# Toward a Unified Theory of the Relationship between Training Methods and Factors of Cognitive Ability

*Shani D. Carter*
*Rhode Island College*

*The paper proposes a theory that trainees have varying ability levels across different factors of cognitive ability, and that these abilities are used in varying levels by different training methods. The paper reviews characteristics of training methods and matches these characteristics to different factors of cognitive ability. The paper proposes that if organizations assign trainees to methods of training based on trainees' cognitive ability profiles, then learning will be maximized.*

Keywords: Training Methods, Cognitive Ability, Interactional Psychology

In the United States, nearly all private organizations offer employee training, amounting to an expenditure of more than $50 billion annually. Organizations want to ensure that these expenditures are used effectively. One method to ensure training is effective in increasing skills is to tailor training to the characteristics of the employees being trained. If trainees fail to learn material in training, then training budgets are wasted, and lower organizational performance can result.

In the current paper, we propose one way to tailor training to employees, which is to match training methods to employees' strengths in different factors of cognitive ability. We rely on the theory that behavior is a function of the person and the environment, B=f(P,E), posited by many researchers (e.g., Lewin, 1951; Terborg, 1981). We examine one specific type of interaction and develop the theory that learning (L) is a function of cognitive ability (C) and training method (M), such that L=f(C,M). We begin with a review of types of training methods, then discuss influences on learning in different methods. Next, we discuss types of cognitive ability. Finally, we propose types of interactions between training methods and cognitive ability that can influence learning.

## Types of Training Methods

Training methods are the form of the training as distinct from the knowledge content of the training. For centuries, teachers have sought to develop teaching methods that can have the greatest impact on their students' learning. For example, Socrates (469-399 B.C.) developed the dialectic method, which is the foundation for what is now known as the Socratic Method of teaching (Columbia University, 2005). This method continues to be used successfully in many law schools, and is gaining increasing use in management and organizational development education, but with mixed results (Areeda, 1996; Cummings, 2000).

Many researchers have developed taxonomies to group training methods into categories based on the methods' characteristics (Carroll, Paine, & Ivancevich, 1972; Arthur Jr., Bennett Jr., Edens, & Bell, 2003; Burke, et al., 2006). For example, some taxonomies divide training methods into categories based on whether the training is designed for children or adults. Pedagogy consists of training methods geared to children or to adults with little or no experience, while andragogy consists of training methods geared to adults with experience; (Knowles, 1989). Briefly, pedagogical methods focus on guiding learners through a series of pre-defined steps, whereas andragogical methods focus on involving learners in the design of the course.

Another taxonomy placed training methods into three categories based on the type and level of trainee participation required. These methods are information presentation, information processing, and simulation (Heneman et al., 1989). This taxonomy incorporates a large number of training theories regarding the purpose of the training, methods of the training, trainee characteristics, and conditions under which the training is effective. The taxonomy is a clear, straightforward, and comprehensive way of viewing and categorizing training methods. We use this taxonomy as the basis of our theory, so detail of this taxonomy is presented here.

*Information Presentation*

Information presentation methods are designed to present large amounts of material to participants in an efficient manner, and allow trainees to absorb and memorize non-complex facts. These methods do not require interaction between trainees, therefore, trainees can learn material independently of each other. Some methods are

reading lists, correspondence courses, films, standard lectures, standard lectures on video tape or satellite, multimedia lectures (i.e., inclusion of slides, movies, videos, or handouts), panel discussions, programmed self-paced learning with booklets, and programmed self-paced learning with computers (Casner-Lotto, 1986; Heneman, et al., 1989; Wexley & Latham, 1981).

Because these methods present large amounts of information and do not require interactions between trainees, they are most useful when: the objective of the training program is knowledge acquisition; the knowledge is not complex; trainees are capable of learning and are self-motivated; there are many trainees; or there are time or cost limitations on the training program (Heneman, et al., 1989).

Information presentation techniques can be problematic for use with adults because there is often little opportunity for self-pacing, and because trainees are required to play a passive role. The specific methods of information presentation training vary on these two dimensions (Casner-Lotto, 1986; Lacey, et al., 1982).

*Information Processing*

In information processing methods, trainees are required to generate and discuss (i.e., process) the material to be learned. These methods require trainees to interact with each other or with the instructor to learn the material. Some of the information processing techniques are discussion groups focused on problem solving, discussion groups focused on trainee behavior, and interactive video (i.e., discussion group joined together by use of satellite; Casner-Lotto, 1986; Heneman, et al., 1989).

These techniques are most useful for: rapid increases in knowledge; increases in the consistency of performance; enhancing knowledge already possessed; when the material is complex; when trainees are not self-motivated; when there are few trainees; or when time and cost limitations are minor (Casner-Lotto, 1986).

*Simulation*

Simulation methods are designed to imitate the work environment and may or may not require interaction of trainees, but they do require a high level of activity of trainees. Some methods of simulation training are case study, role playing, in-basket exercises, work simulation at mock-up work site (either realistic or simulated), and business-games (Heneman, et al., 1989). These methods are most useful for: developing skills through practice; changing employee attitudes; and increasing diagnostic and problem solving skills. These methods are effective for improving performance because they require repetition of tasks, and repetition of tasks helps increase learning (Casner-Lotto, 1986; Weiss, 2000b).

*Relationships Between the Methods*

These training methods can be placed on a continuum which reflects the degree of trainee involvement and degree of similarity to the job environment (Figure 1). The continuum ranges from methods that require minimal involvement of trainees (e.g., lecture) to methods that require complete involvement of trainees (e.g., work sample). It also ranges from methods that are structured quite differently from the job environment (e.g., lecture) to methods that mimic the job environment (e.g., work sample).

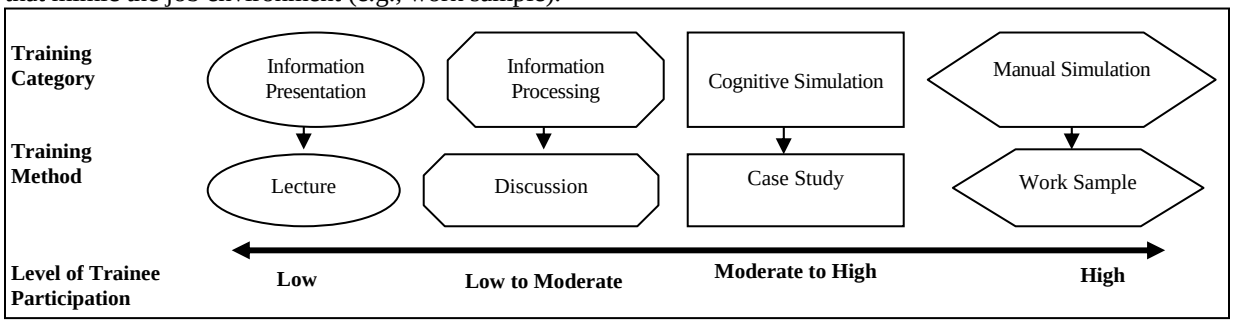


*Figure 1.* Relationship of training methods to trainee participation level

In Figure 1, information presentation methods are illustrated in the ovals on the left. These methods require low levels of participation. Information processing methods are illustrated in the octagons, second from the left. These methods require low-to-moderate levels of participation of trainees. Written simulation methods are illustrated in the rectangles, second from the right. These methods require moderate-to-high levels of trainee participation. Manual simulation training methods are illustrated in the hexagons on the right. These methods require high amounts of trainee participation.

## Interactional Psychology and Training Methods

The theory of interactional psychology states that behavior is a function of interactions between personal and

environmental characteristics, B=f(P,E), (Cantor, 1981; Chatman, 1989, Endler, 1976; Lewis, 1978; Pervin, 1978; Terborg, 1981; Wexley 1984). Environmental characteristics include physiological aspects (e.g., lighting conditions) and psychological aspects (e.g., interactions with co-workers). Personal characteristics also include physiological aspects (e.g., the ability to walk) and psychological aspects (e.g., motivation and intelligence).

Environmental characteristics vary across situations and within situations over time (Lewis, 1978). The variation in environmental characteristics leads to variation in behavior. Likewise, personal characteristics vary across individuals and within individuals over time. The variation in personal characteristics also leads to variation in behavior (Schneider, 1987).

Further, interactions between environmental and personal characteristics influence behavior. Given a certain environmental condition, performance varies across individuals and within individuals over time due to variations in personal characteristics. Likewise, given a set of personal characteristics, performance varies over time due to variation in environmental characteristics. In sum, interactions between variations in personal and environmental characteristics lead to multiple types and levels of performance.

A long line of research has found person-environment interactions to influence different behaviors, such as entrepreneurship, learning, energy consumption, expatriate acculturation, and managerial behaviors (Baldwin, Magjuka, & Loher, 1991; Durand, 1975; Hand, Richards, & Slocum, 1973; Mendenhall & Oddou, 1985; Russell, Terborg, & Powers, 1985; Siero, Boon, Kok, & Siero, 1989). According to interactional psychology, then, training characteristics should interact with trainee characteristics to influence learning. In regard to this link between training method and personal characteristics, researchers have examined personality (Smith-Jentsch, Salas, & Brannick, 2001; Naquin & Holton III, 2002), learning style (Franz, 1991), affectivity (Isen, Daubman, & Nowicki, 1987), self efficacy, (Gist, 1989), and age (Callahan, Kiker, Cross, 2003). Several researchers have examined multiple trainee characteristics simultaneously. For example, Weiss (2000b) emphasized that learning in different training methods can differ depending upon occupation, organizational culture, affective valence of methods, motivation, cognitive ability, trainer style, physical environment of training location, etc.

Another stream of research in training methods has focused on the link between training methods and types of cognitive ability (i.e., intelligence; Weiss, 2000a). This is the type of interaction we examine in the current paper. Specifically, we propose the theory that training methods differ in the cognitive abilities they require to be used. That is, if fit exists between training method cognitive factoral requirements and trainee cognitive factoral ability, then knowledge gains in training will be higher than if fit does not exist.

As early as the late 19$^{th}$ century, researchers were publishing theories to describe this relationship. For example, Spencer (1887) discussed the relationship between intelligence and learning by describing intelligence as "those abilities which an intelligent creature possesses, of recognizing diverse external objects and of adjusting its actions to composite phenomenon of various kinds, imply a power of combining many separate impressions (page 403)." Many researchers continued to explore the relationship between intelligence and learning (e.g., Eysenck, 1979; Gardner, 1983; Jensen, 1981). More recent research examines the physiology of the brain and how it relates to intelligence (Gupta, 2006).

Trainers and educators are intrigued by this topic and want to know how to use the accumulated research to increase their students' learning. In the area of how training methods can be tailored to students' innate abilities, Weiss (2000b) examined technology, brain physiology, and memory. Weiss emphasized that there are multiple abilities, and multiple ways to learn. It is believed that we can increase learning in our courses by using multiple teaching methods which will require trainees to use multiple abilities, yet this leads to the question: which training methods are most effective for which abilities of our trainees?

**Factors of Cognitive Ability**

General cognitive ability is defined by some researchers as an over-arching mental ability. In his work to define and measure intelligence, Spearman (1927) gave the label "g" to the general factor of intelligence, and the label "s" to the specific factors of intelligence. He stated that g "varies freely from individual to individual, (but) remains the same for any individual over time," (page 75). Regarding s, Spencer (1887) stated that it "not only varies from individual to individual, but even for any one individual from each ability to another," (page 75). Each specialized ability is composed of both general ability, g, and specific ability, s, and within each ability, the ratio of g to s varies. That is, individuals have different abilities which enable them to react to different situations. This implies that general cognitive ability, g, is composed of specialized abilities, s. Specialized abilities are composed of portions of g and s.

These specialized abilities are known as factors. There is no consensus in the literature regarding a taxonomy of the factors of cognitive ability. For example, Jensen (1981) defined the factors as numerical, spatial, verbal, visual,

and memory. Eysenck (1979) defined the factors as verbal, numerical, spatial, perceptual, and memory. Finally, Gardner (1983) defined the factors as linguistic, musical, logical-mathematical, spatial, bodily-kinesthetic, inter-personal, and intra-personal.

Gardner (1983) found that some individuals had exceptionally high levels of some abilities, and an almost complete absence of other abilities. Thus, he concluded, the factors are relatively independent of each other. Other researchers, however, believe the factors are related to each other. For example, Jensen (1981) found that after administering tests that measure different abilities, one can apply factor analysis to extract g from the intercorrelation of test scores. Therefore, the factors are correlated with each other and g is the intercorrelation of the factors (Eysenck, 1979).

Other researchers found evidence of strong individual differences using traditional intelligence tests. Kaufman (1990) found that 41% of adolescents and adults tested with the Wechsler Adult Intelligence Scale (WAIS-R) test of IQ obtained significantly different scores on two factor tests (i.e., verbal and non-verbal). A similar result regarding individual difference in abilities could be expected with other factor tests, because many intelligence tests are designed to measure the same skills as the WAIS-R.

*Cognitive Ability Tests and Learning*

Kaufman (1990) stated that individuals who score higher on cognitive ability tests obtain more education and also work in more demanding occupations. Jensen (1981) found that students with higher cognitive ability test scores learn their course work more quickly and easily, and with greater thoroughness and retention than students with lower cognitive ability test scores. While it is possible that individuals perform well on cognitive ability tests because of their formal education, it is also possible that individuals obtain higher levels of education because they are highly intelligent. Whatever the direction of causality, the existence of strong correlations between education and intelligence test scores indicates that we can use these tests to predict success in training (Kaufman, 1990).

Gardner (1983) agreed that scores on intelligence tests predict the ability to perform well in school. He cautioned, however, that intelligence test scores and school grades are both based on written tests, which are inherently based on verbal and logical-mathematical abilities, and that this common method bias explains their close relationship. Although Gardner (1991) opposed standardized testing because he stated it often is used to categorize individuals adversely, he stated that if testing is done then the goal of testing should be to determine trainees' cognitive profiles to give trainees a variety of opportunities to learn.

## Matching Training Methods and Factors of Cognitive Ability

Many researchers have stated that learning can be increased if training methods are matched to cognitive factors. For example, Gardner (1983) stated that individuals have different cognitive strengths and education should be tailored to learners' cognitive profiles. Cooper and Mumaw (1985), found that cognitive ability tests that measure different factors were not equally effective in predicting success in different contents and methods of training.

Other researchers have examined cognitive ability and learning with mixed results. For example, Ree and Earles (1991) found that g was a better predictor than factors of g (i.e., "s") for training success for the 82 jobs in their study. They did not report the use of different methods of training, however. Bretz and Thompsett (1992) found that g was the best predictor of training success for the two training methods in their study and that training method had no significant influence on knowledge gains. The factors of cognitive ability were not measured, however. Thorndike (1986) and Hunter (1986) found that g is a better predictor than factors of g for training success across occupations and complexity of jobs. Neither researcher, however, examined whether the factors of g interacted with training method to influence learning. Hartigan and Wigdor (1989) produced a meta analysis that found that three cognitive factors were fairly good predictors of training performance for five general job types.

*Theory of Matches between Training Methods and Cognitive Ability*

We propose the hypothesis that learning is highest in training if training methods are matched to trainee cognitive ability. First, we describe cognitive ability, relying on the theories of several researchers. Second, we match these abilities to training methods.

*Cognitive ability.* Figure 2 presents our proposed theory regarding relationships between different cognitive factor taxonomies and tests. The figure also illustrates our proposed theory regarding relationships between training methods and cognitive factors. To summarize our theory, there is a range of abilities, and these abilities are defined in slightly different ways by different researches. The abilities are also measured in slightly different ways by different tests. The tests can be used to predict success in different training methods.

At the top of the figure is general intelligence, g, as defined by Spearman (1927). The second and third rows

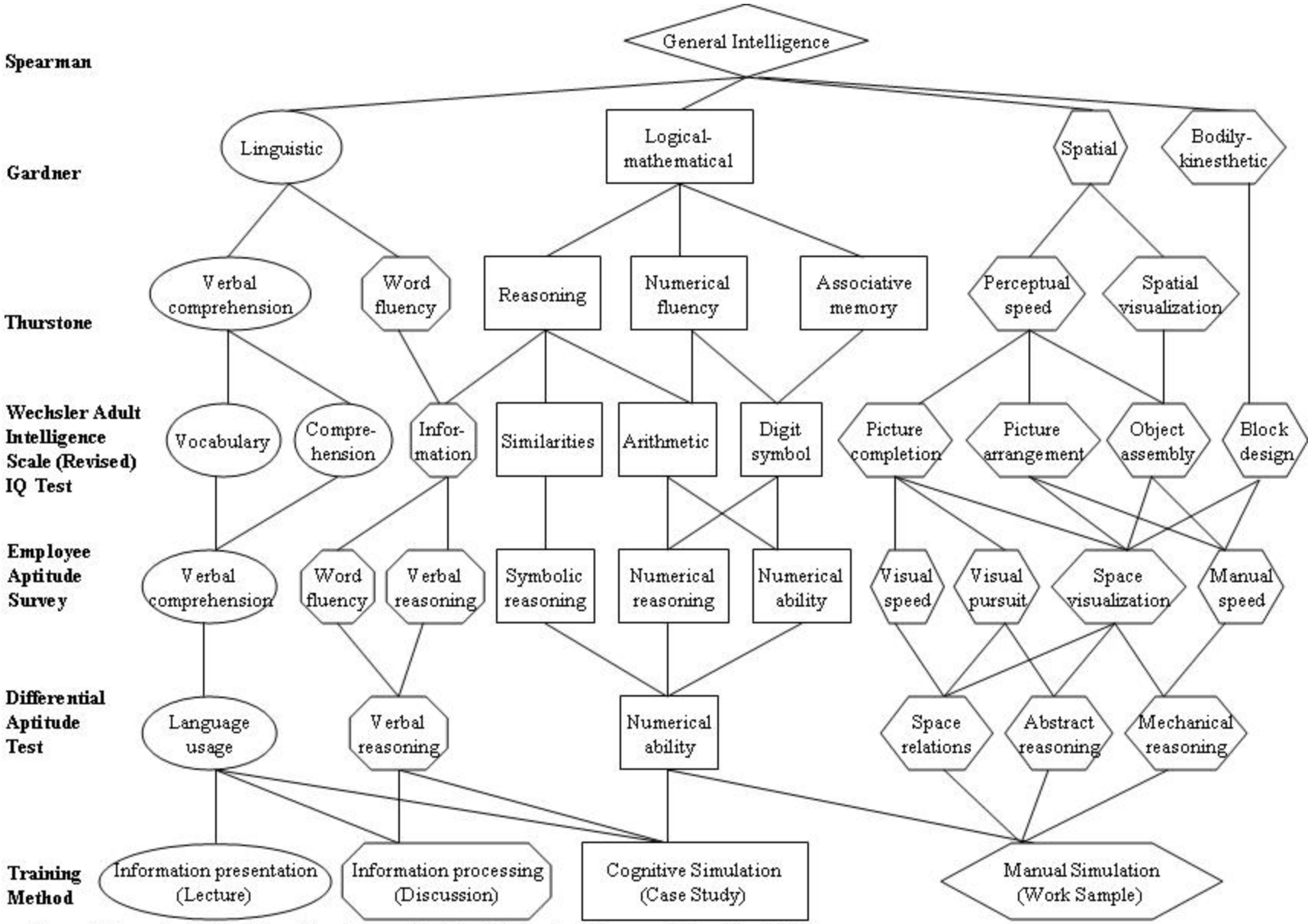


*Figure 2*: Hypothesized Relationships between Training Method and Factors of Cognitive Ability

illustrate the types of cognitive ability factors as described by Gardner (1983) and Thurstone (1960). Figure 2 indicts that we propose that general intelligence, g, comprises the factors linguistic, logical-mathematical, spatial, and bodily-kinesthetic in Gardner's theory (of the Gardner factors, only those related to the factors in other theories are shown). We propose that Gardner's factors can be mapped to Thurstone's factors, which can be mapped to three frequently used cognitive factor tests: Employee Aptitude Survey [EAS]; Differential Aptitude Tests [DAT]; and Wechsler Adult Intelligence Scale - Revised IQ Test [WAIS-R]; (Bouchard, 1978; Quereshi, 1978; Ross, 1972; Wechsler, 1981).

For example, first, Gardner's linguistic factor comprises verbal comprehension and word fluency in Thurstone's theory. Thurstone's verbal comprehension ability is measured by the vocabulary and the comprehension tests of the WAIS-R, by the verbal comprehension test of the EAS, and by the language usage test of the DAT. This category is shown in the column of ovals on the left.

Second, Gardner's logical-mathematical factor comprises reasoning, numerical fluency, and associative memory in Thurstone's taxonomy. These factors are measure by the similarities, arithmetic, and digit symbol tests of the WAIS-R, by the symbolic reasoning, numerical reasoning, and the numerical ability tests of the EAS, and by the numerical ability test of the DAT. This category is shown with the column of rectangles in the center.

Third, Gardner's spatial and bodily-kinesthetic factors comprise Thurstone's perceptual speed and space visualization factors. These factors are measured by the picture completion, picture arrangement, object assembly, and block design tests of the WAIS-R, by the visual speed, visual pursuit, space visualization, and manual speed sections of the EAS, and by the space relations, abstract reasoning, and mechanical reasoning tests of the DAT. This category is shown in the column of hexagons on the far right.

*Training methods.* In Figure 2, the bottom row illustrates which abilities are used by which training methods. Information presentation methods (e.g., lecture) require trainees to participate passively. We propose that these methods utilize verbal comprehension ability because trainees are required to read and to listen passively (e.g., reading lists, lectures). Some methods also utilize visual ability because trainees also must see some of the material presented (e.g., multimedia lectures). Therefore, we propose that trainees whose strongest cognitive ability is in the linguistic family will learn more in information presentation methods than they will learn in other training methods. This proposition was supported in Carter (2002). This category is shown in the column of ovals on the left.

Information processing methods (i.e., discussion groups) require moderate amounts of trainee participation, particularly oral participation. We propose that these methods require the use of verbal reasoning ability because interaction and discussion are required in order to learn (i.e., trainees must listen, think, and respond orally with words). This category is shown with the column of octagons, second from the left.

Simulation techniques (e.g., case study) require high amounts of trainee participation. Cognitive simulation methods include case study, role playing, in-basket exercises, and business games. We propose that these methods require the use of reasoning abilities because trainees are required to solve problems in order to learn. Therefore, we propose that trainees whose strongest cognitive ability is in the logical-mathematical family will learn more in cognitive simulation methods than they will learn in other training methods. This proposition was supported in Carter (2002). This category is shown with the column of rectangles in the center.

Manual simulation methods include realistic work simulation (e.g., mock-up assembly line) and artificial work simulation (e.g., flight simulator). We propose that these methods require the use of mechanical and spatial abilities because trainees are required to manipulate objects in order to learn. Therefore, we propose that trainees whose strongest cognitive ability is in the spatial-bodily kinesthetic family will learn more in manual simulation methods than they will learn in other training methods. This category is shown in the column of hexagons on the far right.

**Conclusions and Implications for Practice**

Past research indicates the need to account for as many environmental and personal characteristics as possible when designing training programs. The current paper proposes that practitioners match the factors of cognitive ability with training method to maximize knowledge gains. In the broader areas of human resources and management, supervisors may have more success in leading their subordinates if they use multiple methods of communication (e.g., face-to-face, email, demonstrations).

The proposed theory can be used to expand the training needs assessment process. Specifically, in needs assessment, individual job performance and employee skills related directly to the job are measured. We advocate expanding this process so that practitioners also measure trainee cognitive profiles in order to match trainees with the most appropriate training methods.

The increasing diversity of the United States labor force and increasing use of outsourcing to Mexico, India, and China for manufacturing and services is expected to make it increasingly difficult to provide effective training

because traditional approaches to designing training may not be effective when used with diverse populations. Practitioners may find it necessary to tailor training to employee characteristics in ways that acknowledge employee diversity. For example, are training methods that are effective in the United States equally effective in India and China? The current research addressed this issue by examining variables that could help practitioners increase the effectiveness of training they offer to an increasingly diverse work force. Ensuring that fit exists between trainee abilities and training method should lead to greater knowledge gains and greater efficiency of training. Thus, the proposed theory can help organizations gain a competitive advantage.

Future research should focus on testing the links between trainee cognitive ability and training methods. Researchers can replicate the study by Carter (2002) to measure trainee cognitive ability and measure trainees' amount of learning in different training methods.

**References**


Areeda, P.E. (1996). The Socratic method (SM). *Harvard Law Review, 109*(5), 911-922.

Arthur Jr., W., Bennett Jr., W., Edens, P.S. & Bell, S.T. (2003). Effectiveness of training in organizations: A meta-analysis of design and evaluation features. *Journal of Applied Psychology, 88*(2), 234-245.

Baldwin, T.T., Magjuka, R.J., & Loher, B.T. (1991). The perils of participation: Effects of choice of training on trainee motivation and learning. *Personnel Psychology, 44*(1), 51-65.

Bretz, R.D., Jr., & Thompsett, R.E. (1992). Comparing traditional and integrative learning methods in organizational training programs. *Journal of Applied Psychology, 77*(6), 941-951.

Bouchard, T.J. (1978). Test review of the DAT. In *The eighth mental measurements yearbook* (pp. 655-658). Highland Park, NJ: Gryphon Press.

Burke, M.J., Sarpy, S.A., Smith-Crowe, K., Chan-Serafin, S., Salvador, R., Islam, G. (2006). Relative effectiveness of worker safety and health training methods. *American Journal of Public Health, 96*(2), 315-324.

Callahan, J.S., Kiker, D.S. & Cross, T. (2003). Does method matter? A meta-analysis of the effects of training method on older learner training performance. *Journal of Management, 29*(5), 663-680.

Cantor, N. (1981). Perceptions of situations: situation prototypes and person-situation prototypes. In D. Magnusson (Ed.), *Toward a psychology of situations: An interactional perspective (pp.* 229-244). Hillsdale, NJ: Lawrence Erlbaum Associates.

Carroll, S.J., Jr., Paine, F.T., & Ivancevich, J.J. (1972). The relative effectiveness of training methods - expert opinion and research. *Personnel Psychology 25*(3), 495-509.

Carter, S.D. (2002). Matching training methods and factors of cognitive ability: A means to improve training outcomes. *Human Resource Development Quarterly, 13*(1), pp. 71-88

Casner-Lotto, J., ed. (1986). *Training for new technology: Part III cost effective design and delivery of training programs*. (no city stated):Work in America Institute.

Chatman, J.A. (1989). Improving interactional organizational research: A model of person-organization fit. *Academy of Management Review, 14*(3), 333-349.

Columbia University, (2005). Socrates. *The Columbia encyclopedia*, (6th ed.). Retrieved September 18, 2006 from: http://www.bartleby.com/65/so/Socrates.html.

Cooper, L.A., & Mumaw, R.J. (1985). Spatial aptitude. In R.F. Dillon, (Ed.), *Individual differences in cognition, volume* 2 (pp. 67-94). Orlando: Academic Press, Inc.

Cummings, T. (2000). Misuse of case method in OD&C education. *Organization Development Journal, 18*(4), 103-104.

Durand, D.E., (1975). Effects of achievement motivation and skill training on the entrepreneurial behavior of black businessmen. *Organizational Behavior and Human Performance, 14*(1), 76-90.

Endler, N.S., (1976). The case for person-situation interactions. In N.S. Endler, & D. Magnusson (Eds.), *Interactional psychology and personality* (pp. 58-70). New York: John Wiley & Sons.

Eysenck, H.J. (1979). *The structure and measurement of intelligence.* New York: Springer-Verlag.

Franz, F. (1991). Learning styles have an impact on computer-based training. *Computing Canada, 17*(18), 34.

Gardner, H. (1983). *Frames of mind.* New York: Basic Books, HarperCollins.

Gardner, H. (1991). Assessment in context: The alternative to standardized testing. In B. R. Gifford and M. O'Connor (Eds.), *Changing assessments: Alternative views of aptitude, achievement, and instruction* (pp. 77-119). Kluwer Publishers.

Gist, M.E. (1989). The influence of training methods on self-efficacy and idea generation among managers. *Personnel Psychology, 42*(4), 787-805.

Gupta, S. (2006). Brainteaser: Scientists dissect mystery of genius. *CNN.com.* Retrieved September 12, 2006 from

http://www.cnn.com/2006/HEALTH/09/11/gupta.genius/index.html.
Hand, H.H., Richards, M.D., & Slocum, J.W. (1973). Organizational climate and the effectiveness of a human relations training program. *Academy of Management Journal, 16*(2), 185-195.
Hartigan, J.A., & Wigdor, A.K., (Eds.). (1989). *Fairness in employment testing: Validity generalization, minority issues, and the general aptitude test battery*. Washington: National Academy Press.
Heneman, H.G., III, Schwab, D.P,. Fossum, J.A., & Dyer, L.D. (1989*). Personnel/human resource management*. Boston: Irwin.
Hunter, J.E. (1986). Cognitive ability, cognitive aptitudes, job knowledge, and job performance. *Journal of Vocational Behavior, 29*( 3), 340-362.
Isen, A.M., Daubman, K.A., & Nowicki, G.P. (1987) Positive affect facilitates creative problem solving. *Journal of Personality and Social Psychology, 52*(6), 1122-1131.
Jensen, A.R. (1981). *Straight talk about mental tests*. New York: The Free Press.
Kaufman, A.S. (1990). *Assessing adolescent and adult intelligence.* Boston: Allyn and Bacon, Inc.
Knowles, M. (1989a). Adult learning: Theory & practice. In. U Nadler L., Nadler Z., (Eds.), *The handbook of human resource development.* New York-Chichester: Wiley.
Knowles, M. (1989b). Everything you wanted to know from Malcolm Knowles (and weren't afraid to ask). *Training 26*(8), 45-49.
Lacey, D W., Lee, R.J. & Wallace, L.J. (1982). Training and development. In K.M. Rowland & G.R Ferris (Eds.), *Personnel management*. Allyn and Bacon, Inc.: Boston.
Lewin, K. (1951). *Formalization and progress in psychology, in field theory in social science.* D. Cartwright, (Ed.), New York: Harper.
Lewis, M. (1978). Situational analysis and the study of behavioral development. In L.A. Pervin & M. Lewis (Eds.), *Perspectives in interactional psychology* (pp. 49-66). New York: Plenum Press.
Mendenhall, M., & Oddou, G. (1985). The dimensions of expatriate acculturation: A review, *Academy of Management Review, 10*(1), 39-47.
Naquin, S.S. & Holton III, E.F. (2002). The effects of personality, affectivity, and work commitment on motivation to improve work through learning. *Human Resource Development Quarterly, 13*(4), 357-376.
Pervin, L.A., (1978). Theoretical approaches to the analysis of individual- environment interaction., In L.A. Pervin & M. Lewis (Eds.), *Perspectives in interactional psychology* (pp. 67-86). New York: Plenum Press.
Quereshi, M.Y. (1978), Test review of the DAT. In *The Eighth Mental Measurements Yearbook* (pp. 665-667). Highland Park, NJ: Gryphon Press.
Ree, M.J., & Earles, J.A. (1991). Predicting training success: Not much more than g, *Personnel Psychology, 44,* 321-332.
Ross, P.F. (1972). Test review of the EAS. In *The sixth mental measurements yearbook* (pp. 1008-1011) Highland Park, NJ: Gryphon Press.
Russell, J.S., Terborg, J.R., & Powers, M.L. (1985). Organizational performance and organizational level training and support. *Personnel Psychology, 38*(4), 849-863.
Schneider, B. (1987). E=f(P,B): The road to a radical approach to person- environment fit. *Journal of Vocational Behavior, 31*(3), 353-361.
Siero, S., Boon, M., Kok, G., & Siero, F. (1989). Modification of driving behavior in a large transport organization: A field experiment. *Journal of Applied Psychology, 74*(3), 417-423.
Smith-Jentsch, K.A., Salas, E. & Brannick, M. T. (2001). To transfer or not to transfer: Investigating the combined effects of trainee characteristics, team leader support, and team climate. *Journal of Applied Psychology, 86*(2), 279-292.
Spearman, C. (1927). *The abilities of man: Their nature and measurement.* New York: The Macmillan Company.
Spencer, H., (1887). *The principles of psychology*, Volume 1 of Volume IV of the larger series of works, *A system of synthetic philosophy*. New York: D. Appleton and Company.
Terborg, J.R. (1981). Interactional psychology and research on human behavior in organizations. *Academy of Management Review, 6*(4), 569- 576.
Thorndike, R.L. (1986). The role of general ability in prediction. *Journal of Vocational Behavior, 29*(3), *332-339.*
Thurstone, L.L. (1960). *The nature of intelligence.* Littlefield: Adams.
Wechsler, D., (1981). *WAIS-R manual.* San Antonio: The Psychological Corporation, Harcourt Brace Jovanovich.
Weiss, R.P. (2000a). Brain-based learning. *Training & Development, 54*(7), 20-25.
Weiss, R.P. (2000b). Memory and learning. *Training & Development, 54*(10), 46-51.
Wexley, K.N. (1984). Personnel training. *Annual Review of Psychology, 35,* 519-551.