PSYTECH
INTERNATIONAL

LSI
LEARNING STYLES
INVENTORY
technical manual

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THEORETICAL OVERVIEW ....

THE CONCEPT OF LEARNING STYLE AND ITS ROLE IN EDUCATIONAL ASSESSMENT

Different people have different ways in which they prefer to learn. For example, while some people may prefer to learn by reading about things, or by quiet contemplation or self-reflection, others may prefer to learn through direct action or hands-on experience. Learning by direct action or experience might, for some people, involve learning: by making things, by trail and error or through experimentation. Moreover, while some people may prefer to learn via self-directed study, others may prefer to learn by participating in discussion groups, tutorials or study groups. In this way each person's preferred way of learning is likely to be different from the next person's. Most importantly, there are no good or bad, right or wrong learning styles, just different preferred ways of learning; just as some people prefer rock music to rap, or folk music to classical music.

A person's preferred way of learning, or Learning Style, is independent of the material being studied; with it being a characteristic of the person rather than the subject matter. Although some subjects may be more readily approached via one Learning Style than by another (e.g. mathematics typically lends itself most naturally to contemplation and private self-study) any subject area can, with sufficient imagination, be approached from any Learning Style (e.g. modern approaches to maths' teaching may involve experimentation with numbers, maps, areas, etc. or group study). For example, while one engineering student may prefer to get to grips with an engineering problem by exploring mathematical or theoretical solutions to the problem, another may prefer to develop an understanding of the problem through experimentation or by constructing prototype solutions.

In this way each person has their own learning style, which they are likely to express whenever they are given the freedom to learn new material in the way that is most natural for them. However, as is true of all preferences, as person's preferred Learning Style may not always be evident from their behaviour. Just as people may not always feel free to listen to the music of their choice (if for example they are under social pressure from their peers to listen to rap music, or pressure from their parents to listen to classical music) so too people may not always be able to express their preferred Learning Style. For example, they may have been taught as children to value academic study over experimentation, or group discussion may be frowned upon in the educational institution where they are studying in preference for self-directed study. Thus, not only may some people not have the opportunity to express their preferred way of learning but they may also have little insight into or understanding of their Learning Style.

However, your preferred way of learning (your Learning Style) is more important than other preferences, such as your preference for different styles of music. This is because your Learning Style affects how efficiently you learn. Specifically, you will be able to learn something most easily if it is taught in a way that is consistent with your Learning Style. So, for example, if you are trying to learn a foreign language, and you prefer learning by reading about things, you are likely to learn the language best by reading about the language's grammar, by memorising lists of words, translating passages of text, etc. However, if you learn best by direct experience, you will find it easiest to learn the language by using the language in real settings. This may involve role playing situations such as shopping and ordering food, listening to conversations and answering questions about what you have just heard, etc.

What makes understanding your Learning Style important is that in order to maximise your learning potential you have to approach learning new material in a way that is consistent with your Leaning Style. One reason why many people have difficulty learning particular subjects is because they have always approached learning these subjects in the wrong way. They may for example always have found learning languages difficult because they have tried to learn grammar, memorise lists of words and translate passages of text, when they prefer learning by experience rather than learning by reading, quiet contemplation and reflection. Moreover, given the difficulties they may have had learning a language through reading and reflection they may have come to the conclusion that they are bad at learning languages when in fact they are not bad at learning languages, it is just that they have gone about learning languages the wrong way.

The function of the LSI is therefore to help people identify their Learning Style, so they are in a position to maximize their learning potential. To this end, the LSI is a self-assessment tool that has been designed to be used in conjunction with a computer generated report which describes your most preferred and least preferred ways of learning, and how you can use this information to maximise your learning potential.

LEARNING STYLES ASSESSED BY THE LSI ......

ABSTRACT

This scale assesses a preference for learning about abstract theoretical subjects. Having an extremely strong interest in intellectual matters, people who show this preference are likely to greatly enjoy participating in theoretical debates and discussions. Moreover, when participating in such discussions they are likely to be strongly motivated to ask profound, penetrating questions that focus on core conceptual issues. They may find themselves becoming so engrossed in their own thoughts that they lose track of practical realities and may have difficulty staying focussed, possibly tending to go off on tangents that catch their vivid imagination. Believing that there is nothing more useful than a good theory, they will be motivated to understand the core theoretical concepts, and fundamental principals, that underlie any problem. As a result they will greatly enjoy spending time exploring conceptual issues

CONCRETE

This scale assesses a preference for taking a direct, practical and hands-on approach to learning. Being extremely realistic and down-to-earth by nature, people who show this preference are likely to be at their most productive when learning material that has an obvious use and can be easily put into practice. Being strongly inclined to concentrate on the practical issues at hand, they are likely to prefer to focus on how to make things work, rather than ask deeper conceptual questions about why things work. When learning something new they will be inclined to question its practical value and to be strongly motivated to explore ways in which the material they are learning can be put to direct use. They are likely to appreciate being given clear demonstrations, and real world examples, of how things work in practice. Having an extremely well developed sense of what is useful, realistic and practical, they will be strongly motivated to focus on achieving tangible results and measurable outcomes.

HOLISTIC

This scale assesses a preference for focusing on the broader picture, and for developing a conceptual overview of the material being studied. People who show this preference are likely to be open and flexible in their approach to problem solving, and to enjoy the challenge of resolving problems as they occur. Bringing a strategic approaching to learning, they are unlikely to be greatly concerned about diligently following set procedures and protocols. Being spontaneous, and possibly tending on occasion to be a little impulsive, they may be inclined to reject tried and tested methods out of hand. Greatly valuing flexibility, and the capacity to adapt to changing circumstances as they arise, they are likely to question the value of well-structured, codified approaches to problem solving. Adaptable and open to change, they will adapt quickly to new learning situations. Having a keen eye for discerning patterns and relationships in the material they are studying, they will be motivated to find links between seemingly disparate areas and to discover patterns that bring order and structure to the subject material.

SERIAL

This scale assesses a preference for focusing on the fine details of the material being studied. Appreciating the value of adhering to well defined procedures and systems, people who show this preference will want the material they are learning to be presented in a well-structured, organized manner. They will be motivated to get a clear grasp of all the key details and points they are studying, before attempting to place this material in its broader context. Being diligent, and having a strong sense of duty and responsibility, they are likely to be happy to persevere with even the most boring and mundane tasks. Being well organized, and approaching work in a highly structured manner, they will be keen to make detailed notes, study plans and time tables, and will want to have clear, well-defined learning goals and objectives. Inclined to set themselves high standards, they may sometimes be so keen to find the perfection solution to a problem that they overlook less elegant but nonetheless acceptable compromises. Greatly valuing accuracy, and being motivated to attend to detail, they are likely to double check all their work to ensure that you have not made careless errors.

ACTING

This scale assesses a preference for learning by direct experience and action. People who show this preference tend to have a lot of energy, and are likely to be active, involved and participative. As a result they may quickly become bored and restless if there are not lots of activities for them to become engaged in. They enjoy learning by experimentation and through trial and error and will want to become actively involved in the learning process. They will tend to be at their most productive when participating in experiential learning tasks and exercises. They are strongly inclined to think on their feet and will throw themselves into new learning situations in a direct, participative manner. Having high levels of energy and enthusiasm, they will quickly become actively engaged with a topic or problem. Greatly valuing variety and change, they are likely to be motivated to seek out new and varied learning opportunities, and to savor learning experiences they have not tried before.

REFLECTING

This scale assesses a preference for learning by guided instruction, private study and quiet contemplation. People who show this preference tend to be happy researching topics in depth in the library, and spending time reading around a subject at length. They like to make the time to quietly reflect on the material they are learning and think things through before experimenting with different solutions. As a result they are not quick to express their views. They are inclined to prefer studying in a formal classroom context, rather than working in an experiential group setting. When participating in experiential group work they are likely to prefer to sit back and reflect on what others are saying, rather than throw themselves into the group process. Reflective, and possibly a little introspective by nature, they are likely to be at their most productive when they have time to quietly reflect on what they are learning rather than have to actively participate in group learning tasks.

PSYCHOMETRIC PROPERTIES OF THE LSI

INTRODUCTION

This chapter presents data on the psychometric properties of the LSI. These data demonstrate that the LSI meets the necessary technical requirements with regard to standardization, reliability and validity, to ensure that this instrument can be used with confidence to aid self-assessment and facilitate personal learning development. Before presenting the data on the psychometric properties of the LSI, the concepts of standardization, reliability and validity will be briefly explained.

STANDARDISATION

Normative data allows us to compare an individual's score on a standardised scale against the scores obtained from a clearly defined group of respondents (e.g. adult learners, the general population, etc.). To enable any respondent's scores on the LSI to be meaningfully interpreted, the test was standardised against a group of people similar to those the test has been developed to be used by (e.g. learners from a wide range of ages and skill levels.). Such standardisation ensures that the scores obtained on the LSI can be meaningfully interpreted by referring them to a relevant score distribution.

RELIABILITY

The reliability of a test assesses the extent to which variation in the test's scores is due true differences between people on the characteristics being measured – in this case a set of 6 learning styles – or to random measurement error. Reliability is generally assessed using one of two different methods; one assesses the stability of the test's scores over time, the other assesses the internal consistency, or homogeneity, of the test's items.

Reliability: Stability

Also known as test-retest reliability, this method for assessing a test's reliability involves determining the extent to which a group of people obtain similar scores on a test when it is administered at two points in time. With regard to learning style, we would expect a person's scores on a learning style test to be relatively stable over time, as a person's preferred learning style is unlikely to change over time. Thus if the test were perfectly reliable, that is to say test scores were *not* influenced by any random error, respondents would be expected to obtain the same scores each time the test was administered, as their learning style should not have changed over time.

In this way, the extent to which respondents' scores are unstable over time can be used to estimate the test's reliability. Stability coefficients therefore provide an important indicator of a test's likely usefulness. If these coefficients are low (less than 0.6 for preference tests) then this suggests that the test is not a reliable measure, and is therefore of little practical use for aiding self-assessment and personal learning development.

Reliability: Internal Consistency

Also known as item homogeneity, this method for assessing a test's reliability involves determining the extent to which, if people score one way on a given test item (e.g. respond to one item so as to indicate a preference for active learning) they will respond in the same way to the other items on the test that measure the same construct (e.g. respond in a way that indicates a preference for active learning on the other test items). If each of the test's items were perfectly reliable (i.e. scores were not influenced by random error), then respondents should answer the test's items in a consistent manner across all the items that assess the same learning style. In this way, the extent to which respondents' scores on each item on a give personality factor are correlated with each other can be used to estimate the test's reliability.

The most common measure of internal consistency reliability is Cronbach's alpha coefficient. If the items on a scale have high inter-correlations with each other, then the test is said to have a high level of internal consistency (reliability) and the alpha coefficient will be high. Thus a high coefficient alpha indicates that the test's items are all measuring the same thing, and are not greatly influenced by random measurement error, while a low alpha coefficient suggests that either the scale's items are measuring different attributes, or the presence of significant random error. If the alpha coefficient is low (less than 0.6 for preference tests), this indicates that the test is not a reliable measure, and is therefore of little practical use for aiding self-assessment and personal learning development.

VALIDITY

The fact that a test is reliable only means that the test is consistency measuring a construct, it does not indicate *what* construct the test is consistently measuring. The concept of validity addresses this issue. As Kline (1993) notes ''a test is said to be valid if it measures what it claims to measure''.

An important point to note is that a test's reliability sets an upper limit for its validity. That is to say a test cannot be more valid than it is reliable, because if it is not consistently measuring *a* construct it cannot be consistently measuring *the* construct it was developed to assess. (Thus a test's reliability is typically assessed before the question of its validity is addressed.) There are two principle methods for examining a test's validity.

Validity: Construct Validity

Construct validity assesses whether the characteristic which a test is measuring is psychologically meaningful and consistent with how that construct is defined. The most common way to assess the construct validity of a test is by demonstrating that the test correlates other major tests which measure related constructs and does *not* correlate with tests that measure different constructs. (This is sometimes referred to as a test's convergent and discriminate validity). Thus demonstrating that a test which measures extraversion is more strongly correlated with an alternative measure of extraversion than it is with a measure of conscientiousness would be evidence of the test's construct validity.

Validity: Criterion Validity

This method for assessing the validity of a test involves demonstrating that the test meaningfully predicts some real-world criterion. For example, a valid test of extraversion might be expected to predict success in sales roles, while a valid test of conscientiousness might be expected to predict success in administrative roles.

Moreover, there are two types of criterion validity - predictive validity and concurrent validity. Predictive validity assesses whether a test is capable of predicting an agreed criterion which will be available at some future point in time - e.g. can a test of extraversion predict the future sales success of job applicants. Concurrent validity, on the other hand, assesses whether a test can be used to predict a criterion which is available at the same time as the test was completed - e.g. can a test of extraversion predict current (rather than future) sales success.

INTERNAL CONSISTENCY OF THE LSI SCALES

Table 1 presents the alpha coefficients for each of the three LSI scales, on a sample of 120 trainees. Inspection of this table indicates that each of these scales has acceptable levels of internal consistency, with these alpha coefficients being high for such short scales.

Scale	alpha coefficient
Abstract-Concrete	.70
Holistic-Serial	.76
Acting-Reflecting	.69

Table 2 presents the alpha coefficients for each of the three LSI scales, on a sample of 105 undergraduates. Inspection of this table indicates that each of these scales has acceptable levels of internal consistency, with these alpha coefficients being high for such short scales.

Scale	alpha coefficient
Abstract-Concrete	.71
Holistic-Serial	.75
Acting-Reflecting	.68

CONSTRUCT VALIDITY OF THE LSI SCALES

The relationship between the LSI and the JTI

The Jung Type Indicator (JTI) classifies people into one of the sixteen Jungian Types via their scores on four bi-polar scales. These scales are Extraversion versus Introversion (EI), Sensing versus iNtuiting (SN), Thinking versus Feeling (TF) and Judging versus Perceiving (JP). Jung's theory of personally is, in many way, conceptually similar to the notion of Learning Style. Unlike trait theories of personality, which assess typical patterns of personality, Jung's dimensions of personality assess the way an individual prefer to process information. Thus, extraverts are characterised by their preference for focussing on the outer world, whereas introverts are characterised by their preference for focussing on the inner subjective world. Sensing types prefer to process the world through their senses, with them focussing on real world facts and experiences, while

iNtuiting types prefer to process the world through intuition, with them focussing on intuiting abstract patterns and relationships. Judging types prefer to judge and evaluate the world, focussing on the details of a task, while Sensing types prefer to take a "broad brush approach", focussing perceiving the overall patterns inherit in the "big picture".

Given the theoretical similarities between Jung's Typology and the concept of Learning Style, the correlations between the LSI and the JTI provide a useful test of the construct validity of the three LSI scales. Table 3 presents the correlations between these two measures. Inspection of this table indicates good convergent and discriminate validly for the LSI. The JTI dimension iNuiting correlates substantially with the Abstract-Concrete scale of the LSI, reflecting the fact that both of these scales assess a preference for the abstract and theoretical over the concrete and practical. Similarly, the JTI dimension Perceiving correlates substantially with the Holistic-Serial scale of the LSI, reflecting the fact that both of these scales assess a preference for focussing on the bigger picture rather than attending to details. Moreover, the JTI dimension Extraversion, with its emphasis on focussing on the outer world, was found to correlate significantly with the Acting-Reflecting scale of the LSI, as would be predicted. Finally, there were no other significant correlations between any of the LSI and JTI scales, thus supporting the discriminant validity of these scales.

The relationship between the LSI and the OIP+

The LSI scales were correlated (n=207) with the dimensions assessed by the OIP+. The OIP+ is designed to assess both personality and vocational interests with the aim of facilitating careers guidance. While not directly assessing Learning Style, the dimensions it assesses would nonetheless be expected to be associated with a person's preferred

Learning Style, and correlations between the LSI and OIP+ can therefore provide some useful evidence of the construct validity of the LSI.

The LSI scale Abstract-Concrete was found to be correlated with the OIP+ scale Openness (.37), indicating that a preference for learning about abstract theoretical ideas was correlated with the tendency to be more psychologically open and free-thinking than those who have a more Concrete Learning Style. This correlation is consistent with the definition of an Abstract-Concrete Learning Style, and therefore provides support for the validity of this LSI scale. The Holistic-Serial scale of the LSI was found to be correlated (.44) with the Conscientiousness dimension of the OIP+, indicating that people who prefer a Serial Learning Style are inclined to be more detail-conscious than are those who prefer a Holistic Learning style. This correlation is consistent with the definition of this learning style and therefore provides support for the validity of this LSI scale.

The relationship between the LSI and the ART

A sample of 143 undergraduates completed the LSI along with the Abstract Reasoning Test (ART). The abstract reasoning test assesses a respondent's ability to perceive the logical patterns and relations in a series of abstract diagrams, and infer from these the next pattern in the sequence. As such we would expect there to be small, but nonetheless a significant and meaningful pattern of correlations between abstract reasoning ability and learning style. As would be predicted, a more abstract rather than concrete learning style was correlated with abstract reasoning ability (r=.29, p<.001), as was a more Holistic rather than a more Serial (i.e. focussing on the "big picture" rather than fine details) learning style (r=.23, p<.001). These results therefore provide further support for the construct validity of the LSI.

	Extraversion	iNtuiting	Perceiving	Feeling
Acting	.36	.10	.15	.02
Abstract	.05	.54	.05	.02
Holistic	.01	.02	.52	.05

Table 3: Correlations between the JTI and LSI