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ABSTRACT

A study investigated the feasibility of teaching conceptual complexity to adults using an in-basket simulation. Training incorporated Kelly's components of differentiation and integration with Schroder's Cognitive Competencies and followed Lewin's Experiential Learning Model. Research participants in the original study were 24 women and 18 men, aged 25-55, attending an experienced learner baccalaureate program. Research participants in the replication study were 10 women and 10 men enrolled in management development courses offered in a community college management development program and/or an external Master's in management program. The instrument consisted of a 41-page, self-paced workbook that included pretest, text, in-basket, feedback on pretest and in-basket exercises, and posttest. The overall training effect was significant, confirming the research hypothesis that conceptual complexity could be improved through explicit training. In addition, in the original study, women scored significantly higher than men and showed greater improvement from pretest to posttest. (Appendixes contain a list of 57 references, 3 data tables, and 1 figure.) (Author/YLB)

Teaching Conceptual Complexity to Adults Using an In-Basket Instructional Design

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Running Head: TEACHING CONCEPTUAL COMPLEXITY TO ADULTS

Abstract

We investigated the feasibility of teaching conceptual complexity to adults using an in-basket simulation. Training incorporated Kelly's (1955) components of differentiation and integration with Schroder's (1986; 1989) Cognitive Competencies and followed Lewin's Experiential Learning Model (Kolb, 1984). Research participants in the original study were 24 women and 18 men, ages 25-55, attending an experienced learner baccalaureate program. Research participants in the replication study were 10 women and 10 men enrolled in management development courses offered from a community college management development program and/or an external M.S.-Management program. The author-developed instrument consisted of a 41-page self-paced workbook that included pretest, text, in-basket, feedback on pretest and in-basket exercises, and posttest. The overall training effect was significant, confirming the research hypothesis that conceptual complexity can be improved through explicit training. In addition, in the original study, women scored significantly higher than men and showed greater improvement from pretest to posttest.

"The explanations [for the failure of many American corporations to adapt to changed economic circumstances] are fundamentally psychological, significantly having to do with....inadequate management of change and inability to recognize and manage cognitive complexity..." (Levinson, 1994, p. 428).

Today's organizations require leaders able to cope effectively with constant change. Conceptual complexity in making decisions is a requisite leadership skill in an uncertain environment (Levinson, 1994), when the repercussions of some actions may not be known in advance, and when some outcomes may potentially be as bad as others are good. The primary purpose of this study was to explore the feasibility of teaching conceptual complexity using an in-basket training format.

Conceptual Complexity

Conceptual complexity/simplicity (Schroder, Driver, & Streufert, 1967; Streufert & Swezey, 1986) refers to the degree to which an individual both discriminates among and integrates multidimensional information. The continuum runs from unidimensional information processing and ensuing decision-making (conceptual simplicity), on the extreme low end of the conceptual complexity scale, to multidimensional information processing and resulting decision-making (conceptual complexity), on the extreme high end of the scale. The focus of the construct is on cognitive processes rather than outcomes. People with higher levels of conceptual complexity are able to perceive more dimensions and to make sharper distinctions in their environments. Additionally, they are better able than their conceptually

simplistic counterparts to synthesize these perceptions.

The terms cognitive complexity, conceptual complexity, and integrative complexity are often used interchangeably in the literature. Kelly (1955), who coined the term "cognitive complexity," is recognized as the pioneer researcher into cognitive differentiation and integration, followed by Bieri (1955; 1966). However, Schroder et al. (1967), who coined the term "conceptual complexity," are cited most frequently in the literature, probably because of their development of the Paragraph Completion Test (PCT) to measure this phenomenon. For the sake of uniformity and conformity to the issue of complex conceptual search, differentiation, and integration, the term conceptual complexity was adopted for this study, which is based on Schroder's (1989) research on the cognitive competencies comprising conceptual complexity (Information Search, Concept Formation, and Conceptual Flexibility).

If conceptual complexity is a learned response elicited by external stimuli, it should be possible to design training that develops and/or enhances the individual's capacity for conceptual complexity. Such training could become an important component of leadership development programs.

Measurement of Conceptual Complexity

The instrument developed for the study used an in-basket format to elicit responses consistent with managerial behaviors in the face of various organizational problems or dilemmas. This represents a major departure from such traditional instruments as the Paragraph Completion Test (Schroder, et al., 1967) or Bieri, et al.'s (1966) Role Concept Repertoire (REP test).

Measurement differences--and the concurrent question about whether any of the researchers (including the authors of the present study) are even examining the same construct--may stem from what appears to be the most significant flaw in much of the research. From review, there appears a promiscuous use of the term "conceptual complexity" to label a variety of cognitive phenomena. Because "conceptual complexity" is often used synonymously with other terms that include or are restricted to limited components of conceptual complexity, we cannot be sure these authors were all looking at the same cognitive phenomenon. Since even different measures across studies produced some of the same results, the differences in operationalization of the construct conceptual complexity may be semantic, and as such, not worthy of dissecting. It is possible that the different tests measure diverse elements of conceptual complexity that converge to yield common cognitive results (Streufert & Nogami, 1988).

The present study avoided this definitional limitation by using "conceptual complexity" to describe the behaviors manifested in Schroder's (1989) cognitive competencies and measuring the differentiation and integration components Kelly (1955) proposed. In addition, the test and training instrument developed for the present study was a variant of the in-basket Schroder has used in his assessment of these competencies. Chorvat's (1994) research conclusively demonstrated the construct validity of the leadership dimensions in the cognitive competencies measured by, among other instruments, the in-basket. Because the cognitive competencies can be seen as separate, independently measurable components of

conceptual complexity, in the present study they were trained simultaneously, but measured independently.

Conceptual Complexity and Effective Leadership

One of the earliest published reports of an empirical investigation into the relationship between conceptual complexity and task performance--relevant to effective leadership--was conducted by Karlins, Coffman, Lamm, and Schroder (1967). Karlins, et al. administered the Navy Tactical Simulation to 24 participants, matched on age and intelligence, divided into two groups, 12 integratively simple and 12 integratively complex (measured by the Paragraph Completion Test) individuals. Each participant assumed the role of an officer with multiple responsibilities, leading a task force into enemy-held territory. Participants all began the task with no information about the components of their own forces or those of the enemy and could only gain needed information by asking questions of interviewers during a 45-minute interview.

With its record of all questions asked in the interview period, the Navy Tactical Simulation provided quantifiable data on information search - one component of conceptual complexity (Schroder, 1986). Although one goal of information search could be the reduction of uncertainty and diversity (cognitively simple goals), the cognitively complex participants typically exhibited more information search than did the integratively simple participants. Karlins et al. (1967) concluded that when a task can be learned by actively manipulating the

environment, complex participants will ask more questions, and questions of a more complex nature, than their cognitively simpler counterparts.

The effect of conceptual complexity on managerial performance has been difficult to measure because of the difficulty in measuring *how* (as opposed to *what*) people think, the traditional use of task-specific assessments, and the concentration of assessment on the content of people's thoughts and actions. Streufert, Pogash, and Piasecki (1988) developed and tested a computer-assisted mechanism for assessing several management competencies, of which conceptual complexity received the principal focus. Participants (n=111) had been in middle management for at least ten years, and most had masters or other post baccalaureate degrees. Streufert et al. used a software program that concurrently simulated action-oriented events and recorded performance data that were later analyzed.

One of the primary goals posted by Streufert et al. (1988) was to provide data on reliability and validity of simulation methods to use for training or assessment purposes. Among other findings, Streufert et al. reported significant correlations between the integrative strategy (complexity) measures and the measures of decision activity and speed of action. The results, although themselves complex, support the validity for simulation-based measurement and training. Cognitive structure dictates how an individual will combine externally and internally generated information (Kelly, 1955). At the heart of complexity theory is ability to manage complex and unstructured environmental input. Therefore, we would expect conceptual complexity to be of value under difficult task situations. This is particularly relevant

to leaders in the turbulent environments confronting their organizations.

Supportive of an hypothesized relationship between conceptual complexity and environmental complexity are two other studies in which conceptual complexity was found to play a major role in the explanation of military wins (Suedfeld, Corteen & McCormick, 1986) and for predicting surprise military attacks (Suedfeld & Bluck, 1988). In examining six major battles in which Robert E. Lee's forces were drastically outnumbered, Suedfeld et al., (1986) compared Lee's complexity scores with those of his opponents, relying upon archival data (letters, reports, documents, etc.). They found that despite the odds against him (as measured by the strength in numbers of his own and his opponents' armies), Lee was successful in the three battles in which he was considerably more complex than his opponents. In one of his losses he was only slightly more complex than his opponent; in the other two his opponents were slightly more complex. It would appear from this study that conceptual complexity contributes to the success of military leaders, at least in battle.

Suedfeld and Bluck (1988) also used archival data to analyze nine surprise attacks upon nations by foreign military forces that occurred between 1941 and 1983. These attacks were precipitated by a decline in complexity in the attacking nation, as evidenced by the communications between attacker and attacked. No such decline appeared when differences were resolved peacefully. The authors concluded that compromise and negotiations require the flexibility of a multiperspective approach, absent when crises could not be resolved without bloodshed.

The primary limitation of the Suedfeld et al. (1986) and Suedfeld and Bluck

(1988) studies is in their narrow application to military leaders, that precludes generalization to a non-combat oriented population. Second, a post-hoc analysis of the process, in which researchers know the outcome, could seriously influence their results and conclusions. However, their conclusions are provocative and worth exploring further among leaders on business "battlefields." The analysis of archival data presents a third limitation, given the general research preference for empirical studies. However, the written communications Suedfeld and his associates examined may be more reflective of how people think in real situations (as opposed to "staged" circumstances) where there is no sense of being evaluated on their thinking per se. Thus, conceptual complexity appears to be germane to the use of many interrelated schema for collecting, integrating, and discriminating among information about the social environment, when it is charged with uncertainty and conflict.

Given the instability facing many organizations today, the ability to view situations from multiple perspectives contributes to a tolerance for and adaptability to, conflict and change. It is this ability to generate and weigh alternative courses of action that contributes to effective adjustment to change and uncertainty, critical for the successful leadership of any organization.

In looking at the overall construct validity of Schroder's (1986) High Performing Competencies, which included the cognitive competencies examined in the present study, Chorvat (1994) confirmatory analysis of assessment center data collected on over 200 British managers offered convincing support for the construct validity of the leadership dimensions in these competencies.

Gender Differences in Conceptual Complexity

Most of the earlier research on conceptual complexity, like that on many other psychological or cognitive phenomena, involved observations by men researchers of men participants since they have dominated organizational leadership and, until recently, business college classrooms (Padgett, 1990). The few recent studies with both women and men revealed inconsistent findings (Charlton & Bakan, 1989; Koenig & Seaman, 1974; Baxter-Magolda, 1992). The identification of gender differences in conceptual complexity appears to have depended upon the measurement of the construct, so that it is uncertain if researchers were looking at the same cognitive phenomenon. The inconsistencies in research results suggested the need for further exploration of gender differences, if any. Thus, the exploration of gender differences in conceptual complexity was an ancillary research concern.

Teaching Conceptual Complexity

When process-oriented research has been conducted it has been predominantly on the training of cognitive skills in such content areas as reading (Perfetti & Curtis, 1986), writing (Scardamalia & Bereiter, 1986), second language (Carroll, 1986), mathematics (Mayer, 1986), Science (Linn, 1986), social studies (Voss, 1986), art (Somerville & Hartley, 1986), music (Serafine, 1986), and even reasoning (Nickerson, 1986). Almost all research into teaching cognitive skills concentrated on children; the literature is bereft of research involving adult participants. Further, aside from the various attempts to teach domain-specific cognitive skills, there is a dearth of studies into the trainability of conceptual

complexity.

Streufert and Nogami (1988) proposed that, because it appears to increase from young to middle age--suggesting a learning effect of sorts--training might be possible. However, few have attempted it. In one of the few published studies on teaching conceptual complexity, Gardiner (1972), working from the premise that racial prejudice is a byproduct of conceptual simplicity, sought to teach white high school students to become conceptually complex in their interracial relations. Students were paid to participate in one of three experimental conditions (two treatment, one control), to which they were randomly assigned. Participants in the training conditions evaluated "candidates" for the role of ombudsperson or conciliator/mediator. Among the candidates in each scenario, the same number of black and white candidates exhibited conceptual complexity and the same number of black and white candidates exhibited conceptual simplicity.

Participants in both of Gardiner's (1972) training conditions were given a list of three conceptual dimensions on which they were to rate candidates and were encouraged to add dimensions they thought germane to the job. Upon completion of this task, participants were then instructed to evaluate two of their friends using a prepared form analogous to the training condition format.

Because posttest Race-Relations scores of participants in the training conditions were higher than posttest scores for the comparison group, Gardiner (1972) concluded that training can lead to increased conceptual complexity and to a reduction in racial prejudice under some circumstances.

Gardiner's (1972) study is fraught with methodological limitations, not the least of which is homogeneity of sample (white teenage boys and girls). Further, reliance on payment to ensure candid, cooperative participation, from a group of minors whose only means of income is their parents or other adults for whom they perform minimum-wage labor placed these students in a subordinate/authority figure relationship that could have inhibited honest responses. Finally, it must be emphasized that any training effect in this study must be recognized in the context of interracial relations. Thus, any attempt to generalize outside the white teen population or to cognitive/emotive areas different than ethic/racial prejudice would be imprudent.

The In-basket as an Instrument for Teaching Cognitive Skills

The instructional goal, enhancing conceptual complexity, falls into Gagné's (1985) Problem Solving classification of intellectual skills. To "teach" conceptual complexity, then, the design must lead people to move away from their reliance on intuitive conceptions to solve problems, generally based upon personally acquired knowledge or experience (Linn, 1986), and toward discovery, exploration, and application of alternative concepts.

The Lewinian Experiential Learning Model (Kolb, 1984), in which learning is a cyclical four-phase process--Concrete Experience, Reflective Observation, Abstract Conceptualization, and Active Experimentation--formed the theory upon which the in-basket training design was based. It was hypothesized that, with an experiential approach that closely simulates the kinds of activities managers would

face on the job, prospective managers could be taught to engage in the behaviors associated with the cognitive competencies that comprise conceptual complexity. Thus, although the in-basket is still the most widely used management assessment tool (Gill, 1979), it was seen here as having the potential to be a valuable experiential learning instrument.

The typical in-basket, which represents the concrete experience portion of the experiential learning model, is an organizational simulation that elicits responses consistent with managerial behaviors in the face of various organizational problems or dilemmas. Brannick, Michaels, and Baker (1989) demonstrated that the in-basket can be used to train certain skills. These authors used a workbook designed to train three dimensions (skills)--Planning and Organizing, Perceptiveness, and Delegation--and the overall sum. Of these dimensions, Perceptiveness (operationalized as the explicit recognition of related in-basket items) can be loosely construed as one element of conceptual complexity.

Upon finding significant training effects for Perceptiveness, Delegation, and the overall sum, Brannick et al. (1989) concluded that training can be successfully designed to improve in-basket performance. Three of the four problem solving skills Gagné (1985) described were targeted in the in-basket developed for the present study. Training focused on (1) concepts (information/opinion); (2) rules (e.g., for determining information adequacy/deficit); and (3) discriminations (between appropriate/inappropriate information types and/or sources).

Method

This quasi-experiment consisted of a reversed-treatment comparison group mixed factorial design (Tabachnick & Fidell, 1983), where repeated measures were used to look at the change in scores from pretest to posttest for women and men in training and comparison groups.

The original study was conducted as part of the first author's doctoral dissertation; the study was replicated 18 months later with a second sample. These two studies will be referred to as original and replication, respectively.

Participants

Table 1 presents demographic data for both sets of research participants.

Insert Table 1 about here

As Table 1 reflects, the participants in the original study were somewhat older, less educated, and had slightly more managerial experience (in terms of number of years and number of subordinates) than the participants in the replication study. However, these differences were not statistically significant, and in an additional analysis (described later) that included this and subsequent samples, the data were pooled.

Original study. Research participants (n=42) were students in an adult, non-traditional baccalaureate program, an experiential-learning-based program in which much of students' work is independent and self-paced.

Twenty (12 women, 8 men) completed the training group workbook and 22

(12 women, 10 men) completed the comparison group workbook.

All but one participant (98%) were white; 37 were between 30 and 49 years of age; 37 had some college; 23 had at least one year of managerial experience, and 14 had more than six years of managerial experience (see Table 1).

Replication study. Research participants (n=20) were students enrolled in management development courses offered from a community college management development program and/or an external M.S.-Management program.

Thirteen (6 women, 7 men) completed the training group workbook and 7 (4 women, 3 men) completed the comparison group workbook.

As Table 1 shows, all but one participant (95%) were white; 10 were under 30 and 10 were between 30 and 49 years of age; all had some college, and half were college graduates; 14 had between one and six years of managerial experience.

Instrument

The author-developed instrument consisted of a 41-page workbook that began with a letter of instruction and a demographic data sheet. This was followed, in order, by (1) pretest, (2) training text, (3) in-basket, and (4) posttest. The in-basket developed for the present study was not specific to any given field, and the items reflected the kinds of things managers in a variety of organizations encounter daily. The bound workbook was self-paced and took most participants approximately two hours to complete.

The instrument was fieldtested *en règle* with both managerial and nonmanagerial research participants not included in either study. The

participants were instructed to progress at their own pace, as if they were taking part in professional training, to ask questions as they arose, and to make any notes or comments they wished in the margins. The few changes in the materials they recommended were incorporated in the final product, with one exception. None was pleased with the self-paced, individual study format. However, it appears that it was not the self-paced mode, but the inability to interact with the researcher that was somewhat off-putting. Two pointed out that "live" training might be more effective, to enable participants to look to the researcher as an information resource; however, because one of the research questions focuses on the in-basket as a training instrument for conceptual complexity, the self-paced format was not changed.

Tests. The pretest and posttest consisted of a mixture of essay questions and checklist items. The total possible score range (checklist plus essay questions) for each test (pretest and posttest) was 0 to 6.

The pretest and posttest were combined and presented together as one test to a group of students (n=24) drawn from the same academic programs as those who participated in both the original and replication study. The small difference between the significantly correlated (r=.536, p<.01) pre- and posttest scores did not even approach significance (t=1.03, p=.29).

The checklist questions were designed to measure the Information Search and Conceptual Flexibility components of conceptual complexity (Schroder, 1983) and they provided participants opportunities to select appropriate sources for

information needed in decision-making or to diagnose problems or issues in order to seek satisfactory resolution. An example of this follows:

> You are an executive for a large newspaper widely known for liberal political views and controversial attitudes. As a result of the sudden death of one of the department heads who reports to you, there is a position vacancy which must be filled quickly. The Human Resources director gave you a list of names of candidates. The most qualified candidate was diagnosed with multiple sclerosis (MS) two years ago, at which time she missed two months of work. She had an excellent attendance record prior to this, and has missed no work since then. Her MS has been in remission for over eighteen months, but MS is unpredictable in terms of when, how, and with what severity it will manifest itself. The job is a demanding one, with long hours and considerable travel. Although in this company executives typically remain in any one job approximately two years, the deceased incumbent had been there nearly three years. He was good. It will be hard to replace him. Place a Y next to the information source(s) below that might help you make the best decision on filling this position.
>
> _ 37. Performance evaluations of all candidates.
>
> _ 38. Medical records on all other candidates.
>
> _ 39. This candidate's insurance records.

__ 40. Consultation with company physician (or another doctor).

__ 41. Journal of Medical Psychosociology

__ 42. Incumbent's travel vouchers and records.

__ 43. The candidate herself.

The score for each question, which ranged from 0 (competency not demonstrated) to 1 (competency thoroughly demonstrated), was the total number of choices divided by the number of correct choices for that question. This scoring procedure was selected to ensure each question was weighted identically, uninfluenced by the difference in the numbers of choices associated with the different checklist questions.

Differentiation refers to the ability to recognize multiple perspectives or dimensions of information. Integration denotes the ability to combine these various pieces of information or perspectives to arrive at a larger picture. As an example, the following is one of the essay questions in the posttest.

> You have just taken over the product development department at Dulce Inc. Your predecessor, voted "Boss of the Year" for the past two years, was fired after the local newspaper ran a series of investigative reports, relying on an unidentified company source who provided information on falsification of safety reports, internal tests, etc. The safety inspector was never involved in the reports. Local sales have slackened, and department morale is low. As the new department head, where would you go from here? What

approach(es) would you take to address the problems you inherited in this department?

The essay questions were transcribed, numbered, separated from the checklist questions, and scored (blind to the training condition) by the researcher and another trained assessor, independently. Because the interrater reliability of these observational measures was high on the essay questions on both the pretest ($r=.994$, $p<.001$) and posttest ($r=.986$, $p<.001$), the average of the two raters' scores on each essay question scores was used as the final essay score on that question. Like the checklist questions, the score range for each essay question was 0 to 1, depending upon the number of components of conceptual complexity present in each response. Again, the scoring procedure ensured that each question was weighted identically. For assessment purposes, the essay questions were scaled as follows:

1 - exhibits integration AND differentiation AND suggests more than one alternative

.75 - exhibits integration AND differentiation (but suggests no more than one possible course of action or solution)

.50 - exhibits integration OR differentiation AND suggests more than one alternative

.25 - exhibits one of the three behaviors above, either differentiation, integration, or multiple alternatives.

0 - exhibits none of the behaviors above

The responses of the training group participants who answered a manipulation check question at the end of the workbook indicated they recognized the training goal, supporting the convergent validity of the training instrument (Kidder & Judd, 1986).

Training Group Booklet. The first segment of the training booklet was a brief description of conceptual complexity and its relevance to effective organizational leadership. Following this was an explanation of the four checklist pretest exercises, emphasizing the components of the cognitive competencies and the training objectives. Each possible choice in the checklist questions was addressed, with an explanation of what made each individual choice correct or incorrect. After this brief didactic section, the remainder (and bulk) of the training material included the in-basket itself, with the accompanying feedback and boosters by which learners proceeded through the Concrete Experience, Reflective Observation, Abstract Conceptualization, and Active Experimentation learning phases of Kolb's (1984) elaboration of the Lewinian Experiential Learning Model.

The in-basket exercise segment represents the concrete experience described above. Six separate items contained different issues or problems in written form (telephone messages, letters, and memoranda). Some required little, whereas others demanded a greater degree of, inquiry, diagnosis, decision, delegation, or action. Each of the six items had three exercise components, simulation, feedback,

and booster, aimed at practicing one of the cognitive competencies.

There are typically no "right or wrong answers" in an in-basket; however, the page following the essay questions contained a key with the best answers to each item and a "booster" reminding them of pertinent questions they must consider before seeking information or planning alternative courses of action. This feedback contributes to reflection and the resultant formation of abstract ideas and generalizations, the second and third portions of the experiential learning model, considered critical elements in the learning process. Lewin (1951) asserted that the absence of suitable feedback processes accounted for much ineffectual behavior and actions in organizations. Presenting the exercises serially gave participants the opportunity to transfer what they learned from one to the other, satisfying the Active Experimentation requirement of the cycle.

Comparison Group Booklet. The comparison group booklet consisted of the same pre- and posttest and simulation (with three additional written items to equalize the time spent). Missing were the introductory text, feedback on pretest responses, and the boosters following each in-basket item in the training group booklet. It was the omission of the Reflective Observation and Abstract Conceptualization components of the cycle that rendered this a reversed treatment.

Procedure

Original study. Seventy training and 70 comparison group workbooks were randomly distributed by the first author to an even number of men and women in 15 classes in a nontraditional baccalaureate degree program for adults. Although

the first author teaches in this program, neither author taught these particular liberal arts classes or knew any of the students. Students were given four weeks to complete the materials and return them to a marked drop-off box outside the classrooms.

Despite the incentive of individual test feedback, only 42 (30%) of the workbooks were returned. This 30% response rate, while disappointing, is relatively standard for mailed surveys. Although the instrument was hand-delivered to participants for completion on their own time, with instructions to return it to a designated location at their school, it could be likened to a mailed survey.

Despite the low response rate, the demographic characteristics of the sample, described earlier, are representative of those of this college program's student population, based upon the first author's experience in and observation of the student population. Unfortunately, college-maintained demographic records were not made available to the researchers.

Replication study. Fifteen training and 15 comparison group workbooks were randomly distributed by the first author to an even number of men and women in one management development class and two external M.S.-Management classes. They were instructed to return their materials the following class period (one week later), and 66% did so. Certainly, the response rate in the replication study was considerably better than in the original study. This may be due, at least in part, to the fact that this sample, unlike the original study, consisted of students

taking classes taught by the first author. Although their responses were voluntary and anonymous, and participation did not affect the grade, some may have participated out of loyalty to their professor.

Results

Original Study

There were no significant differences for age, education, or managerial experience on the pretest or posttest scores; however, there were significant gender differences. Therefore, all women's data and all men's data were pooled for subsequent analyses.

Pretest, posttest, and change score means and standard deviations for women and men in the training and comparison groups are presented in Table 2.

Insert Table 2 about here

As Table 2 indicates, the comparison group actually scored higher than the training group on the pretest. In addition, women's pretest scores were significantly higher than men's scores [$F(1,38)=5.007$ $p<.05$], and there was a significant gender by group interaction [$F(1,38)=8.404$, $p<.01$]. The B-Tukey statistic showed that men in the training group scored significantly lower than all other groups [$F(3,38)=5.647$, $p<.01$].

The training group scored significantly higher on the posttest than the comparison group [$F(1,78)=27.01$ $p<.001$]. In addition, the training group showed

significantly greater improvement from pretest to posttest than did the comparison group [$F(1,78)=48.42$, $p<.001$]. Scores of 80% of the training group improved from pretest to posttest, while 90% of the comparison group scores worsened.

Figure 1 displays the change in scores from pretest to posttest for women and men in the training and comparison groups.

Insert Figure 1 about here

Overall, women both scored significantly higher on the posttest [$F(1,78)=12.60$ $p<.001$] and showed greater improvement from pretest to posttest than men [$F(1,78)=6.10$, $p<.05$] (See Figure 1).

The interaction between treatment and gender was not significant, nor was the interaction between treatment, gender, and time.

While the main effect for time was not significant, post hoc analysis (t-test of correlated means) confirmed that the training group's scores increased significantly from pre- to posttest [$t=-3.18$, $p<.01$). Also, the comparison group scored significantly lower on the posttest than the pretest.

Replication Study

Because there were no significant differences for age, education, or managerial experience nor for gender on the pretest or posttest scores, all participants' data in the replication study were pooled for subsequent analyses.

Pretest, posttest, and change score means and standard deviations for the

training and comparison groups are presented in Table 3.

Insert Table 3 about here

As Table 3 indicates, there was no significant difference between training and comparison groups' pretest scores. However, the training group scored significantly higher on the posttest than the comparison group [$F(1,39)=5.68$, $p<.05$]. In addition, the training group showed significantly greater improvement from pretest to posttest than did the comparison group [$F(1,39)=11.11$, $p<.01$].

Post hoc analysis (*t*-test of correlated means) confirmed that the training group's scores increased significantly from pre- to posttest [$t=-2.61$, $p<.05$). However, unlike the original study, there was no significant decrease in the comparison group's scores.

As an additional meaas by which to evaluate th npact of the training materials on posttest, the data from the original and eplication study were pooled with the results of the 24 students who took the combined pretest/posttest (with no training materials) for one final analysis. There were no significant differences in pretest scores across the three samples [$F(2,85)=1.56$, $p=.22$]. However, the training group posttest scores were significantly higher than those of both the comparison group and the test-only group [$F(2,85)=11.13$, $p<.001$].

Discussion

The focal question in the present study was to determine if an in-basket training strategy would expand the dimensions along which participants think. While the scarcity of research in teaching conceptual complexity to adults offered little empirical foundation for this project, Gardiner's (1972), Schroder's (1975), and Brannick et al.'s (1989) studies were suggestive.

In the original study, the training group's posttest scores were significantly higher than those of the comparison group and than their own pretest scores, confirming the research hypothesis that conceptual complexity, as operationally defined here, would improve. Observing these same results in the replication study substantiates these findings. Similarly, the results of the meta-analysis, evidence that the results of both original and replication studies are not spurious, reinforce the conclusion that the cognitive competencies associated with conceptual complexity can be enhanced.

As Figure 1 depicts, at the outset, the two groups' scores were similar in both studies, and, in fact, men in the training group scored significantly lower on the pretest than the other three groups in the original study. Still, in both studies, both women and men in the training group scored significantly higher on the posttest than did women and men in the comparison group. The training group's positive change from pre- to posttest was predicted. Although one also might have expected that the in-basket material offered the comparison group in both studies would produce little change or perhaps some increase, both comparison groups' performance noticeably deteriorated (See Figure 1). One obvious explanation for

this apparent anomaly could be unreliability of the instrument. However, correlation of the pre- and posttest scores of a fieldtest sample, comparable to the study participants, indicated the two tests were significantly correlated ($r=.706$, $p<.001$). A more likely explanation of the comparison group's score decline lies in the negative effects produced by their counterfeit training.

Missing from the comparison group workbook were text, examples, feedback on pretest and in-basket exercises, and coaching, all of which completed Lewin's experiential learning cycle. Particularly critical might have been the deliberate omission of feedback. Senge (1990) described a delusion of learning from experience that stems from the fact that, although experience can offer the most effective means by which to learn, "We never directly experience the consequences of many of our most important decisions." The immediate feedback given the training group after each in-basket item satisfied Senge's criterion of experiencing the consequences of one's actions, and, in the present study, served as an error correction mechanism for the training group. Thus, the omission of feedback from the comparison group workbook not only deprived them of the positive effect of immediately assessing their own progress, but did not counteract the negative effect of fatigue or boredom, either or both of which may have adversely affected comparison group performance.

To help understand how feedback both directs and energizes behavior, we can extend the theory of cybernetics to the importance of inclusion of all four processes in the Lewinian Model of Experiential Learning (Kolb, 1984). "For any

machine subject to a varied external environment to act effectively, it is necessary that information concerning the results of its own action be furnished to it...The feedback of such information...enables the |person| to correct for |his/her| own malfunctioning or for changes in the environment..." (Nadler, 1977, pp. 67-69). All learning is based on this process of inhibiting incorrect responses, creating internalized programs or learning sets that selectively interpret new experiences (Harlow, 1959). As the training group seems to have demonstrated, learning occurs only when participants are given feedback, the opportunity to reflect on that feedback and draw relevant conclusions, and to replicate modeled behaviors.

Gender

Although women scored significantly higher than men in the original study on both the pre- and posttest (see Table 2), there was no such difference on the replication study. Combining the data for the two studies for subsequent meta-analysis revealed no gender differences in pre- or posttest scores. As discussed earlier, such inconsistency in findings is not unusual.

Koenig and Seaman (1974) found men to be more conceptually complex than women on an instrument measuring participants' assessment of conceptual complexity. However, these researchers interacted directly with the participants, and their conclusions were based upon women's and men's assessments of gender-based stimuli. In the present study the self-administered instruments were not sensitive to gender in these ways, and the evaluation of all test questions was completed blind to gender.

Charlton and Bakan (1989), using an essay format, found that women were more conceptually complex than men and attributed this difference to women's superior verbal fluency. In the original sample in the present study it was on two *objective* questions that women outperformed men in the pretest, and on both objective and subjective items in the posttest. Because the pretest essay questions failed to differentiate between women and men, we could attribute the women's superior posttest essay scores in the original study to their response to training, rather than to verbal fluency. Women in the replication study actually scored slightly lower than men on both the pre- and the posttest, although the difference was not significant.

Although neither Glaser (1982) nor Dillon (1986) mentioned gender as a variable of concern in response to training, the notion of personal differences may have relevance to the different responses to training by women and men in the original sample in the present study. The acquisition of cognitive skills may be a function of other personal variables (e.g., interest, motivation, etc.) not directly measured in this study.

Limitations

The major limitation of this study lay in its small and homogeneous samples. Despite the small Ns in both samples, however, significant effects were obtained. While the participants were all student volunteers, they were in fact more representative of a larger population of managers and organizational leaders than typical college groups. Many held executive or upper-management positions.

As Table 1 reflects, 74% of the participants in the original study and 70% in the replication study had managerial experience. Also, they were above the traditional age of college students (88% in the original study and 50% in the replication study were in their thirties or forties).

Implications for Further Research

Dewey (1910) proposed that the most important element of cognitive training is the evolution of an attitude of "suspended conclusion" (p. 13) in which decisions are postponed until multiple strategies are used to collect both consonant and dissonant information for consideration. In the absence of a good foundation of conceptual complexity training in the literature, it would be wise to withhold judgment on the efficacy of such training until the results of the present study can be replicated, particularly with a population with greater variation in managerial or employment experience. If other studies demonstrate that conceptual complexity can be taught, it should be a continuing education objective for adults and a primary goal of leadership training. This is especially important, given the unstable environmental conditions many organizations face, where the ability to view situations from multiple perspectives strengthens tolerance for, and adaptability to, conflict and changes.

In view of the proposition that effective leadership has an holistic quality that includes other important attributes, and because conceptual complexity may lie at the core of these attributes, we could expect conceptual complexity training to have a positive impact on the larger leadership domain.

The In-Basket as a Training Instrument

The results of the present study have two critical practical implications. First, this study's results support the argument that the skills associated with conceptual complexity can be taught. Second, the results suggest that the in-basket may be a valuable experiential learning instrument by which to teach conceptual complexity. The self-paced training format here can be offered at a fraction of the cost associated with trainer-facilitated instruction. Where in-basket training is offered with trainer-facilitated feedback, often cost-prohibitive in terms of dollars and time, the ability for students to receive immediate feedback on their actions via prepared workbook or better, when developed into an interactive computer program is certainly cost-effective.

Because of the length of time it took participants to complete the training or reverse-treatment materials, and in view of the lack of control over the experimental situation, it may be helpful to replicate this study under more controlled experimental conditions, perhaps by means of CAI technology.

Future research should also examine whether or not this type of training generalized to improved job performance. If so, efforts should be made to identify those tasks and/or jobs in which such training would be beneficial.

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Author Note

This research was conducted as part of the first author's doctoral dissertation.

Table 1

Participants' Demographic Characteristics

	Original Study		Replication Study	
	n	%	n	%
Gender				
Women	22	57%	10	50%
Men	18	43%	10	50%
Race				
White	41	98%	19	95%
Black	1	2%	1	5%
Age				
Under 30 years	3	7%	10	50%
30-39 years	16	38%	6	30%
40-49 years	21	50%	4	20%
50 and above	2	5%	0	0%
Education				
High School	3	7%	1	5%
< 2 years college	6	14%	2	10%
2-4 years college	31	74%	4	20%

College graduate	0	0%	13	65%
Unreported	2	5%	0	0%
Managerial Experience				
No experience	11	26%	6	30%
< 1 year experience	8	19%	0	0%
1 - 3 years experience	5	12%	6	30%
4 - 6 years experience	4	10%	8	40%
> 6 years experience	14	33%	0	0%
Number of subordinates				
Five or less	16	38%	6	30%
6 - 10 subordinates	4	9%	0	0%
11 - 20 subordinates	10	24%	0	0%
21 - 50 subordinates	5	12%	12	60%
More than 50	7	17%	2	10%

Table 2

Original Study Pretest, Posttest, and Change Score Means and Standard Deviations for Women and Men in Training and Comparison Groups

		Pretest	Posttest	Change
Training Group				
Women (N=12)	Mean	4.44	5.33	.89
	SD	1.00	.32	.87
Men (N=8)	Mean	2.96	3.45	.49
	SD	1.31	.99	1.25
Total (N=20)	Mean	3.85	4.58	.73
	SD	1.23	1.15	1.02
Comparison Group				
Women (N=12)	Mean	4.31	3.78	- .53
	SD	.82	.77	.46
Men (N=10)	Mean	4.44	3.32	-1.12
	SD	.76	.29	.59
Total (N=22)	Mean	4.37	3.57	- .80
	SD	.76	.63	.59

Table 3

Replication Study Pretest, Posttest, and Change Score Means and Standard Deviations for Training and Comparison Groups

	Pretest	Posttest	Change
Training Group			
(N=6)			
Mean	4.32	4.95	.63
SD	.59	.85	.89
Comparison Group			
(N=7)			
Mean	4.70	3.41	-1.29
SD	.62	.67	.85

Figure 1: Change from Pretest to Posttest Scores for Women and Men in the Training and Comparison Groups