

## *Assessing Individuality in Learning: the learning skills profile*

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**ABSTRACT** *A typology of learning skills is developed that is congruent with the learning style descriptions of experiential learning theory. The typology is holistic, allowing both idiographic and normative comparisons of individuals and situations, and the 'fit' between them. Learning style describes basic and generalised dimensions of individuality in learning, while a learning skill is more situational and subject to intentional development. The Learning Skills Profile (LSP) is a 72-item, modified Q-sort assessment instrument designed to assess learning skills. Data from numerous studies are reviewed and reported to establish the LSP's reliability, relational validity, criterion and construct validity. The LSP can be used as a vehicle for providing personal and organisational feedback on skills, and to describe the skills required by different jobs and educational programs.*

The last 20 years have seen a burgeoning of research on individuality in the learning process. Much of this work has focused on frameworks and instruments for the assessment of individual learning styles. In experiential learning theory (ELT) (Kolb, 1984), the model of style characteristics is based on a theory of learning. The theory defines four phases in the process of learning from experience: concrete experience, reflective observation, abstract conceptualisation and active experimentation. Individual learning styles are defined by a person's relative reliance on these four learning modes. The framework is holistic, including affective, perceptual and behavioural as well as cognitive strategies.

In her recent review of research on ELT from 1971–1991, Hickcox (1991) analysed 81 studies in the helping professions, medical professions, education, higher education, accounting and business—50 of the studies supported ELT versus 31 studies showing partial or no support. She concluded that the Learning Style Inventory (LSI). (Kolb.

1971, 1976, 1981), in comparison with 17 other North American and Australian learning style instruments, had strong reliability and fair validity. She agreed in this conclusion with Curry's (1987) study of 21 learning style instruments.

That study categorised the instruments in a three layer 'onion' model of learning styles with cognitive/personality dimensions at the core, information processing dimensions in the middle, and instructional preferences on the surface where transactions with the environment take place. The LSI was positioned as a mid-level instrument that assessed the way an individual processed information. Curry's model is analogous with ELT's three level model of development which defines three modes of individual adaptation to the environment: performance, learning and development.

The goal of the research reported here is to develop and validate the Learning Skills Profile (LSP), an instrument for the assessment of individuality in the performance mode. This study is part of a continuing research programme aimed at understanding the components of effective performance that began with studies of adaptive competence (Boyatzis, 1982; Kolb, 1984). A recent study (Boyatzis & Kolb, in press) integrated earlier results into an ELT-based learning skill typology for analysis of executive roles. The current study seeks to generalise the skill typology from management to a broadly conceived educational domain, producing a self-assessment instrument that can be used to assess individual learning skill profiles and describe the learning skill requirements of formal education and training programs as well as informal requirements for learning on the job and in other life settings.

### **Definition of Learning Skills**

A skill is a combination of ability, knowledge and experience that enables a person to do something well. A learning skill defines a generic heuristic that enables mastery of a specific performance domain. It has two components: a domain of application and a knowledge transformation process. Three aspects of this definition are important.

#### *1. Skills are domain specific and knowledge rich*

Glaser (1984) criticises general process approaches in education because they ignore the interactions between structures of knowledge and cognitive processes. One example he cites is research on expert problem solving that shows high levels of competence are characterised by rich structures of domain specific knowledge, rather than superior execution of a general problem solving process. Similarly, Minsky and Papert (1974), describing developments in the field of artificial intelligence, suggest that "A very intelligent person might be that way because of specific local features of his knowledge—organising knowledge rather than because of global qualities of his thinking" (p. 98).

The assessment challenge is to develop a skill taxonomy that is refined enough to accurately describe person and job variations [a problem with the four learning style modes or Fine's (1974) data-people-things typology]; yet not so complex as to defy generalisation across persons and tasks. As Fleishman reports "Reviews of earlier work led to the conclusion that neither highly specific nor highly generalized categories were likely to be most useful in generalizing principles across tasks" (1982, p. 828).

*2. A skill describes an integrated transaction between the person and environment*

Skills are integrated routines combining a person's knowledge and ability with a perceived environmental domain of application. This integration between personal skill and environmental domain allows for commensurate measurement of person/environment fit (Sims, 1983); following what Fleischman (1982) calls the abilities requirement approach, whereby specific environments are characterised by their skill demands.

Skilled performance is the result of a 'fit' or synergy between personal skill and environmental demand. This congruence has been described as an optimal experience of flow (Csikszentmihalyi & Csikszentmihalyi, 1988). Flow can be said to occur when people are able to meet the challenges of their environment with appropriate skills, and accordingly, feel a sense of well-being, mastery, and a heightened sense of self-esteem. However, learning a skill may require some separation from the environment in the form of reflection and generalisation. In the developmental mode of person/environment transaction, evidence suggests a counter-balancing response which brings to the situation the missing perspective that allows learning to occur (Perlmutter, 1990; Kolb, 1984).

*3. Skills are developed by practice*

While learning styles vary over short periods of time in test-retest reliability studies (Sims & Veres, 1986), data on the relationship between the learning style of adult respondents and their undergraduate major suggest a longer term, more stable component (cf. Kagan, 1989).

Learning skills, however, are developed by learning from experience and, as a result, are more variable and subject to intentional personal development. For example, Anderson (1982) describes the acquisition of cognitive skill as a 'learning by doing' system that translates declarative knowledge into procedural knowledge. He describes the ubiquity of the log-linear law of practice in skill acquisition research. The integrated transaction between a personal skill routine and its domain of application is thus developed iteratively by learning from experience. Fitts (1964) describes three phases in this process that apply to a wide range of skills: the cognitive stage of initial encoding which permits the learner to generate a crude approximation of the skilled behaviour, the associative stage of smoothing out errors in performance, and the autonomous stage of gradual continued performance.

**The ELT Typology of Knowledge**

ELT describes a three-dimensional model of human knowledge. The base of the model maps knowledge specialties by their relative emphasis on concreteness versus abstractness and action versus reflection. Learning styles in this theory are higher order heuristics for learning how to learn and represent the deep structure of the knowledge that is imparted in knowledge specialties and professions. This map has been validated in several professions by numerous studies showing relationships between individual learning style and educational specialisation, career choice and job role (Kolb, 1991). When knowledge specialties are defined by the learning style heuristics used by specialists in these fields, the pattern arrayed on the two dimensions of concrete/abstract and active/reflective is isomorphic with independent investigations of the

structure of academic fields (Biglan, 1973), Ann Roe's (1956) model of career structure, Holland's (1973) typology of vocational interests and Quinn's (1988) model of organisational value and role differentiation. Results are also consistent with Fine's (1974) functional job analysis system on which the *Dictionary of Occupational Titles* is based.

The third dimension of the model is integrative complexity comprising the degree of specialisation and integration of knowledge. It defines three levels of adaptation: performance, learning and development. At the performance level, knowledge is discrete, content focused and of limited time duration. At the level of learning, the application of knowledge is extended in time and space to include generically similar situations. Knowledge at the developmental level is organised in the longest time perspective and is concerned with the strategic control of adaptation.

The Learning Skills Profile provides a language and assessment methodology for describing knowledge at the performance level that are consistent with experiential learning theory and the knowledge structure models described above. The Learning Style Inventory was designed to assess the organisation of a person's knowledge at the level of learning. Another instrument developed by the authors and their colleagues, The Adaptive Style Inventory, assesses the organisation of knowledge at the developmental level by computing the adaptive flexibility of an individual's responses to different learning situations.

### **Assessment of Learning Skills: The Learning Skills Profile**

The research studies reported below had three objectives.

1. To create a language and method for the assessment of learning skills that is congruent with ELT's two dimensional typology of specialised knowledge.
2. To extend and generalise construct validation of the ELT knowledge typology.
3. To improve the psychometric properties of the LSP over earlier versions.

Vector analysis was used to describe learning skills in the ELT two-dimensional knowledge space. A vector is a directed line segment in  $n$ -dimensional space emanating from the origin of the coordinate system. Its terminus defines its direction from the origin and its length. This abstract definition of learning skills as vectors in the two-dimensional knowledge space of ELT allows comparison across the language barriers of different fields and jobs, while defining specific learning skills in the context and language of the field of study.

The learning skills typology is composed of 12 six-item scales. Each scale defines a vector in the two-dimensional abstract/concrete and active/reflective knowledge space of ELT. Using the familiar metaphor of a clock face, vector directions are specified by hourly clock positions as shown in Fig. 1. Eleven, twelve, and one o'clock scales assess interpersonal learning skills most associated with the 'concrete experience' learning mode. Two, three, and four o'clock assess information skills associated with 'reflective observation'. Five, six, and seven o'clock assess analytic skills associated with 'abstract conceptualisation'. Eight, nine and ten o'clock assess behavioural skills associated with 'active experimentation'.

The initial item wording and vector directions for the twelve 6-item, learning skill scales came from an earlier version of the instrument, the Executive Skills Profile (ESP), (Boyatzis & Kolb, in press), which was focused on management jobs and careers.

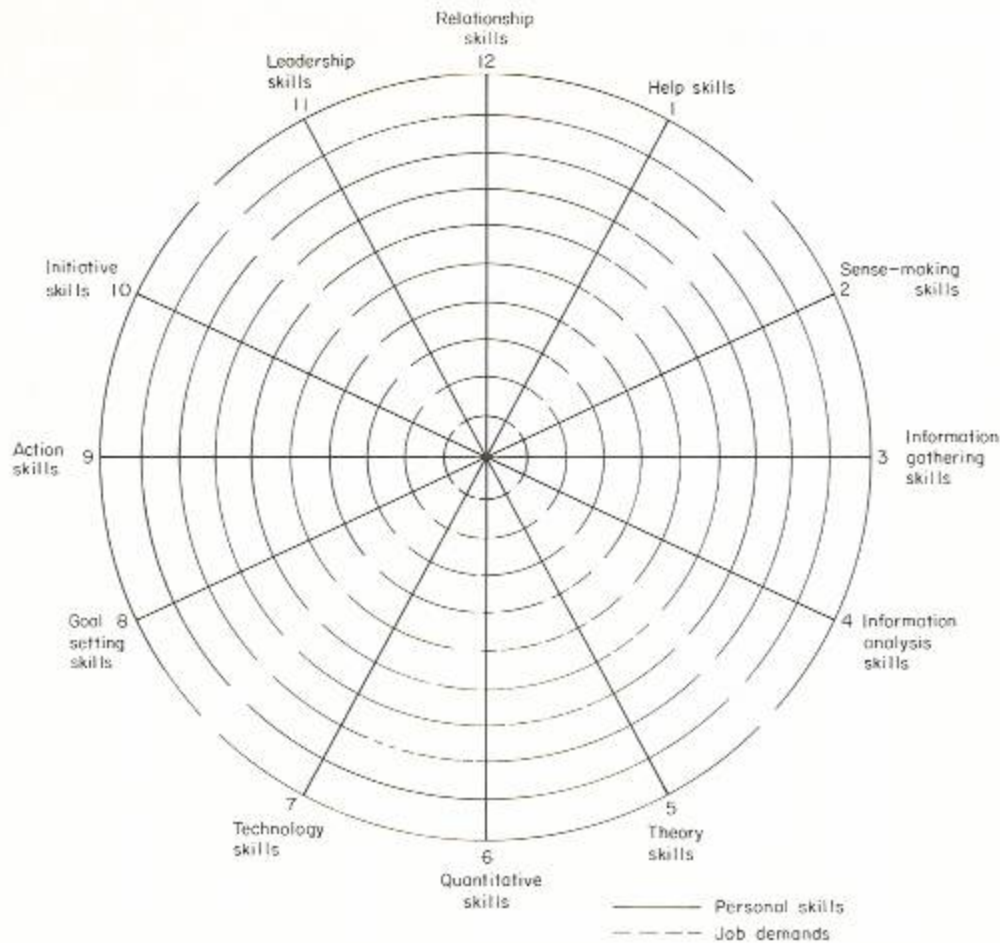


FIG. 1. The learning skills profile.

To create the items for the LSP, the 72 learning skill statements of the ESP were evaluated and revised as necessary to meet the following seven criteria.

1. The item should describe a learning skill—a transformation and a field of application.
2. It should describe a generalised learning skill rather than a specific task.
3. It should be stated in simple language.
4. It should contribute positively to the ESP scale Cronbach alpha coefficient.
5. It should load appropriately on a factor analysis of ESP item data.
6. It should show discriminant validity by little correlation with other than its designated scale in ESP data.
7. It should correlate appropriately with the ESP/LSI to determine its vector direction.

Thirty-seven of the 72 ESP items were revised according to these criteria to make the LSP. Like the ESP, the LSP is administered in a modified Q-sort format (McKeown & Thomas, 1988). Respondents are asked to sort 72 learning skill cards twice, once into seven categories describing their personal skill level and a second time describing their job or learning programme demands.

## Empirical Evidence

### *Reliability of the LSP Scales*

The LSP has been used in several studies, resulting in a sample of 236 adults from the following occupational groups: 205 MBA students, average age 27 years (39 per cent were females) and 31 middle and first level managers, and an assortment of professionals from a manufacturing company (10 per cent females). Internal reliability of the scales were computed with Cronbach's alpha, and are shown in Table I with other descriptive statistics. In addition to the reported statistics, the skew (ranging from  $-0.33$  to  $0.33$  with a mean of  $-0.09$ ) and the kurtosis (ranging from  $-0.89$  to  $0.24$  with a mean of  $-0.19$ ) of each scale suggest normal distributions. The internal scale reliabilities ranged from  $0.618$  to  $0.917$ , with an average of  $0.778$ .

TABLE I. Scale reliability and description ( $n=236$ )

Clock position	Scale	Mean	SD	Median	Alpha
11:00	Leadership	26.4	6.71	26.0	0.825
12:00	Relationship	30.0	5.39	30.0	0.781
1:00	Help	27.2	5.82	27.0	0.734
2:00	Sense-making	27.2	5.08	27.0	0.755
3:00	Information gathering	25.7	5.00	26.0	0.618
4:00	Information analysis	26.8	5.04	27.0	0.741
5:00	Theory	24.7	5.92	26.0	0.775
6:00	Quantitative	21.6	7.16	22.0	0.850
7:00	Technology	22.0	9.14	21.5	0.917
8:00	Goal setting	26.0	5.57	26.0	0.762
9:00	Action	29.3	5.44	30.0	0.765
10:00	Initiative	29.2	5.99	29.0	0.812

These reliabilities are slightly higher than those reported for the ESP. Although usually less than a 10 per cent change as compared to the original alpha, the reliabilities increased in seven scales, with the exception of 5:00 and 7:00 where the reliabilities increased considerably. The reliability decreased in five scales, but never more than 10 per cent of the original alpha.

## Learning Skills

### *Relational Validity*

Two methods were used to assess the relational validity of the LSP. The first determined the accurate positioning of the scale vectors relative to one another through the analysis of scale intercorrelation. The scales were conceived to be related to those in the same region of the two-dimensional learning space of ELT. Scales were expected to be highly intercorrelated with scales close to their position on the clock. For example, the 12:00 scale (relationship skills) was expected to be highly correlated with the 11:00 scale (leadership skills) and the 1:00 scale (help skills). In contrast to some other forms of assessment instruments and common practices in scale construction, independence of the scales in related positions of the clock was not desired.

The scales showed a high degree of intercorrelation with those scales in related clock

positions as shown in Table II. Ten of the scales show their highest correlation with an immediate neighbour in the clock positions. These were: leadership, relationship, help, information analysis, theory, quantitative, technology, goal setting, action and initiative skills. The two scales that do not conform to this pattern are: sense-making and information gathering. The sense-making skill is the most highly correlated with the theory skill, three clock positions apart. The information gathering skill is highly correlated with relationship skill, also three clock positions apart. It is also highly correlated with help, leadership, sense-making (i.e. its immediate neighbour on the clock space), and goal setting skills.

To estimate the strength of these associations, the average correlation of each scale was computed with those scales that were located in the next clock position (i.e. for the 12:00 scale, the correlation of it with the 11:00 and 1:00 scales were averaged), and for those scales two, three, four, five and six positions on the clock away from each scale. To get an estimate of variance, although not unique variance, the mean for these average correlations was computed and squared. The result is that scales one position away from a given scale appear to account for 29 per cent of the variance on the average. Those two positions away appear to account for 20 per cent of the variance. Those three, four, five, and six positions away appear to account for 12, 7, 5 and 4% of the variance, respectively. This supports the concept that the scales are the most associated with those scales appearing closest to them on the clock configuration, and decreasingly associated with other scales with increased distance around the clock.

The scales of the LSP are more highly correlated with scales who are their immediate neighbours than were the ESP scales. The average intercorrelation with scales two, three, four, five and six clock positions away for the LSP were in a similar descending sequence as for the ESP, but the LSP average intercorrelations were slightly lower than those for the ESP. Therefore, it is concluded that the LSP is demonstrating better relational validity with slightly lower overall intercorrelation of the scales than with the ESP.

The second test of the LSP's relational validity is an assessment of its relationship to the learning styles described by the Learning Style Inventory. Leadership, relationship, and help skills significantly correlated with a disposition toward concrete experience over abstract conceptualisation. Initiative and sense-making skills did not show the same expected relationship as shown in Table III.

As expected, information analysis, theory and quantitative skills significantly correlated with a disposition toward abstract conceptualisation over concrete experience. Technology and goal setting skills did not show the same expected relationship.

As expected, action, initiative, and leadership skills significantly correlated with a disposition toward active experimentation over reflective observation. Technology and goal setting skills did not show the same expected relationship.

As expected, the information analysis skill significantly correlated with a disposition toward reflective observation over active experimentation. Other skills did not show the expected relationship with this learning disposition. They were: help, sense-making, information gathering and theory skills.

Overall, the relationship between the LSP scales and the Learning Style Inventory is stronger than the relationship demonstrated by the earlier ESP sales. The scales of the LSP appear to associate in the expected directions, with the exceptions of sense-making, technology and goal setting skills. These improvements in LSP vector direction are shown graphically in Fig. 2 which compares LSP/LSI correlations with ESP/LSI correlations. Vector positioning of LSP scales, 10:00, 11:00, 4:00 and 5:00

TABLE II. Intercorrelation of scales ( $n=236$ )

	Relationship	Help	Sense Making	Information gathering	Information Analysis	Theory	Quantitative	Technology	Goal setting	Action	Initiative
Leadership	0.623	0.642	0.440	0.579	0.259	0.179	0.001	-0.205	0.593	0.484	0.696
Relationship		0.674	0.460	0.601	0.176	0.089	-0.043	-0.175	0.391	0.376	0.523
Help			0.425	0.586	0.172	0.085	-0.035	-0.189	0.476	0.423	0.460
Sense-making				0.574	0.556	0.597	0.328	0.106	0.503	0.335	0.546
Information gathering					0.411	0.357	0.180	-0.019	0.562	0.360	0.424
Information analysis						0.618	0.497	0.306	0.419	0.291	0.350
Theory							0.691	0.474	0.558	0.155	0.331
Quantitative								0.535	0.272	0.073	0.099
Technology									-0.028	-0.060	0.014
Goal setting										0.680	0.635
Action											0.585

Correlations above 0.155 are statistically significant beyond the  $p=0.02$  level, and correlations above 0.218 are significant beyond the  $p=0.001$  level.



TABLE III. Correlations of scales with learning styles ( $n=205$ )

Clock position	Scale	Learning style orientation	
		Active experimentation minus reflective observation	Abstract conceptualisation minus concrete experience
11:00	Leadership	0.141*	-0.132*
12:00	Relationship	0.147*b	-0.112*
1:00	Help	0.048	-0.180**
2:00	Sense-making	0.021	0.054
3:00	Information gathering	-0.029c	-0.77b
4:00	Information analysis	-0.199**	0.212***
5:00	Theory	-0.091	0.195**
6:00	Quantitative	-0.088b	0.150*
7:00	Technology	0.023	0.096
8:00	Goal setting	0.018	-0.024
9:00	Action	0.132*	-0.054b
10:00	Initiative	0.269***	-0.089

a. Significance tests are one-tailed except where noted (\* $p < 0.05$ ; \*\* $p < 0.01$ ; \*\*\* $p < 0.001$ ).

b. Since there was no predicted direction, a two-tailed test is reported concerning this correlation.

c. A relationship of the 3:00 Scale was predicted with reflective observation: it was significant ( $r=0.146$ ,  $p < 0.018$ ). Unfortunately, the scale also correlated with active experimentation significantly ( $r=0.134$ ,  $p < 0.056$ ).

was greatly improved; scale 3:00 was somewhat improved. LSP scales 12:00; 1:00, 6:00, 7:00 and 9:00 were equivocal. Vector positioning of LSP scale 2:00 was moving in the desired direction on one dimension, but opposite to desired direction on the other dimension. LSP scale 8:00 showed no improvement and actually appeared with a poorer positioning than the ESP/LSI relationship.

#### Criterion Validation: Boss's Views

A group of 57 middle and first level managers, and assorted professionals, of which 19 per cent were female, within a division of a manufacturing company used the LSP to describe themselves. Their bosses, who were divisional executives, or middle level managers, used the LSP to describe their subordinates. A significant positive correlation was found between the boss's view of the manager's and professional's skills and the manager's professional's own views of his or her skills on 5 of the 12 scales in the LSP and a near significant correlation on a sixth scale. They were: relationship, help, theory, quantitative, technology and goal setting skills as shown in Table IV.

The boss's view of some of the manager's and professional's skills appeared related to other skill scales in its vicinity or negatively associated with scales considerably distant in terms of clock positions. For example, the boss's view of the manager's or professional's quantitative skill correlated positively with the manager's or professional's view of his or her own theory and technology skill (i.e. 6:00 with 5:00 and 7:00). The boss's view of the manager's or professional's quantitative skill correlated negatively with the manager's or professional's own view of his or her initiative, relationship, and information gathering skills (i.e. 6:00 with 10:00, 12:00 and 3:00).

In terms of the correlation of boss's views and manager's or professional's views, the

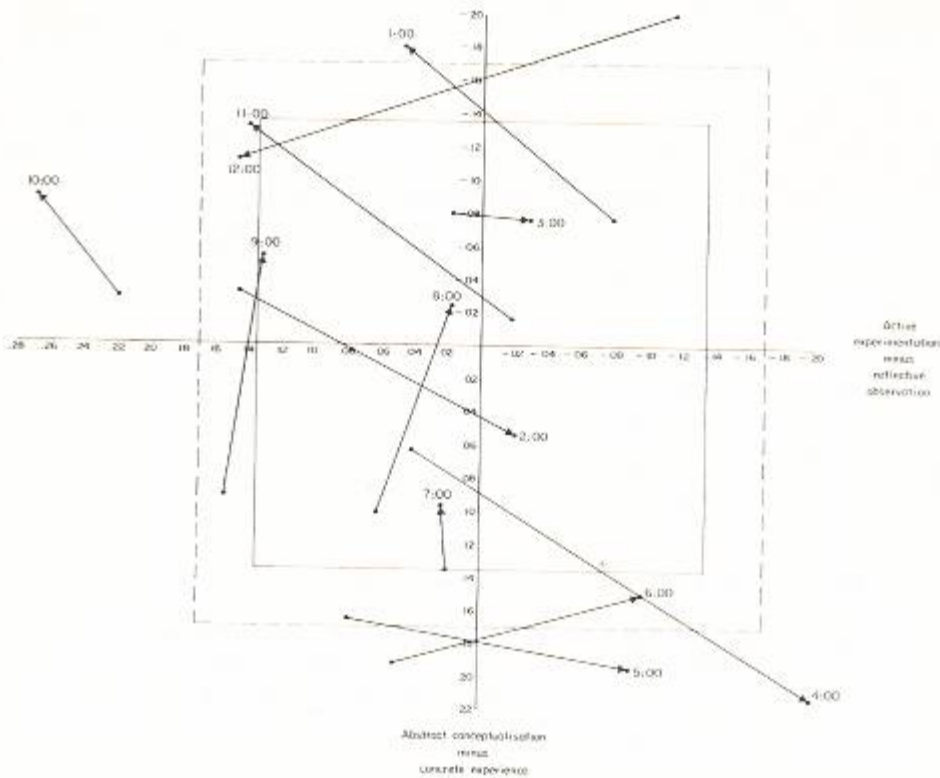


FIG. 2. Diagram of correlations of ESP ( $n=124$ ) and LSP ( $n=205$ ) scales to LSI dimensions. Boundary of zone of statistical significance:

- $r=0.135$ ,  $p<0.05$ ,  $n=205$  sample  
 ---  $r=0.170$ ,  $p<0.05$ ,  $n=124$  sample

relationships found with the LSP were not as strong as those found with the ESP. In the earlier version (i.e. the ESP), eight of the skill scales showed significant correlation between the boss's view of a skill and a manager's own view of that skill. The earlier study was conducted with middle level managers with longer tenure in the organization; their bosses were executives of the division. This may have affected the differential results of the two studies.

### Relationship to Observed Abilities and Other Constructs

As a required part of an MBA program, 231 MBA students completed a required course called Managerial Assessment and Development (Boyatzis *et al.*, 1991; Boyatzis, 1991a). Of the 231 students taking the course in the first semester, 205 gave permission for their information to be used in research and, therefore, are included in this article. The objective of the course is to help students learn a method for assessing themselves on knowledge, abilities and values, and using this information to construct a development plan for use throughout their career and life. In the course, students receive information from three sources of information: (1) assessment instruments and exercises; (2) self-assessment; and (3) assessment by others (i.e. colleagues at work, spouse, family, friends and other students in their Executive Action Team—12-person

teams formed for participation in the course and other developmental activities). The assessment instruments and exercises completed in the course include:

- (1) a 1-hour group discussion exercise (i.e. leaderless group) which is videotaped and conducted with groups of six students;
- (2) a 1-hour critical incident interview (i.e. an individual interview) which is audiotaped;
- (3) a Presentation Exercise (i.e. 10-minute presentation on a randomly assigned topic with a 5-minute question and answer period) conducted with six students at a time, which is videotaped;
- (4) written analysis of two business case studies and a written assignment comparing the two cases—each of these takes approximately 1 hour 30 minutes;
- (5) The Profile of Non-verbal Sensitivity (PONS), a test of non-verbal sensitivity believed to assess empathy (Rosenthal, *et al.*, 1979);
- (6) the Test of Thematic Analysis (TA), a test of analytic reasoning, specifically a person's ability to perceive patterns through compare and contrast written analysis (McClelland & Winter, 1978);
- (7) the LSP.

The videotaped and audiotaped information is coded for the presence of 20 of the 22 abilities used as the model of effective managerial ability in this course. The coding is conducted by advanced doctoral students specially trained in the coding system, each of whom has passed interrater-to-expert reliability tests of at least 0.74 on the 14 frequently observed abilities. Not all abilities are coded in each exercise.

The 22 abilities are: efficiency orientation; planning; initiative; attention to detail; self-control, flexibility; empathy; persuasiveness; networking; negotiating; self-confidence; developing others; group management; oral communications; use of concepts; systems thinking; pattern recognition; theory building; quantitative analysis; use of technology; social objectivity; and written communication.

All of the abilities are coded from the Group Discussion Exercise videotapes and Critical Incident Interview audiotapes except use of concepts, theory building, oral communication and written communication. The first is present too often to be useful and the second is present too seldom. The latter two are inappropriate for these two assessment exercises. The Presentation Exercise videotapes are coded for oral communication, persuasiveness, systems thinking, pattern recognition and self-confidence. The Written Case Analyses are coded for written communication, systems thinking and pattern recognition.

The PONS is scored for six channels of non-verbal information, according to an answer key provided. The TA is coded thematically by an advanced doctoral student specially trained in the code. Unfortunately, no interrater-to-expert reliability test is available at this time for the TA, but all of the protocols were coded by the same person.

The coding of each student on all of the exercises which assessed each of the 20 abilities were summed to provide a score for each MBA student on each of these abilities. Because of the large number of correlations shown in this section, all significance tests reported will be two-tailed.

The leadership skill of the LSP (i.e. 11:00) significantly positively correlated, as expected, with Persuasiveness ( $r=0.166$ ,  $n=205$ ,  $p=0.017$ ), self-confidence ( $r=0.352$ ,  $n=205$ ,  $p<0.001$ ), and significantly positively with planning ( $r=0.194$ ,  $n=205$ ,  $p=0.005$ ), networking ( $r=0.180$ ,  $n=205$ ,  $p=0.01$ ), social objectivity

TABLE IV. Comparison of a manager's and professional's views ( $n=57$ ) of their skills with their boss's views ( $n=57$ ) of their skills†

Boss's view of manager's skills	Correlation	Manager's view of their skills
Leadership	<u>0.110</u>	Leadership
11:00	-0.282*	Information analysis
	-0.298*	Quantitative
	-0.240†	Technology
Relationship	<u>0.287*</u>	Relationship
12:00	0.288*	Help
Help	<u>0.259*</u>	Help
1:00	-0.249†	Information analysis
	-0.246†	Quantitative
	-0.238†	Technology
Sense-making	<u>-0.128</u>	Sense-making
2:00		
Information gathering	0.241†	Relationship
3:00	0.261*	Help
	<u>0.115</u>	Information gathering
	-0.224†	Information analysis
Information analysis	<u>0.44</u>	Information analysis
4:00		
Theory	-0.230†	Information gathering
5:00	<u>0.239*</u>	Theory
	-0.258*	Initiative
Quantitative	-0.253†	Relationship
6:00	-0.258*	Information gathering
	0.291*	Theory
	<u>0.339**</u>	Quantitative
	0.277*	Technology
	-0.317*	Initiative
Technology	0.219†	Theory
7:00	<u>0.530***</u>	Technology
	-0.365**	Initiative
Goal setting	<u>0.191†</u>	Goal setting
8:00		
Action	-0.243†	Sense-making
9:00	<u>0.092</u>	Action
Initiative	-0.233†	Information analysis
10:00	<u>0.088</u>	Initiative

†Correlations of the same scale are underlined for convenience (one-tailed tests for same scale, two-tailed tests for correlation with other scales).

† $p < 0.10$ ; \* $p < 0.05$ ; \*\* $p < 0.01$ ; \*\*\* $p < 0.001$ ).

$r=0.157$ ,  $n=205$ ,  $p=0.025$ ), and written communication ( $r=0.169$ ,  $n=205$ ,  $p=0.015$ ). It negatively correlated with use of technology ( $r=-0.216$ ,  $n=205$ ,  $p=0.002$ ). Although it was expected, leadership skill did not correlate with negotiating, oral communications, nor group management.

The relationship skill of the LSP (i.e. 12:00) significantly correlated, as expected, with social objectivity ( $r=0.174$ ,  $n=205$ ,  $p=0.013$ ), and near significantly with

empathy ( $r=0.124$ ,  $n=205$ ,  $p=0.076$ ). It also correlated significantly positively with self-confidence ( $r=0.183$ ,  $n=205$ ,  $p=0.009$ ), persuasiveness ( $r=0.149$ ,  $n=205$ ,  $p=0.033$ ), and negatively with use of technology ( $r=-0.196$ ,  $n=205$ ,  $p=0.005$ ). The relationship skill of the LSP correlated significantly positively, as expected, with the content filtered score of the PONS ( $r=0.156$ ,  $n=205$ ,  $p=0.025$ ), as did the similar scale of the original ESP (Boyatzis & Kolb, in press). It also correlated significantly positively with the Tone score of the PONS ( $r=0.199$ ,  $n=205$ ,  $p=0.004$ ).

The help skill of the LSP (i.e. 1:00) significantly positively correlated with networking ( $r=0.143$ ,  $n=205$ ,  $p=0.04$ ) and self-confidence ( $r=0.164$ ,  $n=205$ ,  $p=0.019$ ). It correlated significantly negatively with flexibility ( $r=-0.181$ ,  $n=205$ ,  $p=0.009$ ), use of technology ( $r=-0.279$ ,  $n=205$ ,  $p<0.002$ ), and quantitative analysis ( $r=-0.155$ ,  $n=205$ ,  $p=0.027$ ). Although expected, it did not correlate with developing others.

Of the eight expected relationships, the LSP scales of leadership, relationship, and help skills showed a relationship to behaviour in four of them. The highest correlations of each scale were with the behaviourally coded self confidence ability, suggesting that these scales do indicate the interpersonal presence of a person. These scales were also negatively correlated with use of technology, suggesting that people who use technology and, in particular, computers, see themselves as less interpersonally skilled.

In studies using the earlier version of the LSP, the ESP, a significant positive relationship was found on these scales with certain behaviourally coded abilities. Dreyfus (1991), in a study of male managers of scientists and engineers, found a positive correlation between 11:00 and 1:00 with concern with impact, an influence ability. She also found a positive correlation between 12:00 and 1:00 with positive regard, an ability in which people believe in others. Using supervisory, peer and subordinate nominations to determine performance levels, Dreyfus (1991) reported that highly effective managers showed higher scores on leadership (11:00), and near significantly higher scores on help (1:00), as compared to typical performing managers. Friedman (1989), in a study of female middle level managers, found a positive correlation between 12:00 and 1:00 with developing others, the same ability as used in the MBA study.

The sense-making skill of the LSP (i.e. 2:00) correlated significantly positively with planning ( $r=0.151$ ,  $n=205$ ,  $p=0.030$ ). Although expected, it did not correlate with pattern recognition.

The information gathering skill of the LSP (i.e. 3:00) correlated significantly negatively with use of technology ( $r=-0.145$ ,  $n=205$ ,  $p=0.038$ ).

The information analysis skill of the LSP (i.e. 4:00) correlated significantly positively, as expected, with written communication ( $r=0.141$ ,  $n=205$ ,  $p=0.044$ ), and near significantly with pattern recognition ( $r=0.116$ ,  $n=205$ ,  $p=0.99$ ). It correlated positively with planning ( $r=0.149$ ,  $n=205$ ,  $p=0.033$ ) and use of technology ( $r=0.164$ ,  $n=205$ ,  $p=0.019$ ).

Of the three expected relationship to behaviourally coded abilities, the sense-making, information gathering, and information analysis skills of the LSP showed a relationship to two of them. Sense-making and information analysis showed a positive relationship with planning; it was the highest correlation for 2:00. Use of technology showed the highest correlation with information analysis. Although the items in the scale do not mention computers, this suggests that people use computers to access and process information.

In the earlier version of the LSP, the ESP, Dreyfus (1991) reported that highly

effective managers showed near significantly higher scores on 2:00 than typical performing managers. Marsick (1988), in a study of male middle level managers in a manufacturing company, reported the 2:00 and 4:00 scales significantly associated with promotions. Friedman (1989) reported a similar relationship for the women middle level managers studied in a telecommunications company with the 4:00 scale.

The theory skill of the LSP (i.e. 5:00) correlated significantly positively with efficiency orientation ( $r=0.138$ ,  $n=205$ ,  $p=0.048$ ) and use of technology ( $r=0.335$ ,  $n=205$ ,  $p<0.001$ ). The theory skill of the LSP correlated significantly negatively with the content filtered score of the PONS ( $r=-0.148$ ,  $n=205$ ,  $p=0.034$ ). It would be expected that the theory skill of the LSP would correlate highly with the theory building ability, but there was no attempt to code it in any of the assessment instruments or exercises in the MBA study.

The quantitative skill of the LSP (i.e. 6:00) correlated significantly positively, as expected, with quantitative analysis ( $r=0.196$ ,  $n=205$ ,  $p=0.005$ ) and with use of technology ( $r=0.366$ ,  $n=205$ ,  $p<0.001$ ). It correlated significantly negatively with initiative ( $r=-0.167$ ,  $n=205$ ,  $p=0.016$ ), self-control ( $r=-0.167$ ,  $n=205$ ,  $p=0.017$ ), negotiating ( $r=-0.181$ ,  $n=205$ ,  $p=0.009$ ), and group management ( $r=-0.162$ ,  $n=205$ ,  $p=0.021$ ).

The technology skill of the LSP (i.e. 7:00) correlated significantly positively, as expected with use of technology ( $r=0.611$ ,  $n=205$ ,  $p<0.001$ ), and positively with quantitative analysis ( $r=0.199$ ,  $n=205$ ,  $p=0.004$ ), efficiency orientation ( $r=0.178$ ,  $n=205$ ,  $p=0.011$ ), and oral communication ( $r=0.158$ ,  $n=205$ ,  $p=0.024$ ). The technology skill of the LSP significantly negatively correlated with the TA score ( $r=-0.155$ ,  $n=205$ ,  $p=0.026$ ).

Of the three relationships expected between the LSP scales of theory, quantitative and technology skills, and behaviourally-coded abilities, all three were found significant. For all three of these scales, theory (5:00), quantitative (6:00) and technology (7:00) skills, the correlation with use of technology was the highest. In the 1990's it is understandable that analytic skills would be highly associated with using technology to process, interpret and use the information, and insight generated from analysis.

The goal setting skill of the LSP (i.e. 8:00) correlated significantly positively, as expected, with planning ( $r=0.189$ ,  $n=205$ ,  $p=0.007$ ), and near significantly with developing others ( $r=0.129$ ,  $n=205$ ,  $p=0.061$ ).

The action skill of the LSP (i.e. 9:00) correlated significantly positively with planning ( $r=0.189$ ,  $n=205$ ,  $p=0.007$ ). It correlated significantly negatively with flexibility ( $r=-0.137$ ,  $n=205$ ,  $p=0.051$ ).

The initiative skill of the LSP (i.e. 10:00) correlated significantly with planning ( $r=0.271$ ,  $n=205$ ,  $p<0.001$ ), persuasiveness ( $r=0.142$ ,  $n=205$ ,  $p=0.043$ ), networking ( $r=0.181$ ,  $n=205$ ,  $p=0.009$ ), self-confidence ( $r=0.249$ ,  $n=205$ ,  $p<0.001$ ), oral communication ( $r=0.182$ ,  $n=205$ ,  $p=0.009$ ), pattern recognition ( $r=0.210$ ,  $n=0.002$ ), and written communication ( $r=1.64$ ,  $n=205$ ,  $p=0.019$ ). Although expected, it did not correlate with initiative as behaviourally-coded.

Of the four expected relationships between the LSP skills goal setting, action, and initiative, three were found with behaviourally-coded abilities. Each of these three skills showed their highest correlation with the behavioural ability called planning. The substantial number of abilities relating to the initiative skill (10:00) suggest a close relationship with leadership (11:00), as expected given their proximity in the clock space.

In studies with the earlier version of the LSP, and ESP, Dreyfus (1991) reported

near significantly higher scores on the goal setting skill for highly effective managers as compared to typical performing managers. Friedman (1989) reported the same relationship between oral communications and the initiative skill (10:00). Marsick (1988) showed that the action (9:00) and initiative (10:00) skills were positively related to promotions.

### **Use of the LSP in Developmental Activities**

The LSP and its earlier version, the ESP, have been used in providing personal feedback to individuals in a manufacturing company (Marsick, 1988), a telecommunications company (Friedman, 1989) and a research laboratory (Dreyfus, 1989) as part of management development programs. It has also been used in career development, and personal counseling sessions with physicians and physician executives (Smith, 1990; Sharpe, 1990). People report the experience to be helpful in assessing their strengths and weaknesses, and focusing their attention on areas to improve. In one setting, boss's feedback with the LSP also provided managers and professionals with the opportunity to compare their expectations of the job demands and their boss's. This resulted in conversations with the bosses about both the perceptions of the manager's and professional's skills, but also the expectations about the job. In another setting, boss's feedback and feedback from subordinates via the LSP resulted in conversations with their subordinates and bosses about the manager's and professional's skill and style.

The utility of the LSP for growth at the performance or learning modes of adaptation will depend on how the person taking it wants to use it *and* the structure of the learning experience. When boss and/or subordinate feedback on the LSP is involved, issues in the performance mode are aroused: How well am I doing in my job, in the view of others? Providing the feedback plot in percentiles allows normative comparison to others, also arousing interest of someone in the performance mode. Meanwhile, issues in the learning mode are aroused when the self-assessment on the LSP leads the person to ask: Which are my relative 'peaks and valleys', or strengths and weaknesses of skills? What explains the pattern in my responses? Providing the feedback plot in 'raw' scale scores allows this self-contextual analysis. Attractiveness of the LSP as a developmental instrument is increased by the potential of its use for people in both the performance and learning modes of adaptation.

The LSP's earlier version, the ESP, has also been used in providing feedback to people regarding aspects of their organisation as a whole. Boyatzis (1991b) reported its use with the faculty of a school of management. The feedback of the results to the faculty appeared to facilitate discussion of their collective objectives and the identification of a set of shared objectives of their program. In this case, the results were also reviewed with other stakeholders in the organisation, such as the school's Advisory Board, Alumni Association, administration and selected groups of students. In all sessions the information appeared to stimulate discussion and provide a focus on the determination of the shared objectives, or intent as to the MBA program. It has also been a useful instrument in conducting program evaluation research and feeding the results back to these stakeholders (Boyatzis & Renio, 1989).

The LSP and earlier, the ESP, have been and continue to be used in an MBA program (Boyatzis, 1991a). The results are used by students to interpret their learning skills and as a guide in developing individualised learning plans in conjunction with the

other information in the Managerial Assessment and Development course mentioned earlier.

### Summary

A typology of skills based upon a framework of learning styles and experiential learning theory, rather than a framework of job performance or some other personality construct, provided a language and guidance for development of an assessment method describing knowledge at the performance and learning levels of adaptation. It required development of the concept of learning skills which are: (a) domain specific and knowledge rich; (b) describing an integrated transaction between the person and environment; and (c) developed by practice. The Learning Skills Profile (LSP) was designed to assess learning skills for populations in business, education, and health care through a typology of 12 skill scales. Data were reviewed and reported that established the LSP's reliability, relational validity, criterion validity and construct validity.

Although many of the findings reviewed were consistent with the underlying learning framework, not all of them were. This suggests the need to reexamine some of the items within several scales in detail and make revisions to have clearer representation of the underlying framework.

Further validation is needed. For example, several of the findings reviewed suggested an impact of the organisation or corporate culture on the LSP scores. Studies are needed on the impact of reference groups, social networks, and organisational differences to determine the degree to which a person's LSP score reflects his or her socialisation into an organisational culture.

The LSP, with its contextual comparison, can be used as a vehicle for providing personal and organisational feedback on skills, and expectations and intent regarding skills in jobs and developmental programs.

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