Learning Styles and Adaptive Flexibility:

Testing Experiential Learning Theory

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Abstract

Previous research on learning styles has focused on conditions of extreme learning

specialization, leaving many questions about integrated learning largely unanswered. This study

introduces new measures of balanced learning profiles and adaptive flexibility and test several

hypotheses with regard to integrated and specialized learning on a sample of 314 MBA students.

The basic prediction of the study was that, the more balanced individuals are on the dual

dialectics of learning, the more they will show adaptive flexibility. It was confirmed for both

dimensions of the learning process, but the results were stronger for the Conceptualizing/

Experiencing dimension than the Acting/ Reflecting dimension. Unpredicted corollary results

showed that individuals specializing in abstract learning styles are less flexible learners than

those specializing in concrete styles. Other hypotheses about the relation between learning styles

and level of skill development were tested and produced mixed results. Implications for

research, education, and practice are discussed.

KEYWORDS:

Learning Styles

Integrated Learning

Adaptive Flexibility

Experiential Learning Theory

Learning Style Inventory

Adaptive Style Inventory

Learning Skills Profile

"It's what you learn after you know it all that counts" -- Earl Weaver

Experiential learning theory (ELT) argues that development in learning sophistication results from the integration of the dual dialectics of the learning process, i.e., conceptualizing/experiencing and acting/reflecting. Individuals with balanced learning profiles on these dimensions are hypothesized to be more sophisticated (adaptively flexible) learners than those with specialized learning styles (Kolb, 1984). This central prediction of ELT has found little empirical investigation up to date because the vast majority of research has focused on specialized rather than balanced learning styles. Reviewing approximately one thousand studies on ELT (including two hundred in the field of management) which were conducted between 1971 and 1999, we recently found only three studies that examine balanced learning profiles (Kolb, Boyatzis, & Mainemelis, in press). In this paper we introduce new measures of a balanced learning profile and test several predictions of ELT with regard to integrated and specialized learning.

Experiential Learning Theory on Integrated and Specialized Learning

Experiential learning theory defines learning as "the process whereby knowledge is created through the transformation of experience. Knowledge results from the combination of grasping and transforming experience" (Kolb 1984, p. 41). The learning model portrays two dialectically related modes of grasping experience--Concrete Experience (CE) and Abstract Conceptualization (AC)--and two dialectically related modes of transforming experience-- Reflective Observation (RO) and Active Experimentation (AE). Individual learning styles are

determined by an individual's preferred way of resolving these two dialectics, favoring one mode over the other. The experiential learning theory suggests that, as such, these learning styles represent specialized and limited ways of learning. Following Jung's theory that adult development moves from a specialized way of adapting toward a holistic integrated way, development in learning sophistication is seen as a move from specialization to integration. Integrated learning is a process involving a creative tension among the four learning modes that is responsive to contextual demands. This is portrayed as an idealized learning cycle or spiral where the learner "touches all the bases"--experiencing, reflecting, thinking, and acting--in a recursive process that is responsive to the learning situation and what is being learned. The theory argues that this development in learning sophistication results from the integration of the dual dialectics of conceptualizing/experiencing and acting/reflecting as shown in Figure 1.

Insert Figure 1 about here

Jung discovered the universal mandala symbol in many cultures and religions throughout time representing this holistic, dynamic adaptive process. Mandala means circle, an eternal process where endings become beginnings again and again. "The mandala form is that of a flower, cross, or wheel with a distinct tendency toward quadripartite structures." (Jung, 1931, p.100) It often represents dual polarities, the integration of which fuels the endless circular process of knowing. "Psychologically this circulation would be a 'turning in a circle around oneself': whereby all sides of the personality become involved. They cause the poles of light and darkness to rotate…" (p104). In their theories of experiential learning Jean Piaget, William

James, and Paulo Freire express similar but distinctive views about the integration of these dialectics.

Piaget combines these two dialectics in the idea that an act of intellectual adaptation requires a balance or equilibrium between assimilation and accommodation. Intelligence is thus the result of the dialectic integration of internal cognitive organization, reflective abstraction, and external adaptation, active involvement in experience. He says,

> …organization is inseparable from adaptation: they are two complementary
>
> processes of a single mechanism, the first being the internal aspect of the cycle of
>
> which adaptation constitutes the external aspect… The 'accord of thought with
>
> things' and 'the accord of thought with itself' express this dual functional invariant
>
> of adaptation and organization. These two aspects of thought are indissociable: it
>
> is by adapting to things that thought organizes itself and it is by organizing itself
>
> that it structures things. (1952, pp: 7-8)

 Another view is articulated by William James in his philosophy of radical empiricism. James posed radical empiricism as a new theory of reality and mind which resolved the conflicts between 19th century rationalism and empiricism, the philosophies of idealism and materialism. For James, everything begins and ends in the continuous flux and flow of experience. His philosophy of radical empiricism was based on two co-equal and dialectically related ways of knowing the world - "knowledge of acquaintance" based on direct perception and "knowledge about" based on mediating conception. In radical empiricism, direct perception has primacy since all concepts derive their validity from connection to sense experience. Concepts, however, have priority in controlling human action because they often enable us to predict the future and

achieve our desires. James (1977) draws attention to the importance of this co-equal relationship when he says,

> We thus see clearly what is gained and what is lost when percepts are translated into concepts. Perception is solely of the here and now; conception is of the like and unlike, of the future, and of the past, and of the far away. But this map of what surrounds the present, like all maps, is only a surface; its features are but abstract signs and symbols of things that in themself are concrete bits of sensible experience. We have but to weigh extent against content, thickness against spread, and we see that for some purposes the one, for other purposes the other, has the higher value. Who can decide off-hand which is absolutely better to live and to understand life? We must do both alternately, and a man can no more limit himself to either than a pair of scissors can cut with a single one of its blades. (p. 243)

 While Paulo Freire recognizes the conceptualizing/experiencing dialectic in stressing the importance of naming ones own experience in dialogue with others, he and other critical theorists give primary emphasis to praxis, the transformative dialectic between reflection and action--reflection informed by action and action informed by reflection. He writes powerfully about the dynamics of this dialectic:

> As we attempt to analyze dialogue as a human phenomenon... Within the word we find two dimensions, reflection and action, in such radical interaction that if one is sacrificed -even in part -the other immediately suffers.... When a word is deprived of its dimension of action, reflection automatically suffers as well; and the word is changed into idle chatter, into verbalism, into an alienated and

alienating 'blah'.... On the other hand, if action is emphasized exclusively, to the

detriment of reflection, the word is converted into activism. The latter action for

action's sake negates the true praxis and makes dialogue impossible. (1992, pp:

75-78)

Operationalizing Experiential Learning Theory

Three instruments have been developed to assess the constructs of experiential learning

theory--The Learning Style Inventory (Kolb, 1984, 1999a), The Adaptive Style Inventory (Kolb

1984; Boyatzis & Kolb, 1993) and The Learning Skills Profile (Boyatzis & Kolb 1991,1995,

1997). They have been designed to be theoretically commensurate while methodologically

diverse in order to reduce spurious common method variance among the three instruments.

The Learning Style Inventory (LSI). The LSI uses a forced choice ranking method to

scale an individual's preferred modes of learning, CE, RO, AC, and AE. Two scores indicate an

individual's relative preference for one pole or the other of the two dialectics,

conceptualizing/experiencing (AC-CE) and acting/reflecting (AE-RO). Although ELT and the

LSI have been cited in approximately 1,000 publications since 1971 (Kolb & Kolb, 1999), we

have found only 3 studies that examine a balanced learning profile on the LSI (Kolb, Boyatzis, &

Mainemelis, in press). In this paper we introduce new scores that measure the degree to which

an individual is balanced in their preference for AC versus CE, and AE versus RO. The

assumption is that the more balanced a person is in their dialectic preference, the more they will

experience a creative tension or attraction to both poles opening a wider space for flexible

adaptation and development of learning skill.

      The Adaptive Style Inventory (ASI). The ASI uses a paired comparison method to rank learning preferences for the four learning modes in eight personalized learning contexts. It measures adaptive flexibility in learning, the degree to which one changes learning style to respond to different learning situations in their life. Earlier studies found that adaptive flexibility is positively related to higher levels of ego development on Loevinger's instrument (Kolb & Wolfe, 1981). Individuals with high adaptive flexibility are more self-directed, have richer life structures, and experience less conflict in their lives (Kolb, 1984).

      The Learning Skills Profile (LSP). The LSP uses a modified Q-sort method to assess level of skill development in four skill areas that are related to the four learning modes-- Interpersonal Skills (CE), Information Skills (RO), Analytical Skills (AC) and Behavioral Skills (AE). Several recent studies have used the LSP in program evaluation (Ballou, Bowers, Boyatzis, & Kolb, 1999; Boyatzis, Cowen, & Kolb, 1995) and learning needs assessment (Rainey, Hekelman, Glazka, & Kolb, 1993; Smith 1990).

<div align="center">Hypotheses</div>

      The commensurability of the LSI, ASI, and LSP makes it possible to empirically test some of the predictions of experiential learning theory. In this paper we investigate whether individuals with balanced learning styles on the LSI show more sophisticated development in learning (as measured by adaptive flexibility on the ASI) than individuals with specialized learning styles. Also we examine levels of learning skill development on the LSP and their relationship to integrative and specialized learning styles. Specifically, we test the following hypotheses on a sample of 314 MBA students.

Hypothesis 1a. The more individuals are balanced on the conceptualizing/experiencing dialectic of the LSI, the more they will show adaptive flexibility on this dimension on the ASI.

Hypothesis 1b. The more individuals are balanced on the acting/reflecting dialectic of the LSI, the more they will show adaptive flexibility on this dimension on the ASI.

Hypothesis 2a. The more individuals are specialized in their preference for conceptualizing or experiencing on the LSI, the less they will show adaptive flexibility on this dimension on the ASI.

Hypothesis 2b. The more individuals are specialized in their preference for acting or reflecting on the LSI, the less they will show adaptive flexibility on this dimension on the ASI.

Hypothesis 3a. The more individuals are balanced on the conceptualizing/experiencing dialectic of the LSI, the greater will be their level of learning skill development in analytical and interpersonal skills on the LSP.

Hypothesis 3b. The more individuals are balanced on the acting/reflecting dialectic of the LSI, the greater will be their level of learning skill development in behavioral and information skills on the LSP.

Hypothesis 4a. The more individuals have high adaptive flexibility on the conceptualizing/experiencing dialectic of the ASI, the greater will be their level of learning skill development in analytical and interpersonal skills on the LSP.

Hypothesis 4b. The more individuals have high adaptive flexibility on the acting/reflecting dialectic of the ASI, the greater will be their level of learning skill development in behavioral and information skills on the LSP.

Hypothesis 5a. The more individuals are specialized in their preference for conceptualizing on the LSI, the greater will be their level of learning skill development in analytical skills on the LSP.

Hypothesis 5b. The more individuals are specialized in their preference for experiencing on the LSI, the greater will be their level of learning skill development in interpersonal skills on the LSP.

Hypothesis 5c. The more individuals are specialized in their preference for acting on the LSI, the greater will be their level of learning skill development in behavioral skills on the LSP.

Hypothesis 5d. The more individuals are specialized in their preference for reflecting on the LSI, the greater will be their level of learning skill development in information skills on the LSP.

Method

Sample

As part of a projected fifty-year longitudinal study of managerial careers and lifelong competency development now in its tenth year, a sample of 314 MBA students completed a battery of learning instruments during a required course called Managerial Assessment and Development (Boyatzis, 1994; Boyatzis, Cowen, & Kolb, 1995; Boyatzis et. al., 1996; Boyatzis, Wheeler, & Wright, in press; Goleman, 1998). The sample was composed of students who entered the full-time or part-time program in 1990 (84), 1991 (55), 1992 (74), 1993 (75), and 1994 (18). The average age of the sample was 27.4; 61% were male and 39% female; 77% were native English speakers and 23% were not. At the conclusion of the required course, all students

are asked for permission to use their data in various research studies. An average of 89% of the students gave their permission in each of these samples.

Measures

Data were collected with the Learning Style Inventory, Adaptive Style Inventory, and Learning Skills Profile, described earlier. Eight variables were calculated from the LSI: raw scores for each of the learning modes (CE, RO, AC, AE); two measures of specialization in one of the dialectical modes of the two dimensions in ELT (AC-CE, AE-RO); and to assess a balanced profile, the absolute value of these two dialectical scores was adjusted for population variation. For example, individuals scoring equally in AC and CE can be said to be balanced on this dimension. Their subtracted absolute score reflects an inverse score of this balance; that is, a low score indicates a balanced profile, a high score indicates a high score toward either end of the dialectical dimension. The absolute score was adjusted to center it around the 50th percentile (ABS [AC-(CE+4)]) of the LSI normative comparison group (Kolb, 1999a, 1999b), resulting in a score with a range of 0 to 33, mean of 10.7, and a standard deviation of 7.2 (skewness = .528, kurtosis = -.316). Similarly, the formula for the balanced profile in the AE/RO dimension is ABS [AE-(RO+6)], resulting in a score with a range of 0 to 33, mean of 11, and a standard deviation of 7.1 (skewness = .556, kurtosis = -.267).

Eight variables were calculated from the ASI: Four mode scores (CE, RO, AC, AE), two specialization scores (AC-CE and AE-RO), and two adaptive flexibility measures, one for each dialectical dimension. The formulae for the adaptive flexibility measures and the relevant univariate statistics are explained in Appendix A. These two measures are absolute values of the subtraction of the flexibility on AC minus the flexibility on CE, and flexibility on AE minus

flexibility on RO respectively. The AC/CE adaptive flexibility score ranges from 0 to 8, with a mean of 3.6 and a standard deviation of 2.3 (skew and kurtosis are less than 1.) The AE/RO adaptive flexibility score ranges from 0 to 8, with a mean of 2.2 and a standard deviation of 1.9 (skew and kurtosis are less than 1).

Six variables were calculated from the LSP. Four were obtained from the sum of the scale scores of the three scales constituting each "quadrant" of skills. One quadrant assesses CE skills (the Interpersonal quadrant of Leadership, Relationship, and Helping Skills). Another quadrant assesses RO skills (the Information quadrant of Sense Making, Information Gathering, and Information Analysis Skills). Another quadrant assesses AC skills (the Analytical quadrant of Theory, Quantitative, and Technology Skills). The last quadrant assesses AE skills (the Behavioral quadrant of Goal Setting, Action, and Initiative Skills). The last two measures were computed as the dialectical dimensions difference scores (AC-CE and AE-RO).

Psychometric Characteristics of the ELT Instruments

The psychometric properties of the LSI, ASI, and LSP have been described in detail elsewhere (Kolb, 1984, 1999a, 1999b; Boyatzis & Kolb, 1991, 1993, 1995, 1997; Gish, 1980; Veres, Sims, & Locklear, 1991; Ferrell, 1983). In this study we examined the consistency of these commensurate instruments by testing their intercorrelations. We found that the scores from each of the three instruments for each of the four learning modes (CE, RO, AC, and AE) and the two dialectical dimensions (AC-CE and AE-RO) were significantly correlated, as shown in Appendix B. The LSI and ASI correlations for the four modes and two dimensions ranged from .39 to .50 (power=100% at alpha=.05, one-tailed). The LSI and LSP showed significant correlations for four of the six relationships ranging from .23 to .54 (power > 96%). The two

exceptions were RO and AE. The ASI and LSP showed significant correlations for five of the six relationships, ranging from .15 to .37 (power > 73%). Again, the exception was RO. Overall, fifteen of the total eighteen intercorrelations among the LSI, ASI, and LSP scores were significant.

Demographic Characteristics of the ELT Instruments

The mean LSI scores for program type (i.e., full-time, part-time), gender, and age are presented in Appendix C (Table C.1). The sample overall has an AC and AE bias, and there are no significant differences between full-time and part-time students, as well as between age groups. There is one significant difference in terms of gender. Men have a significantly stronger preference than women for conceptualizing ($\underline{t}$ = -4.19, $\underline{p}$ < .001) and the conceptualizing end of the AC/CE dimension ($\underline{t}$=-3.762, $\underline{p}$<.001).

In terms of the ASI, there are no significant differences between full-time and part-time students, as well as between age groups (Table C.2). There are important differences between male and female students with the latter adapting significantly more toward experiencing than males ($\underline{t}$ = 2.88, $\underline{p}$ < .01) and the men adapting more toward the conceptualizing end of the AC/CE dimension ($\underline{t}$=-2.45, $\underline{p}$<.05). Women are also more adaptively flexible than men on both the conceptualizing/experiencing dimension ($\underline{t}$ = -2.36, $\underline{p}$ < .05) and the acting/reflecting dimension ($\underline{t}$ = -2.12, $\underline{p}$< .05).

Finally, Table C.3 in Appendix C presents the mean LSP scores for program type, gender, and age. There are no significant differences for the age groups. Male students have significantly more developed analytical skills than female students when they enter the program ($\underline{t}$ = -5.65, $\underline{p}$ < .001) while women specialize more on interpersonal skills ($\underline{t}$=-4.86, $\underline{p}$<.001). Part-

time students enter the program with significantly more developed analytical skills (t = -2.27, p< .05) while full-time students specialize more on interpersonal skills (t=-2.80, p<.01).

Results

A balanced learning profile on the conceptualizing/experiencing dialectic of the LSI was positively correlated with adaptive flexibility on this dimension, as shown in Table 1 (power=98%, alpha=.05, one-tailed). A balanced learning profile on the acting/reflecting dialectic of the LSI was positively correlated with adaptive flexibility on the same dimension in the ASI (power=80%). Hypotheses 1a and 1b are, therefore, supported.

Insert Table 1 about here

Specialization in a preference for conceptualizing on the LSI was negatively related with adaptive flexibility on this dialectical dimension (power=94%). While specialization in a preference for experiencing on the LSI was positively related with adaptive flexibility on this dialectical dimension (power=79%), as shown in Table 2. This indicates that people with a specialization in conceptualizing are less flexible on this dimension according to the ASI, while people with a specialization in experiencing are more flexible. Therefore, Hypothesis 2a is supported for one mode or end of this dimension and rejected for the other.

Specialization in a preference for acting or reflecting on the LSI was not correlated with adaptive flexibility on this dialectical dimension, as shown in Table 2. Therefore, Hypothesis 2b was rejected.

Insert Table 2 about here

A balanced learning profile on the conceptualizing/experiencing dimension of the LSI showed significantly less developed learning skills in the Information quadrant (power=89%) and the Analytical quadrant (power=99%), and no significant correlation with the Interpersonal quadrant, as shown in Table 3. Individuals with a balanced learning profile on the AC/CE dialectic of the LSI show less developed Information and Analytical skills. Hypothesis 3a was therefore rejected. A balanced learning profile on the acting/reflecting dimension of the LSI did not show greater learning skills in either relevant quadrant (the Behavioral nor Information quadrants of learning skills). Therefore, Hypothesis 3b too was rejected.

Insert Table 3 about here

Adaptive flexibility on the conceptualizing/experiencing dimension of the ASI showed less developed learning skills in the Analytic quadrant (power=80%) and the Information quadrant (power=63%) of the LSP, as shown in Table 4. Adaptive flexibility on the acting/reflecting dimension of the LSI did not show greater learning skills in either relevant quadrant (the Behavioral nor Information quadrants of learning skills). Therefore, Hypotheses 4a and 4b were rejected.

Insert Table 4 about here

Specialization in conceptualizing on the LSI showed positive correlation to greater learning skills in the Analytic quadrant (power=100%) and negative correlation to learning skills in the Interpersonal quadrant (power=97%), as shown in Table 5. Specialization in experiencing on the LSI showed positive correlation to greater learning skills in the Interpersonal quadrant (power=100%) and negative correlation to learning skills in the Analytic quadrant (power=100%). Therefore, Hypotheses 5a and 5b were supported.

Specialization in acting on the LSI did not show a significant positive correlation to the learning skills in the Behavioral quadrant, but showed a negative correlation with the Analytic quadrant (power=88%), as shown in Table 5. A pattern that emerged from the study is that the learning skills of the Analytic quadrant correlate negatively with learning styles specializing in both Experiencing and Acting. Specialization in reflecting on the LSI did not show a correlation to greater learning skills in the Information quadrant but did show a negative correlation to learning skills in the Behavioral quadrant (power=94%), as shown in Table 5. The reflective learning skills, indicated by the Information quadrant, do not show consistent results of the other scales. Hypothesis 5c was therefore partially supported and Hypothesis 5d was rejected.

Insert Table 5 about here

Discussion

Summary of Results

The primary prediction from experiential learning theory was that individuals who integrate the dual dialectics of the learning model of conceptualizing and experiencing as well as

acting and reflecting will be more flexible on those dimensions. It was confirmed. Balanced LSI scores are significantly correlated with ASI adaptive flexibility scores on the AC/CE and AE/RO dimensions. The relationship is strongest on the conceptualizing and experiencing (AC/CE) dimension. Individuals who are adaptively flexible on the ASI show the same pattern of results on LSP scores as those who are balanced on the LSI.

Results from the corollary prediction that specialized learning styles might respond less flexibly to different learning contexts showed unpredicted findings. Flexibility on the AE/RO dimension is unrelated to degree of specialization in any of the learning styles. However, specialization in the concrete learning style was related to being more flexible and specialization in the abstract learning style was related to being less flexible on the AC/CE dimension of ASI adaptive flexibility.

Contrary to prediction those with the balanced learning style did not show greater learning skill development. Balance on the LSI AE/RO dimension was unrelated to level of learning skill in any area of the LSP. Individuals who were balanced on the LSI AC/CE dimension, surprisingly showed lower levels of skill development in analytic skills and information skills.

Individuals with learning styles specialized in experiencing (CE) show higher levels of interpersonal skill and lower levels of analytic skill. Individuals who specialize in conceptualizing (AC) show lower levels of interpersonal skill and higher levels of analytic skill on the LSP. Learning styles that are specialized in acting or reflecting show less or no significant relationship to levels of skill development in the corresponding LSP areas. Those who specialize in the reflecting style, however, show lower levels of skill development overall,

while those specializing in the acting style show moderately higher skills in the Behavioral quadrant of the LSP.

Interpretation

While the above results show some support for the dual dialectic model of experiential learning, they show stronger relationships among variables on the conceptualizing/experiencing dialectic than on the acting/reflecting dialectic. It would appear that balancing the dialectic of comprehension (conceptualizing) and apprehension (experiencing) has more impact on the learning process, flexibility in responding to possible learning, and skill development than balancing the extension (acting) and intention (reflecting) dimension. The increased flexibility shown by those focusing on experiencing supports the importance of being contextual in responding to learning opportunities. The decreased flexibility shown by those focusing on conceptualizing is reminiscent of the research on attitude change showing that attitudes were more difficult to change when embedded in an internally consistent theory or mental model than when the attitude appeared inconsistent with the person's other views or their worldview.

One possible explanation for this may lie in the context of the study--MBA students in a degree program that emphasizes analytic and quantitative skills. In contrast, Freire's work that emphasizes the acting/reflecting dialectic is done in the context of oppressed peoples for whom the learning challenges are in the acting realm. In addition, the sample used in this study had a slight bias toward AC. This predisposition to AC and socialization toward AC from graduate school programs (Boyatzis, Cowen, and Kolb, 1995) may act like a pre-selection screen encouraging those less flexible in learning styles. If this were the case, the explicit objective of

many graduate programs to broaden people's perspectives and their openness to others would be frustrated.

A specializing learning style in the skill domain of experiencing or conceptualizing is related to higher skill development in that domain and lower skill development in the opposite domain; while the balanced profile is related to lower skill development particularly in the domain of analytic skills. Perhaps, when learning challenges are focused in the analytic realm, the person who is specialized in conceptualization has the advantage over the more flexible person with a balanced learning style. The fact that specialization in conceptualizing is negatively related to adaptive flexibility, while specialization in experiencing is positively related to adaptive flexibility is consistent with ELT.

Other study results provide further construct validation for ELT. Table 6 shows the highly significant positive correlation of GMAT scores to specializing in conceptualizing as a learning style, to the conceptualizing end of the dialectic dimension, skill development in analytic learning skills, and negatively correlated with learning skill development in interpersonal skills. Since the GMAT is currently used as a popular screening tool for MBA programs, and the corresponding standardized, multiple-choice test is used for other graduate programs (i.e., LSAT for law school, MCAT for medical school, GRE for other graduate programs), we can conclude that graduate programs favor admitting those students biased toward conceptualizing learning styles and showing less flexibility in learning situations. As these test scores have increased in salience because of their use in competitive rankings of programs by the media, the consequences on learning flexibility and skill development may have become exaggerated in a direction opposite to the explicit mission of graduate programs.

Insert Table 6 about here

The ELT instruments show a high degree of commensurability. The high degree of inter-correlation of the dimensions and dialectics suggest scales and instruments assessing comparable theoretical dimensions. Meanwhile, their differential construct and criterion validation results support the discriminant validity of the scales and measures. In terms of age and gender, as shown in tables in Appendix C (Tables C.1, C.2, and C.3), we find consistent lack of findings regarding type of program and age, and consistent findings regarding gender. As the literature would suggest, women show an increased tendency toward the experiencing end of the dialectic, increased flexibility on this dimension, and greater learning skill development, while men show the opposite tendency toward conceptualizing (White, 1994, 1992; Kolb, 1984).

Implications for Research and Practice.

One of the major goals in creating the ASI was to develop a quantitative measure of adult development. The findings suggest that further research to replicate, extend the construct validity, and mathematical analysis of new formulas to assess adaptive flexibility on the ASI will add to our understanding of learning processes and effectiveness. Also, the substantial correlation between LSI scores and ASI total scores suggest that ASI total scores are similar to LSI scores. Whereas to date the LSI has been extensively used in the management literature to study learning preferences, the results of this study underline the importance of integrated learning and adaptive flexibility.

Implications for practice must be considered tentative at this point, awaiting replication and further construct validation of the balanced LSI learning profile and adaptive flexibility on the ASI. At a minimum the study gives a suggested answer to the often asked questions, "What does it mean if I score 'in the middle' on the LSI?" or "what is the difference between balanced and specialized learning styles." The findings suggest that the balanced learning profile, particularly on the conceptualizing/experiencing dialectic, is more flexible in adapting to different learning contexts, but may be less effective for skill development than a specialized learning style commensurate with specific specialized learning skills.

These findings suggest the biases inherent in most graduate programs admissions criteria and faculty orientation create a self-fulfilling prophesy. Those with a high conceptualizing orientation perform better in the faculty's eyes and get better grades for written work and classroom performance (cf. Rothstein, Paunonen, Rush, & King, 1994). Meanwhile, those who perform their professions and occupations more effectively, and maybe even in life, seem to represent people with more varied learning style preferences, flexibility, and skill development (Kolb, 1984; Boyatzis et. al., 1995; Boyatzis, 1982; Perlmutter, 1990). To be more effective in preparing students for their professions, graduate programs should consider designing admissions criteria and learning processes with more pluralism regarding learning styles and flexibilities (Kolb, 1984; Lengnick-Hall & Sanders, 1997). The same argument would apply to organizationally sponsored training and development. Although the training and development programs offered in companies and government agencies often have a different learning orientation bias, but one which still focuses on the socially most acceptable styles and devalues others, and unintentionally devalues flexibility.

References

Ballou, R., Bowers, D., Boyatzis, R. E, & Kolb, D. A. (1999). Fellowship in lifelong learning: An executive development program for advanced professionals. Journal of Management Education, 23(4), 338-354.

Boyatzis, R. E. (1982). The competent manager: A model for effective performance. New York: John Wiley & Sons.

Boyatzis, R. E. (1994). Stimulating self-directed change: A required MBA course called Managerial Assessment and Development. Journal of Management Education, 18(3), 304- 323.

Boyatzis, R. E., & Kolb, D. A. (1993). Adaptive Style Inventory: Self scored inventory and interpretation booklet. TRG Hay/McBer, Training Resources Group. 116 Huntington Avenue, Boston, MA 02116, trg_mcber@haygroup.com.

Boyatzis, R. E., & Kolb, D. A. (1991). Learning Skills Profile. TRG Hay/McBer, Training Resources Group. 116 Huntington Avenue, Boston, MA 02116, trg_mcber@haygroup.com.

Boyatzis, R. E. & Kolb, D. A. (1995, March-April). From learning styles to learning skills: The Executive Skills Profile. Journal of Managerial Psychology, 10(5), 3-17.

Boyatzis, R. E. & Kolb, D. A. (1997). Assessing individuality in learning: The Learning Skills Profile. Educational Psychology, 11(3-4), 279-295.

Boyatzis, R. E., Cowen, S. S., & Kolb, D. A. (Eds., 1995). Innovation in professional education: Steps in a journey from teaching to learning. San Francisco: Jossey-Bass.

Boyatzis, R. E., Wheeler, J., and Wright, R. (in press). Competency development in graduate education: A longitudinal perspective, Proceedings of the First World Conference on Self-Directed Learning, GIRAT, Montreal.

Boyatzis, R. E., Baker, A., Leonard, D., Rhee, K., and Thompson, L. (1995). Will it make a difference?: Assessing a value-based, outcome oriented, competency-based professional program. In Boyatzis, R. E., Cowen, S. S., and Kolb, D. A. (Eds.) Innovation in professional education: Steps on a journey from teaching to learning. San Francisco: Jossey-Bass.

Boyatzis, R. E., Leonard, D., Rhee, K., and Wheeler, J.V. (1996). Competencies can be developed, but not the way we thought. Capability, 2(2), 25-41.

Cohen, J. (1977). Statistical power analysis for the behavioral sciences. New York: Academic Press.

Ferrell, B. G. (1983). A factor analytic comparison of four learning styles instruments. Journal of Educational Psychology, 75(1), 33-39.

Freire, P. (1992). Pedagogy of the Oppressed. New York: Continuum.

Gish, G. (1980). Adult development and adaptation: An empirical test of the experiential learning theory and adaptive flexibility. Unpublished doctoral dissertation, Department of Organizational Behavior, Weatherhead School of Management, Case Western Reserve University, Cleveland, OH.

Goleman, D. (1998). Working with emotional intelligence. New York: Bantam Books.

James, W. (1977). Percept and concept: the import of concepts. In J. McDermott (Ed.), The writings of William James. Chicago: University of Chicago Press.

Jung, C. G. (1931). Forward and commentary. In R. Wilhelm (Trans.), The secret of the golden flower. NY: Harcourt Brace & World.

Kolb, A., & Kolb, D. A. (1999). <u>Bibliography of research on experiential learning theory and the learning style inventory</u>. Department of Organizational Behavior, Weatherhead School of Management, Case Western Reserve University, Cleveland, OH.

Kolb, D. A. (1984). <u>Experiential learning: Experience as the source of learning and development.</u> New Jersey: Prentice-Hall.

Kolb, D. A. (1999a). <u>Learning Style Inventory, Version 3.</u> TRG Hay/McBer, Training Resources Group. 116 Huntington Avenue, Boston, MA 02116, trg_mcber@haygroup.com.

Kolb, D. A. (1999b). <u>Learning style inventory-version 3: Technical specifications.</u> TRG Hay/McBer, Training Resources Group. 116 Huntington Avenue, Boston, MA 02116, trg_mcber@haygroup.com.

Kolb, D. A., & Wolfe, D. (1981). <u>Professional education and career development: A cross-sectional study of adaptive competencies in experiential learning</u>. Final report NIE grant no. NIE-G-77-0053, ERIC no. ED 209 493 CE 030 519.

Kolb, D. A., Boyatzis, R. E., & Mainemelis, C. (in press). Experiential learning theory: Previous research and new directions. In R. J. Sternberg & L. F. Zhang, (Eds.) <u>Perspectives on cognitive, learning, and thinking styles</u>. Mahwah, NJ: Lawrence Erlbaum.

Lengnick-Hall, C. A., & Sanders, M. M. (1997). Designing effective learning systems for management education: Student roles, requisite variety, and practicing what we teach. <u>Academy of Management Journal, 40(6),</u> 1334-1368.

Perlmutter, S. (1990). <u>Cognitive complexity and time perspective in hybrid organizations.</u> Unpublished doctoral dissertation, Department of Organizational Behavior, Weatherhead School of Management, Case Western Reserve University, Cleveland, OH.

Piaget, J. (1952). <u>The origins of intelligence in children</u>. New York: International University Press.

Rainey, M. A., Hekelman, F., Galazka, S.F., & Kolb, D. A. (1993, February). Job demands and personal skills in family medicine: Implications for faculty development. <u>Family Medicine, 25,</u> 100-3**.**

Rothstein, M. G., Pauonen, S. V., Rush, J. C. & King, G. A. (`1994). Personality and cognitive ability predictors of performance in graduate business school. <u>Journal of Educational Psychology, 86(4),</u> 516-530.

Smith, D. (1990). <u>Physician managerial skills: Assessing the critical competencies of the physician executive.</u> Unpublished doctoral dissertation, Department of Organizational Behavior, Weatherhead School of Management, Case Western Reserve University, Cleveland, OH.

Veres, J. G., Sims, R. R., & Locklear, T. S. (1991). Improving the reliability of Kolb's revised LSI. <u>Educational and Psychological Measurement, 51,</u> 143-150.

White, J. (1994). Individual characteristics and social knowledge in ethical reasoning. <u>Psychological Reports, 75,</u> 627-649.

White, J. (1992). Applying an experiential learning styles framework to management and professional development. <u>Journal of Management Development, 11(5),</u> 55-64.

Appendix A

Adaptive Flexibility Formulae

The formulae for the two adaptive flexibility measures are based on the vectors for each of the eight items of the ASI. There are two possible vectors per dimension for each item. For example, the AC/CE vectors for Item 1 are:

If AC > CE, Vector AC/Item1=1, Vector CE/Item1=0.

If AC = CE, Vector AC/Item1 = Vector CE/Item1 =1.

If AC < CE, Vector AC/Item1 =0, Vector CE/Item1=1.

The valence of individuals' preference for each mode is given by summing the vectors of the eight items:

SUM (Vectors AC) = Vector AC/Item1 + … + Vector AC/Item8.

SUM (Vectors CE) = Vector CE/Item1 + … + Vector CE/Item8.

SUM (Vectors AE) = Vector AE/Item1 + … + Vector AE/Item8.

SUM (Vectors CE) = Vector RO/Item1 + … + Vector RO/Item8.

The formulae for adaptive flexibility in the two ASI dimensions are the following (note that due to subtraction the scoring is inverse: The lower the score, the higher the adaptive flexibility):

Adaptive Flexibility in AC/CE = ABS (SUM [Vectors AC] – SUM [Vectors CE]). This score has a minimum value = 0, maximum = 8, mean = 3.59, standard deviation = 2.27, skewness = .236, and kurtosis = -.901.

Adaptive Flexibility in AE/RO = ABS (SUM [Vectors AE] – SUM [Vectors RO]). This score has minimum = 0, maximum = 8, mean = 2.21, s.d. = 1.85, skewness = .994, kurtosis = .745.

Table B: Univariate Statistics and Pearson Correlations Among LSI, ASI, and LSP Scores (N=225).

Item	Mean	s. d.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1. LSI AC	33.73	7.67																				
2. LSI CE	24.78	6.69	-.44																			
3. LSI AE	33.55	7.27	-.38	-.03																		
4. LSI RO	27.94	8.10	-.24	-.38	-.51																	
5. LSI (AC-CE)	8.95	12.22	.87	-.83	-.22	.06																
6. LSI (AE-RO)	5.61	13.37	-.06	.21	.85	-.88	-.15															
7. LSI ABS (AC–[CE+4])	10.91	7.38	.35	-.31	-.08	.00	.38	-.04														
8. LSI ABS (AE-[RO+6])	11.29	7.14	-.08	.09	-.13	.12	-.10	-.14	-.14													
9. ASI AC	13.94	3.91	.48	-.23	-.22	-.06	.43	-.08	.12	-.07												
10. ASI CE	9.63	3.91	-.41	.40	.06	.00	-.48	.03	-.19	.08	-.63											
11. ASI AE	11.85	3.42	-.11	-.02	.45	-.28	-.06	.41	.02	-.08	-.39	-.12										
12. ASI RO	12.59	3.10	.04	-.20	-.30	.39	.13	-.40	.07	.07	-.05	-.34	-.47									
13. ASI (AC-CE)	4.32	7.05	.49	-.35	-.16	-.03	.50	-.07	.17	-.08	.90	-.90	-.15	.16								
14. ASI (AE-RO)	- .74	5.60	-.09	.10	.44	-.39	-.11	.48	-.03	-.09	-.21	.12	.87	-.84	-.18							
15. ASI Adaptive																						

Variable	M	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
flexibility AC/CE	3.57	2.27	.21	-.16	-.06	-.01	.22	-.03	.24	-.08	.43	-.44	-.12	.14	.48	-.15					
16. ASI Adaptive flexibility AE/RO	2.21	1.83	.03	-.04	.00	.00	.04	.00	-.03	.16	-.01	.03	.00	-.04	-.02	.02	.01				
17. LSP Analytical (AC)	67.44	20.20	.54	-.29	-.19	-.10	.50	-.04	.28	.00	.33	-.33	.03	-.04	.36	.04	.16	.03			
18. LSP Interpersonal (CE)	83.37	14.80	-.24	.30	.10	-.11	-.31	.12	-.02	.07	-.14	.15	.04	-.07	-.16	.06	.04	-.04	-.10		
19. LSP Behavioral (AE)	84.43	13.96	.05	.07	.12	-.21	-.01	.19	.11	-.04	.05	-.04	.16	-.19	.05	.21	.09	-.05	.19	.56	
20. LSP Information (RO)	78.60	11.35	.14	.09	-.11	-.11	.04	.01	.19	.00	.10	-.08	.00	-.02	.10	.01	.13	-.03	.35	.53	.62
21. LSP (AC-CE)	-15.9	26.22	.55	-.39	-.20	-.01	.56	-.10	.22	-.04	.33	-.34	.00	.01	.37	.00	.10	.05	.83	-.64	-.17	-.03
22. LSP (AE-RO)	5.82	11.35	-.08	.00	.26	-.15	-.05	.23	-.05	-.05	-.04	.03	.21	-.22	-.04	.25	-.02	-.04	-.11	.16	.61	-.24

Note. Significance (two-tailed): r's ≥ ABS (.13), $p < .05$; r's ≥ ABS (.18), $p < .01$; r's ≥ ABS (.23), $p < .001$.

Appendix C

Table C.1: Mean LSI Scores for Program Type, Gender, and Age.

LSI Scores	Program		Gender		Age		
	Full-time	Part-time	Men	Women	< 27	27-32	> 32
	(N=166)	(N=58)	(N=145)	(N=79)	(N=62)	(N=123)	(N=32)
Conceptualizing (AC)	33.28	35.00	35.26	30.91	33.98	33.34	34.06
Experiencing (CE)	24.97	24.05	24.06	25.96	24.48	24.98	24.13
Acting (AE)	33.61	33.72	33.59	33.75	32.81	34.63	31.69
Reflecting (RO)	28.13	27.22	27.09	29.38	28.73	27.06	30.13
AC-CE	8.31	10.95	11.20	4.95	9.50	8.37	9.94
AE-RO	5.48	6.50	6.50	4.37	4.08	7.57	1.56
Balanced Learning Profile in AC/CE	10.55	12.02	11.53	9.84	11.15	10.63	11.63
Balanced Learning Profile in AE/RO	11.39	10.67	11.37	10.90	11.02	10.90	12.38

Note. Due to inverse scoring in the computation of the balanced learning profile, the lower the score the more balanced the profile.

Table C.2: Mean ASI Scores for Program Type, Gender, and Age.

ASI Scores	Program		Gender		Age		
	Full-time	Part-time	Men	Women	< 27	27-32	> 32
	(N=166)	(N=58)	(N=145)	(N=79)	(N=62)	(N=123)	(N=32)
Conceptualizing (AC)	13.81	14.29	14.25	13.37	14.34	13.70	14.03
Experiencing (CE)	9.69	9.44	9.08	10.63	9.94	9.50	9.47
Acting (AE)	11.93	11.72	11.94	11.77	11.42	12.22	11.63
Reflecting (RO)	12.57	12.55	12.73	12.25	12.32	12.58	12.88
AC-CE	4.12	4.84	5.17	2.73	4.40	4.20	4.56
AE-RO	-.63	-.83	-.79	-.48	-.90	-.37	-1.25
Adaptive Flexibility in AC/CE	3.54	3.67	3.84	3.09	3.55	3.59	3.88
Adaptive Flexibility in AE/RO	2.25	2.04	2.38	1.85	2.34	2.18	1.99

Note. Due to inverse scoring in the computation of adaptive flexibility, the lower the score the more adaptively flexible the individual.

Table C.3: Mean LSP Scores for Program Type, Gender, and Age.

LSP Skills	Program		Gender		Age		
	Full-time	Part-time	Men	Women	< 27	27-32	> 32
	(N=166)	(N=58)	(N=145)	(N=79)	(N=62)	(N=123)	(N=32)
Analytical (AC)	65.69	72.62	72.77	57.80	67.69	66.56	67.44
Interpersonal (CE)	84.52	80.40	82.74	84.77	84.50	82.30	86.66
Behavioral (AE)	85.13	83.07	84.65	84.49	86.02	83.39	86.91
Information (RO)	78.60	78.50	79.43	77.00	78.29	77.36	82.31
AC-CE	-18.83	-7.77	-9.97	-26.98	-16.81	-15.75	-19.22
AE-RO	6.53	4.57	5.22	7.49	7.73	6.03	4.60

Table 1

Pearson Correlations Between the Balanced Learning Profile and Adaptive Flexibility (N=225).

	Adaptive Flexibility in the ASI dimensions of:	
LSI Learning Profiles	Conceptualizing/Experiencing	Acting/Reflecting
Balanced Learning Profile in Conceptualizing/Experiencing	.243***	-.031
Balanced Learning Profile in Acting/Reflecting	-.080	.164*

Notes. 1. Due to inverse scoring in the computation of adaptive flexibility, the lower the score the more adaptively flexible the individual. 2. The same is true for the balanced learning profile where the lower the score the more balanced the profile. Thus a positive correlation between the balanced learning profile and adaptive flexibility indicates a positive relation between them.

3. Significance (two-tailed): *, $p < .05$; ***, $p < .001$.

Table 2

Pearson Correlations Between Specialized Learning Styles and Adaptive Flexibility (N=225).

LSI Learning Styles Specialization	Adaptive Flexibility in the ASI dimensions of:	
	Conceptualizing/ Experiencing	Acting/Reflecting
Conceptualizing (AC)	.209**	.031
Experiencing (CE)	-.163*	-.036
Acting (AE)	-.063	.000
Reflecting (RO)	-.007	.000
AC-CE	.220**	.040
AE-RO	-.030	.000

Notes. 1. Due to inverse scoring in the computation of adaptive flexibility, the lower the score the more adaptively flexible the individual. Therefore a negative correlation between a specialized learning style and adaptive flexibility indicates a positive relation between them.

2. Significance (two-tailed): *, $p < .05$; **, $p < .01$.

Table 3

Pearson Correlations Between the Balanced Learning Profile and Level of Skill Development (N=225).

	Level of Development in LSP Skills			
LSI Learning Profiles	Analytical	Interpersonal	Behavioral	Information
Balanced Learning Profile in Conceptualizing/ Experiencing	.276***	-.018	.114	.191**
Balanced Learning Profile in Acting/Reflecting	-.004	.068	-.035	.005

Notes. 1. Due to inverse scoring in the computation of the balanced learning profile, the lower the score the more balanced the profile. Therefore a positive correlation between the balanced learning profile and level of skill development indicates a negative relation between them. 2. Significance (two-tailed): **, $p < .01$; ***, $p < .001$.

Table 4

Pearson Correlations Between Adaptive Flexibility and Level of Skill Development (N=225).

ASI Adaptive Flexibility	Level of Development in LSP Skills			
	Analytical	Interpersonal	Behavioral	Information
Adaptive Flexibility in Conceptualizing/ Experiencing	.164*	.040	.093	.132*
Adaptive Flexibility in Acting/Reflecting	.032	-.039	-.051	-.026

Notes. 1. Due to inverse scoring in the computation of adaptive flexibility, the lower the score the more adaptively flexible the individual. Thus a positive correlation between adaptive flexibility and level of skill development indicates a negative relation between them. 2. Significance (two-tailed): *, $p < .05$.

Table 5

Pearson Correlations Between Specialized Learning Styles and Level of Skill Development

(N=225)

LSI Learning Styles	Level of Development in LSP Skills			
Specialization	Analytical	Interpersonal	Behavioral	Information
Conceptualizing (AC)	.541***	-.236***	.047	.138*
Experiencing (CE)	-.292***	.299***	.071	.090
Acting (AE)	-.189**	.102	.118	-.110
Reflecting (RO)	-.101	-.115	-.209**	-.107
AC-CE	.499***	-.312***	-.009	.037
AE-RO	-.041	.125^{+}	.191**	.005

Note. Significance (two-tailed): *, p < .05; **, p < .01; ***, p < .001.

Table 6

Pearson Correlations Between LSI, ASI, LSP Scores and GMAT Scores (N=219).

LSI, ASI, and LSP Scores	GMAT Scores		
	Quantitative	Verbal	Total
LSI Specialization in Conceptualizing (AC)	.305***	.146*	.307***
LSI Specialization in Experiencing (CE)	-.166*	.006	-.116
LSI Specialization in Acting (AE)	-.090	-.029	-.089
LSI Specialization in Reflecting (RO)	-.071	-.116	-.114
LSI Specialization in (AC-CE)	.286***	.090	.260***
LSI Specialization in (AE-RO)	-.006	.055	.020
Balanced LSI Learning Profile in AC/CE	.026	.127	.116
Balanced LSI Learning Profile in AE/RO	.070	-.148*	-.039
ASI Specialization in Conceptualizing (AC)	.094	-.057	.030
ASI Specialization in Experiencing (CE)	-.115	.137*	-.003
ASI Specialization in Acting (AE)	.069	.039	.073
ASI Specialization in Reflecting (RO)	-.048	-.137*	-.107
ASI Specialization in (AC-CE)	. 116	-.108	.019
ASI Specialization in (AE-RO)	.069	.100	.104
ASI Adaptive Flexibility in AC/CE	.009	-.069	-.018
ASI Adaptive Flexibility in AE/RO	.068	-.010	.063
LSP Specialization in Analytical Skills (AC)	.261***	-.006	.188**
LSP Specialization in Interpersonal Skills (CE)	-.251***	-.162*	-276***

LSP Specialization in Behavioral Skills (AE)	-.158*	-.035	-.127
LSP Specialization in Information Skills (RO)	-.076	.009	-.023
LSP Specialization in (AC-CE)	.342***	.086	.300***
LSP Specialization in (AE-RO)	-.116	-.051	-.131

Notes. 1. Due to inverse scoring in the computation of the balanced learning profile, a negative correlation between the balanced learning profile and GMAT scores indicates a positive relation between them. 2. Due to inverse scoring in the computation of adaptive flexibility, a negative correlation between adaptive flexibility and GMAT scores indicates a positive relation between them. 3. Significance (two-tailed): *, $p < .05$; **, $p < .01$; ***, $p < .001$.

Figure 1

The experiential learning theory of development (Kolb, 1984, p. 141)