Hulin, 1990). Since training reaction also requires a summary judgement, about how well the subject liked the training, single item measures are not inappropriate (Alliger & Janak, 1989). Because the Faces scale has been shown to be reliable in other contexts requiring affect-based summary judgments, it seemed an appropriate measure of training reaction, particularly given the organization's desire to keep testing time to a minimum.

Several control measures were also taken. The Wonderlic Personnel Test (copyright E.F. Wonderlic, 1959, 1985, 1988) was administered to control for general cognitive ability. As a measure of cognitive ability, the Wonderlic fairs well and has been shown to correlate between .56 and .80 with Aptitude G of the General Aptitude Test Battery (U.S. Department of Labor, 1967), and between .91 and .93 with the Weschler Adult Intelligence Scale--Full Scale I.Q. (Dodril, 1983). One advantage Wonderlic has over other cognitive ability measures is that it takes only twelve minutes to administer.

Since the IL approach accepts the premise that learning styles affect the degree to which material presented through particular media will be assimilated, the Productivity Environmental Preference Survey (PEPS) was used to identify the conditions under which individuals are most likely to achieve or learn (Price, Dunn, & Dunn, 1991). Freedman and Stumpf (1980) suggested that the use of learning style measures should be suspended due to unreliable instrument design. However, since newly developed instruments, such as the PEPS, report acceptable internal consistency coefficients and are

fundamental to the training approach being studied, it seemed appropriate to include this control. The PEPS contains scales that, among other things, assess preference for different environmental conditions (alpha in parentheses) such as light (.84), noise level (.83), time of day (.84), and temperature (.85). Other scales assess preference for cooperative learning (.84) auditory stimuli (.78), visual stimuli (.67), tactile involvement (.78), and kinesthetic activity (.58). Although many of the variables were held constant by fixing the time and place of the training, others such as preference for cooperative learning and type of stimuli varied considerably by treatment. Therefore, it was deemed appropriate to control for individual preferences for these conditions.

Affective disposition is the "tendency to respond to classes of environmental stimuli in a predetermined, affect-based manner" (Judge & Hulin, 1990, p. 6). Positive affect is a state of high energy, full concentration, and pleasurable engagement while negative affectivity is characterized by distress, unpleasurable engagement and nervousness (Watson, Clark, & Tellegen, 1988). Affectivity has been shown to affect learning through its influence on how information is coded and recalled (Isen & Daubman, 1984). Affectivity may also affect attitudes toward training. Therefore, the subject's affective state during training was assessed using the Watson, et al. (1988) Positive and Negative Affectivity Scale (PANAS).

Additionally, subjective well-being, the ongoing state of psychological wellness (Diener, 1984), might also affect both reaction and learning. Therefore, the G.M. Faces scale, "Which face comes closest to expressing how you feel about your life as a whole?" (Kunin, 1955), was used to assess subjective well-being. Again, this item has been shown to be a valid and

reliable measure of life satisfaction that compares favorably with several faceted measurements of this construct (Andrews, & Withey, 1976; Diener, 1984; Judge, & Hulin, 1990).

### **Procedure**

Employees ( $n = 180$ ) were randomly assigned to receive either IL-based or traditional training, but they were not informed of the type of training they would receive until the day training began. Since it was not customary at Kodak to evaluate student performance in training programs (administer tests), at the time of enrollment all potential students were informed that the MRP-II course they would be attending was part of a large scale study on the effectiveness of Kodak training programs. They were also informed that the study would include assessments about how they felt about the course and how much they learned. All students were given the opportunity to withdraw at anytime without penalty and receive the training at a later date. Although no participants announced their intention to withdraw, eight employees did not report for their scheduled training session.

Employees were notified by electronic mail of the time and place to report for the three-day training session. To accommodate the number of students, six classes were needed. Traditionally, MRP-II training was conducted using a lecture format. Therefore the number of students per class was constrained only by classroom size. Since this type of training had typically been offered to groups of 40 to 50, we maintained that convention. Actual class sizes for the two traditional training groups were 40 (class #1) and 44 (class #2). IL-based classes require significant student interaction and kinesthetic activity. For this reason, proponents recommend that class sizes

## Comparing Training Methods 20

be kept in the range of 15 to 30 students. Differences in the physical sizes of the classrooms, and accommodating a few schedule changes resulted in actual IL class sizes of 29 (class #3), 22 (class #4), 22 (class #5), and 15 (class #6).

Five subjects came to the wrong session. Rather than losing subjects (because they arrived for a later session), or asking them to return one to three hours later (because they arrived for an earlier session), we accommodated them as best we could. All five of the subjects that reported at the wrong time were placed into a class that was receiving the type of treatment they had originally been assigned to. Therefore, accommodating them changed our anticipated class sizes but did not distort the random assignment.

Two methods were used to determine which subjects would be pretested. For the two larger, traditional training classes, the students were split into two groups through a process of counting off (1-2-1-2-1-2...). One half left the room and engaged in an unrelated exercise while the other half was pretested. Those that were pretested were asked not to discuss any part of the pretest with the other students. For the smaller, IL-based classes, a coin flip determined which two of the four classes would receive the pretest-posttest condition and which two would receive the posttest only condition. Because of the high level of interaction among students in the IL treatment, it was believed that this process would reduce the likelihood of pretest recipients discussing the pretest content with those who were not pretested.

These procedures resulted in somewhat unequal group sizes. The 51 subjects in Group 1 (pretest - IL training - posttest) consisted of all subjects in classes #3 and #5. The 42 subjects in Group 2 (pretest - Traditional training -

## Comparing Training Methods 21

posttest) consisted of half of the students from classes #1 and #2. The 37 subjects in Group 3 (IL training - posttest only) consisted of all subjects in classes #4 and #6. Finally, the 42 subjects in Group 4 (Traditional training - posttest only) consisted of half of the students in classes #1 and #2.

To minimize instructor effects, different instructors taught each of the six classes. All instructors had had previous experience teaching MRP-II, had experience with either traditional or IL-based instruction (although the traditional instructors had significantly more experience), and were randomly chosen from two pools (one for each of the training methods). Because the IL-based training was designed to be presented by teams of two instructors per class, we maintained that convention. Therefore, the traditional classes were taught by a single instructor but the IL classes were taught by teams of two instructors. Since this was the method by which future IL training would be offered, maintaining this convention added to the generalizability of the results. The classes were scheduled so that both types of training were offered concurrently.

On the day the training began, the start times were staggered so that the principal investigator could personally meet each class (and the no-treatment group) and administer the measures. Absolute confidentiality of individual responses was assured and subjects were told that nobody at Kodak would ever see their individual information. Subjects were informed that upon completion of the study, their personal information would be returned to them along with a summary of the results. Time was then provided for questions and comments. Most questions involved how the material would be returned so that confidentiality would be maintained. In response, subjects

were insured that the principal investigator would maintain possession of all test materials and would be available upon completion of the study to personally return the materials and discuss them with the participants.

The pretest consisted of the MRP-II comprehension exam, the PANAS, and the reaction measures. One hour was set aside for the pretest. Most subjects finished in 30 to 40 minutes.

At the end of the three-day training session, all subjects received posttests. Coinciding with the staggered starting times, the classes also ended at different times so that the principal investigator could administer the posttests. One and one half hours were allowed for the posttest and most subjects utilized the entire time period. Posttest measures included all of the pretest measures plus the Wonderlic, the PEPS, and demographic information.

### **Analyses**

Ordinary least squares (OLS) regression analysis was used to examine the relative effects of the training interventions. Two dummy variables were created. IL-Training was set equal to 1 if the subject received IL-based training, and set equal to 0 otherwise. TR-Training was set equal to 1 if the subject received traditional training, and set equal to 0 otherwise. These two dummies allowed the independent effects of each type of training to be ascertained. The no-treatment condition served as the excluded group. Additionally, to assess whether the pretest had any effect on learning or reaction, a dummy variable (Pretest) was created and set equal to one if the subject was pretested and set equal to zero otherwise.

A learning style index that included preference for learning with peers, preference for several types of stimuli, preference for mobility, preference for



tactile manipulation while learning, and preference for kinesthetic activity was created by combining subjects scores on the PEPS scales that assessed these preferences. Based on the content of the two training treatments, this combination emphasized the differences between the IL and the traditional training environments. Specifically, the IL instructional environment included all of these components while the traditional environment contained virtually none of them.

When MRP-II comprehension was specified as the dependent variable, the other control variables included cognitive ability, affectivity, subjective well-being, preference for particular learning environments, attitudes toward the training and toward general training opportunities, and individual demographic variables such as sex, race, age, organizational tenure, marital status, education, and income.

When reaction to the training was specified as the dependent variable, the other control variables included amount of material learned, cognitive ability, affectivity, subjective well-being, preference for particular learning environments, attitudes toward general training opportunities, and the individual demographic variables.

### **Results**

Oneway ANOVA indicated that the three groups (IL-trained, traditional-trained, and no-treatment) were similar in most regards at the pretest. No differences were noted on MRP-II pretest scores, attitudes about training opportunities, expectations about the forthcoming training session, subjective well-being, learning style, or positive affectivity. The only difference that was found concerned negative affectivity. Specifically, the no-

## Comparing Training Methods 24

treatment group exhibited a higher level of negative affectivity than did the IL and traditional training groups ( $F(df=2,104) = 3.85, p < .05$ ). There was no difference between the IL and the traditional treatment groups on pretest negative affectivity.

Additionally, while the IL and traditional training groups were virtually identical on the demographic variables, the no-treatment group differed in some meaningful ways. Specifically, the training groups were predominately male (IL = 74%; Traditional = 79%) but the no-treatment group was 77% female ( $F(df=2,104) = 6.1, p < .01$ ). The training groups had significantly more ( $F(df=2,104) = 3.4, p < .05$ ) organizational tenure (IL = 18 years; Traditional = 16.5 years) than the no-treatment group (12.6 years). Greater percentages of the training groups were married (IL = 80%; Traditional = 75%) compared to 42% of the no-treatment group ( $F(df=2,104) = 4.2, p < .05$ ). Finally, the subjects in the training groups tended to earn more (IL = \$39,489; Traditional = \$42,631) than the \$33,449 average for those in the no-treatment group ( $F(df=2,104) = 3.5, p < .05$ ). These differences reflect the random assignment to training versus the voluntary make-up of the no-treatment group. Because of the non-representative nature of the no-treatment group, we recommend cautious interpretation of no-treatment group outcomes.

Because some differences between the no-treatment group and the training groups did exist, these variables were included as controls in the analyses. No differences between treatments were noted on the variables that were thought most likely to influence learning, such as cognitive ability scores (IL = 21.2; Traditional = 21.8; No Treatment = 24), years of education

## Comparing Training Methods 25

(IL = 13.3; Traditional = 13.8; No Treatment = 14), or age (IL = 41.9; Traditional = 40.5; No Treatment = 40.3), or on any of the other variables.

Correlational analyses indicated that cognitive ability, amount of material learned, and years of formal education were all significantly positively related. Reaction to the training was significantly positively related to positive affectivity, subjective well-being, and perceived training opportunities but was unrelated to learning ( $r = .02$ ). The very small, non-significant correlation between reaction and learning apparently contradicts the assumption of successive causality in Kirkpatrick's hierarchical model of training criteria, but is consistent with Alliger and Janak's (1989) assertion that reactions need not be related to learning. The correlations between variables in the analyses are presented in Table 1.

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Insert Table 1 About Here  
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For the subjects that received both pre- and posttests ( $N = 107$ ), average scores on the dependent measures are shown in Table 2. Based on these results, gain scores were calculated and expressed in terms of standard deviation units. For example, the IL-trained group experienced a positive learning effect of 0.80 SD compared to a positive 0.98 SD effect on learning in the traditional training treatment, and a 0.43 SD decrease for the no-treatment group. The difference in gains between the traditional and the IL groups was not significant ( $T(df=92) = 1.74, p = .085$ ). Similarly, the effect of training on reaction was a 1.26 SD increase in the IL treatment compared to 0.35 SD increase in the traditional training treatment, and a 0.30

SD decrease in the no-treatment group. The difference in gains between the traditional and IL-based groups was significant ( $T (df=93) = 3.96, p < .01$ ).

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Insert Table 2 About Here  
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Learning. Regression results indicated that both types of training had significant, positive effects on learning (see Table 3). Training was the most powerful predictor of performance level on the MRP-II comprehension test. Tukey multiple comparison analyses ( $\alpha = .05$ ) indicated that both training groups differed significantly from the no-treatment group ( $F (df=2,180) = 6.95, p < .01$ ) but were not significantly different from one another. Thus, H1 was not supported. The non-significant coefficients on the pretest dummy and on learning style indicated that neither the pretest nor preference for particular learning environments had an effect on the amount of material learned.

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Insert Table 3 About Here  
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The practical significance of the training intervention was that the no-treatment group averaged 61% correct on the posttest learning measure, while the IL group and the traditional training group averaged 71% and 75% correct, respectively. Although the difference between the no-treatment group and the trained groups was only 10 to 14 percent, it represents a standard deviation better performance. Also, recall that the no-treatment group consisted of volunteers from TER. Since MRP-II is such an important

training initiative for TER, it is likely that in the course of their day-to-day work, the members of the no-treatment group were exposed to a significant amount of the course content. Therefore, the difference between the trained and untrained groups may be understated.

The variables that tend to be associated with "learning" were also significant predictors of performance on the MRP-II exam. As expected (e.g., Ree & Earles, 1991), cognitive ability accounted for significant variation in performance. Next to content-specific training, general cognitive ability had the most significant effect. Years of formal education was also significant.

Subjects' perceptions of their general training opportunities had significant effects, but their feelings about the course they were attending did not. Finally, some demographic characteristics were also significant. The coefficient on Race (coded 0 = white, 1 = nonwhite) indicated that whites tended to score better than non-whites. Additionally, women tended to score better than men (sex coded 0 = female, 1 = male), and younger subjects scored better than older ones.

Reaction. As Table 4 indicates, IL-based training had an effect on participant reaction. The coefficients on both the training intervention variables were positive and significant. Tukey's multiple comparison procedure ( $\alpha = .05$ ) indicated that all three groups differed significantly in their reactions to the training ( $F(df=2,181) = 23.05, p < .01$ ). Thus, H2 was supported. Attitudes about general training opportunities and subjective well being also influenced reaction to training.

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Insert Table 4 About Here  
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### Discussion

Predictions that the IL-trained subjects would learn significantly more than the traditionally-trained subjects were not supported by this study. Subjects who were randomly assigned to the IL-based training learned slightly less than subjects who received traditional lecture-based training. However, subjects in the IL-based training had much more positive reactions to the intervention than did those in the traditional training.

The similar amount of material learned through IL and traditional interventions is inconsistent with previous claims, and may have been observed in the current study for many reasons. One explanation may be that IL works better for particular types of subject matter than for others. Specifically, the MRP-II knowledge assessed in the current study was very cognitive in nature whereas some previous studies (e.g., Gill & Meier, 1989) assessed training that was more interpersonal or behavioral in nature. Although current IL philosophy does not specify that the approach is superior for behaviorally-based topics, the instructional components do appear to be better suited to behavioral or skill-based training.

Given the role of affect in IL-based training, the intervention may also work better for topics that tend to cause apprehension or anxiety and/or those that are generally disliked. For example, many people express dislike for certain subjects (e.g., foreign languages, mathematics), generally because they are perceived to be difficult. IL's focus on making the learning experience

fun and eliminating negative feedback suggests that these types of topics may be best suited to its application. Alternatively, a topic that everyone finds enjoyable and interesting to begin with probably presents fewer learning barriers to overcome and therefore may offer little opportunity for improved learning.

The current training topic may not have been particularly well suited to the IL intervention. In fact, this topic seems to represent the type of training that should prove most challenging for IL to achieve significantly better learning effects. It was cognitive in nature and was designed to impart knowledge, rather than change behavioral patterns or skills. Also, since much of the MRP-II material presented in the current training can be defined as "organized common sense" (Wallace, 1985, p. 262), subjects may have had very little anxiety or apprehension about the topic. Moreover, since MRP-II outcomes are unit-based, it is unlikely that any particular individual could be singled out as the reason for meeting (or not meeting) goals. Therefore, subjects may not have felt much pressure to learn the material. Given these conditions, the traditional learning barriers that IL purports to overcome may not have been much of a factor in this case.

Another explanation for the similar results may be that the traditional lecture-based method incorporated some of the instructional components that IL relies upon (e.g., advanced organizers, relaxation, affect, imagery, cooperation, participation, and practice). Examination of the traditional method found no evidence to support this suspicion. Although it was a thoughtful, interesting, organized presentation, it was none-the-less a lecture. However, it is possible that the attitude of the instructors in the traditional

intervention did have an effect. Specifically, both instructors tended to be very positive, tried to make the material interesting and enjoyable, and relied heavily on positive reinforcement. Therefore, the nature of the traditional instructors may also have minimized the learning barriers that IL purports to overcome, and this may have had a suppressing effect on the power of the IL intervention.

Another possible explanation is that IL has not operationalized its component parts as effectively as possible. Previous research has shown (often in laboratory settings) that the instructional components upon which IL relies facilitate learning. However, while it is true that IL utilizes these components, at least as applied to the MRP-II training assessed in this study, the approach does not appear to emphasize any of them. It is possible that the components work in a compensatory fashion or that the effects of some components either offset the effects of others, or add little above the effects already achieved by others. This possibility deserves future research attention. For example, it would be possible to assess the unique effect of each component by offering a set of IL-based training sessions in which one component at a time was systematically omitted. By measuring the learning that occurs in the absence of particular components, it would be possible to ascertain the independent effects of each instructional component in the IL environment.

It is also possible that particular instructional components may be differentially effective depending on the type of material being taught. For example, kinesthetic activity may be more effective for learning specific skills or behaviors than for learning the types of principles and procedures taught in



the MRP-II course described in this study. Examining unique effects of each of the instructional components within the context of the others, and further exploring the types of subject matter best suited to the specific components would seem to offer the greatest potential for understanding which combination of learning components have the greatest impact for specific purposes.

Finally, claims made on the basis of results from previous research have typically far exceeded the legitimate conclusions that the research designs permitted. Past research is dominated by single-group and posttest-only research designs. Cook and Campbell (1979, p. 96) have referred to these types of research designs as "generally uninterpretable". The highly controlled research design utilized in the current study eliminates most threats to internal and external validity, and permits more rigorous documentation of training effects.

The significantly more positive reaction expressed by the IL-trained subjects is consistent with reactions reported in prior descriptions of IL interventions. Both students and teachers enjoyed the informal classroom atmosphere and the variety of activities utilized. It is not surprising that games, music, imagery, physical activity, and substantial interaction elicited more positive reactions than did three days of listening to lecture. The favorable reactions (both measured reactions, and those articulated by the participants), are consistent with the existing overwhelming testimonial support for this approach. Relative to the traditionally-trained subjects, participants in the IL-based approach not only liked the training better but also tended to believe they had learned more.

This study examined the relative effects of IL and traditional training methods on participant reaction and learning. Additional research is also needed to examine possible differences on other criteria such as retention of material, job-relevant behavior, and organizational impact. It is possible that even though no differences were observed on the amount of material learned, differences may emerge if one group retains more of the learned material than the other group. Since IL-based training utilizes components that have been shown to increase retention (e.g. spaced practice, advanced organizers), some bases exist for expecting IL-trained subjects to remember more than traditionally trained subjects. This possibility could be explored by assessing subjects' knowledge of the training content at subsequent points in time. To avoid instrumentation effects, the same instrument (or equivalent form) used to assess learning at the posttest stage should be used to assess retention. Retention could then be expressed as a percentage of learning.

This study would have been strengthened if the behavioral effects of training could have been assessed. Unfortunately, a major organizational restructuring prevented the collection of supervisory ratings of trainee performance on MRP-II-related activity. However, future research should attempt to assess both pre- and post-training behaviors. The process of assessing training needs and enrolling an employee for training provides the opportunity to obtain pre-training assessments of behavior. At the time an employee is enrolled for training, the supervisor might be asked to provide a brief, though systematic, assessment of the employee's behavior on course-relevant dimensions. Post-training behavior might be assessed by asking the supervisor to complete a similar questionnaire at a later date. Alternatively, it

might be assessed as part of the formal performance appraisal process and then matched to pre-training assessments.

The MRP-II comprehension test was designed to measure how much of the training program content was assimilated by the subjects. Since trainees can only transfer what they have learned, the test score provided an indication of the maximum amount of training program content that the subject would be able to transfer to the job. However, since many things restrict the transfer of training content, test scores probably overestimate the transfer that would actually occur. Direct measurement of job behaviors would address this issue. For example, although no differences between groups were observed on test scores, perhaps through differences in attitudes or interpersonal relationships, one group may be more or less able to affect greater changes in job behavior. It is also possible that the more favorable reaction to the IL-based training might make employees more motivated to undertake future training, and might also facilitate transfer. This seems particularly likely in organizational environments where mandatory training is perceived as boring or seen as being a chore. If so, different conclusions about the effectiveness of the intervention would be warranted. Since IL-based training emphasizes interaction and interpersonal relationships to a much greater extent than does lecture-based training, it is possible that transfer to the job may be greater for IL-trained subjects.

Direct comparisons of different training programs also offer opportunities to study the impact of training interventions. Although a complete utility analysis is beyond the scope of this study, it appears that analyses of the relative costs and benefits of each approach might be the most

effective way of determining the value of different training approaches in particular organizational settings. For example, in the current study the teacher-student ratio for the IL-based approach was approximately 1/10 compared with 1/44 for the traditional approach. Other costs included acquiring the IL technology. Therefore, the costs of each approach can be objectively determined. It seems possible to subjectively determine the value of material learned, behavioral changes, and participant attitudes. Once done, it would be possible to form a more holistic opinion of the contextual merits of alternative training interventions.

Future research might also consider alternative methods for measuring what was learned. This study assessed MRP-II knowledge using a multiple choice test that relied on linguistic and logical-mathematical abilities. It is possible that this type of examination did not allow all subjects to express their knowledge to its fullest extent. Even though all parties involved with the design of this study agreed to this method of testing, since the IL approach accepts the premise of multiple intelligences, future research should consider how to measure learning in a variety of ways.

In conclusion, when subjected to a very tightly controlled experimental design, and a decidedly cognitive topic, claims of greater learning in IL-based training were not supported. However, for the reasons discussed above, this study appears to have been a very challenging test for IL. Different results may be observed for more task-oriented or behavioral training interventions, or when greater learning barriers are present or perceived. It is possible that the assessment of different criteria (e.g., behaviors) might have yielded other conclusions, or that the unmeasured

## Comparing Training Methods 35

effects of enhanced participant reaction return significant benefits to the organization. Even so, IL yielded similar learning results, with less-experienced instructors, and with significantly more positive reactions. Therefore, additional research with different samples, in different types of training, and in other settings is needed to substantiate or refute these findings.

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## Comparing Training Methods 39

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Comparing Training Methods 42

Table 1

Correlation Matrix

	alpha	Mean	SD	1	2	3	4	5	6
1 IL Training	--	0.48	0.50	--	-88**	-07	-08	42**	03
2 TRAD Training	--	0.46	0.50		--	02	19**	-28**	-02
3 Cognitive Ability	--	21.7	6.6			--	57**	-08	03
4 MRP II Learning	.75	28.9	5.0				--	02	00
5 Reaction	--	2.3	1.0					--	24**
6 Positive Affectivity	.89	34.6	7.2						--
7 Negative Affectivity	.89	17.3	6.6						
8 Perceived Training Opp	--	2.3	1.0						
9 Subjective Wellbeing	--	2.4	0.9						
10 Sex	--	0.74	0.44						
11 Race	--	0.08	0.27						
12 Age	--	41	7.5						
13 Tenure	--	17	7.4						
14 Marital Status	--	0.75	0.43						
15 Income	--	40,530	12,582						
16 Education	--	13.6	2.0						

Table 1 - continues

## Comparing Training Methods 43

Table 1 - continued

Correlation Matrix

	7	8	9	10	11	12	13	14	15	16
1 IL Training	01	14	05	-00	01	10	15	10	-08	15*
2 TRAD Training	-07	-12	-06	12	-06	-08	-07	00	15*	12
3 Cognitive Ability	01	01	00	09	-20**	-11	-12	-05	28**	60**
4 MRP II Learning	00	11	-05	01	-22**	-19**	-04	06	24**	51**
5 Reaction	-08	44**	29**	-12	-01	-01	01	-04	-02	-07
6 Positive Affectivity	-13	31**	39**	-01	06	05	-01	-00	02	08
7 Negative Affectivity	--	-17*	-41**	-09	-06	-14	-09	-00	-05	08
8 Perceived Training Opp		--	33**	-03	05	01	-01	01	-01	11
9 Subjective Wellbeing			--	06	00	06	02	-06	02	06
10 Sex				--	-20**	14	25**	34**	35**	00
11 Race					--	-14	-18*	-12	-07	01
12 Age						--	72**	21**	28**	-12
13 Tenure							--	17*	36**	-21**
14 Marital Status								--	18*	03
15 Income									--	38**
16 Education										--

Note. Decimals omitted. N = 184. Sex coded 0 = female, 1 = male. Race coded 0 = white, 1 = non-white.

\*\*  $\underline{P} < .01$  \*  $\underline{P} < .05$

## Comparing Training Methods 44

Table 2

Dependent Variable Scores and Standardized Effects

		IL-based (N = 51)	Traditional (N = 44)	No-Treatment (N = 12)
Pre Learning	M	23.88	24.75	25.65
	SD	(5.34)	(5.55)	(2.46)
Post Learning	M	28.16	30.23	24.58
	SD	(5.19)	(5.38)	(3.99)
	<b>Effect</b>	<b>0.80</b>	<b>0.98</b>	<b>-0.43</b>
Pre Reaction	M	3.04	2.86	3.00
	SD	(0.92)	(0.88)	(1.10)
Post Reaction	M	1.88	2.55	3.33
	SD	(0.95)	(0.76)	(1.07)
	<b>Effect</b>	<b>1.26</b>	<b>0.35</b>	<b>-0.30</b>

Note. M = mean, SD = standard deviation. Effect = (Post - Pre) / Pre SD. For Reaction, lower scores indicate more positive reaction.

## Comparing Training Methods 45

Table 3

Regression Results For Learning Measure

	Full Sample (N = 173)		Pretest-Posttest Sample (N = 100)	
	Beta	t ratio	Beta	t ratio
Pretest Dummy	-.009	-0.169	---	---
Pretest Score	---	---	.536	7.134**
Traditional Training	.557	4.511**	.370	3.313**
IL-based Training	.466	3.621**	.252	2.024*
Cognitive Ability	.445	6.253**	.195	2.497*
Years of Education	.268	3.406**	.182	2.120*
Reaction to Training	.009	0.121	.126	1.456
Positive Affect	-.031	-0.524	-.059	-0.884
Negative Affect	-.077	-1.288	-.085	-1.357
Subjective Well-Being	-.101	-1.543	-.134	-1.827
Perceived Training Opportunities	.132	2.053*	-.029	-0.379
Learning Style	.055	0.927	.041	0.668
Age	-.291	-3.653**	-.310	-3.578**
Sex	-.173	-2.724**	.016	0.221
Race	-.141	-2.461*	-.104	-1.658
Tenure	.297	3.491**	.229	2.369*
Marital Status	.071	1.201	.042	0.651
Income	-.036	-0.521	-.063	-0.749
R <sup>2</sup>	.571		.756	
Adj R <sup>2</sup>	.524		.706	

Note. t ratio = regression coefficient / standard error.

\*\* p < .01      \* p < .05

## Comparing Training Methods 46

Table 4

Regression Results For Reaction Measure

	Full Sample (N = 173)		Pretest-Posttest Sample (N = 100)	
	Beta	t ratio	Beta	t ratio
Pretest Dummy	.021	0.341	---	---
Learning Score	.011	0.121	-.100	-0.941
Pretest Reaction	---	---	.144	1.763
Traditional Training	.434	3.005**	.256	1.801
IL-based Training	.736	5.277**	.634	4.474**
Cognitive Ability	-.017	-0.194	-.111	-1.126
Years of Education	-.124	-1.347	-.139	-1.285
Positive Affect	.082	1.228	.020	0.243
Negative Affect	.057	0.853	-.033	-0.421
Subjective Well-Being	.168	2.300*	.124	1.353
Perceived Training Opportunities	.348	5.112**	.452	5.529**
Learning Style	.041	0.617	.159	2.111*
Age	-.018	-0.191	.000	0.000
Sex	-.182	-2.523*	.109	1.273
Race	-.057	-0.868	-.115	-1.470
Tenure	-.071	-0.715	.020	0.157
Marital Status	-.049	-0.725	-.115	-1.450
Income	.140	1.769	.152	1.467
R <sup>2</sup>	.451		.624	
Adj R <sup>2</sup>	.391		.546	

Note. t ratio = regression coefficient / standard error.

\*\* p < .01      \* p < .05