

In recent years, the desire among educators to enhance the learning process for students has led to a growing concern with learning styles. CDTL Brief now presents the first of a two-part discussion on the issues surrounding **Learning Styles**.

Students' Learning Styles and Their Implications for Teachers

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Introduction

With the shift from an instructional to a learning paradigm, there is growing acceptance that *understanding* the way students learn is the key to educational improvement. To achieve a desired learning outcome, one should provide teaching and counselling interventions that are compatible with the students' learning styles. Thus, 'learning style' is a concept that is important not only in shaping teaching practices, but also in highlighting issues that help faculty members and administrators think more deeply about their roles in facilitating student learning. This article discusses some prominent research on learning styles and the implication of learning styles in teaching strategies.

What is Learning Style?

Learning styles can be defined as a set of cognitive, emotional, characteristic and physiological factors that serve as relatively stable indicators of how a learner perceives, interacts with, and responds to the learning environment (Keefe, 1979). A student's style of learning, if accommodated, can result in improved attitudes toward learning and an increase in thinking skills, academic achievement, and creativity (Irvine & York, 1995).

Past research on learning styles attempted to categorise learners by ability has produced some convincing results. For example, Kolb (1984) identified four learning styles (i.e. accommodation, assimilation, converging, and diverging) and four learning modes (i.e. concrete experience, reflective observation, abstract conceptualisation, and active experimentation). Dunn and Dunn (1978) developed a comprehensive model dealing with environmental, emotional, sociological, physical, and psychological learning style elements and claimed that these elements could provide information directly to teaching strategies. However, increasing research in this field is producing burgeoning sub-categories of styles as more and more differences among learners are unveiled with each study (Jonassen & Grabowski, 1993).

How Understanding Learning Styles Can Help Improve Students' Learning

Information about learning styles can help faculty become more sensitive to the differences students bring to the classroom. It can also serve as a guide in thoughtfully and systematically designing learning experiences that match or mismatch students' styles, depending on the teacher's purpose. Matching is particularly appropriate in working with poorly prepared students and new college students, among which attrition rates are usually the highest. Some studies show that identifying a student's style and then providing instruction consistent with that style contributes to more effective learning. In other instances, some mismatching may be appropriate so that students' experiences help them to learn in new ways and to bring into play ways of thinking and aspects of the self not previously developed. Any mismatching, however, should be done carefully and with consideration for the students, because the experience of discontinuity can be very threatening, particularly when students are weak in certain areas of study.

Dimensions of Learning Styles and Implications for the Teacher

The many theories of learning styles can be condensed and examined in four dimensions as follows (Curry, 1987):

1. Personality of the Learners

A learner's personality influences how he/she acquires and integrates information. Examples of learner types based on their personality dimensions are:

- a. *Field-independent vs. field-dependent learners* (Witkin, 1954; Witkin & Goodenough, 1981):

Some learners look at a whole picture at first and isolate or break it down into smaller parts with ease (field-independent); while others start to examine the pattern or relationships between the parts first before looking at the whole picture (field-dependent). As

abstraction is easier for the former type of learners, and integration is easier for the latter, a teacher could include both sorts of tasks to match these preferences as well as challenge learners to adjust and adapt to tasks that do not match their preferences. Field-dependent individuals are considered to be more group-oriented and cooperative and less competitive than field-independent individuals (Dunn & Griggs, 1996).

b. *Impulsive vs. reflective learners* (Schmeck, 1988):

Some learners tend to respond quickly as compared to others who do so more slowly and thoughtfully. The former could be categorised as risk-taking learners while the latter can be interpreted as cautious learners. The teacher should note this variable as it can influence students' responsiveness in class, test-taking behaviour and assignment outcomes.

2. Information Processing

Information processing refers to how an individual prefers to assimilate information. It can take the form of two interdependent approaches:

- a. *cognitive styles*, i.e. intrinsic patterns of a learner's typical mode of perceiving, thinking, remembering, and problem-solving (Schmeck, 1983; Kolb, 1984); and
- b. *constructivism*, i.e. how a learner constructs his/her own view (Fosnot, 1996).

The latter concept is more learner-centred and includes a learner's self-regulation in the learning process and self-determination in motivating him/herself (Deci, Vallerand, Pellertier & Ryan, 1991). In this case, the learner sets goals, organises resources, makes strategic decisions about resource use, and evaluates the entire process (Weinstein, 1996).

Information processing discussed in this way has valuable implications for teachers. Teachers can create opportunities for students to learn and exert self-regulation of their learning by involving the students in setting learning goals, selecting and implementing learning strategies as well as monitoring their own learning. Moreover, teachers can provide situational cues to motivate students to learn on their own (Lave & Wegner, 1991). For example, methods like problem-based learning or discovery learning, where the focus is on the process of problem solving rather than getting the solution, can promote more learning.

3. Social and Situational Interaction Among Learners

Social interaction addresses how students interact in the classroom. Reichmann and Grasha (1974) defined a few types of learners according to their types and levels of interaction (i.e. independent/dependent, collaborative/competitive, and participant/avoidant). Understanding how students interact is crucial in formulating learning strategies to be conducted in class. For example, depending on how learners interact with others and within the learning situation, teachers can

establish the foundation for collaborative learning strategies that can be potent methods of student learning in a large-class situation.

4. Instructional Methods

Instructional methods address the individual learner's preferred environment for learning (Keefe, 1989; Dunn & Dunn, 1978). These models basically ascertain the importance of identifying and addressing individual differences in the learning process. However, they differ in a way that some models stress accommodation of individual style preferences in the instructional methods, while others stress flexibility and adaptation by the learners.

Identifying Learning Styles

Diagnosing and interpreting learning styles provide data as to how individuals perceive, interact with, and respond to the learning environment. The starting point in teaching is to respond to the learning style needs of students, which implies knowledge of students' preferences and a conscious effort by the teacher to expand his/her range of techniques to respond to student diversity. A number of learning style inventories have been developed¹. Examples of a few prominent inventories are (Felder, 1996):

- Myers-Briggs Type Indicator (MBTI) (Myers, 1978) with dichotomous scales measuring extroversion vs. introversion, sensing vs. intuition, thinking vs. feeling, and judging vs. perception;
- Kolb's Learning Style Model, classifying learners in four types: *Type 1* (concrete, reflective), *Type 2* (abstract, reflective), *Type 3* (abstract, active) and *Type 4* (concrete, active);
- Herrmann Brain Dominance Instrument (HBDI), classifying learners according to their preferences for thinking based on task-specialised functioning of the brain.

Strategies to Promote Effective Learning Using Data on Learning Styles

- Conduct classroom research and get information on types of learning styles students are adopting. Information about style, when linked with other data about students, holds great promise for helping faculty members to improve their teaching. The collection and use of such data, done formally or informally, can also contribute to a continuing dialogue among faculty and administrators as they learn from each other about teaching and learning.
- Establish curricular experiences that help students learn how to learn.
- Inventories of learning styles and other processes can be used to help make students aware of their own preferences and strengths. Help should also be given

1. See Karen J. Ristuccia, (2001), 'Learning Styles on the Web', <http://www.csrnet.org/csrnet/articles/web-learning-styles.html> (Access date: 22 October 2001) for more details on learning style inventories.

to students to develop strategies for succeeding in courses taught in ways that are incongruent with their primary learning abilities.

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Productive Diversity in the Classroom: Practising the Theories of Differences in Learning Styles

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Introduction

The classroom in many societies is a representation of people with different social class, gender, age, ability, ableness, sexuality, religious, racial, and/or ethnic backgrounds, as well as different personality types. Many of these differences are reflected in the multiplicity of learning styles of students. The irony is that most classrooms tend to cater mainly to the learning style needs of a particular group. According to Ginsburg (2001a, p. 109),

most university instruction is geared for abstract sequential learning. We emphasize the development of analytical skills and focus most classes on theoretical and conceptual issues; we eagerly give "corrective feedback" and often, if inadvertently, encourage perfectionism; we rely more on lectures than group discussions and in our small groups we feature the cut and thrust of debate over the exchange of feelings and spiritual insights.

The above observation of Jerry Ginsburg's seems very true even in most pre-university classrooms in many societies. So far, because of lack of recognition and facilitation of differences in learning styles, diversity in the classroom frustrates many students and teachers. The result is that development of fruitful learning and teaching is stunted. If the classroom is to motivate students to learn effectively, efficiently, and with joy rather than pain, the differences in their learning styles should be taken into account in the design and delivery of courses. To succeed in facilitating productive diversification in the classroom, the main principles of productive diversity—full inclusion and accommodation—must be diligently applied to course content, materials, assessment criteria, and delivery. Since the practice of these diversity principles is tedious, teachers must be convinced of diversity benefits first.

Different Learning Styles

Scholars of learning and thinking have identified many learning styles (c.f. Jung, 1971; Kolb, 1976; Wheeler, 1980;

Butler, 1984; Myers & McCaulley, 1985; Gregorc, 1985; Belensky, *et al.*, 1986; Tobias, 1990; and Gibbs 1992 for detailed discussion of learning styles). For analytical purposes, the learning styles identified in the literature can be integrated into what Gregorc (1985) designates as concrete sequential learning, abstract sequential learning, abstract random learning, and concrete random learning (Ginsburg, 2001), and various combinations of these styles. The existence of diversity of learning styles has serious pedagogical implications. However, many classrooms ignore the implications of diversity of learning styles. The result is the prevalence of parochial approaches to learning in the education system (Rogers, 2001) that homogenise the learning process of a diversity of students. This serves the interest of the status quo but kills initiative, innovation, and creativity that are needed to produce productive workers and citizens. Students and society benefit from productive diversity in the classroom, and adapting pedagogy to different learning styles promotes productive diversity.

Developing Diversity Pedagogy

Although students have different learning styles, the conventional approach to learning presented to them in the school system makes them think that other pedagogies are either not right or are only useful outside the classroom. “Indeed, traditional schooling might have taught them [students] that...teachers are endowed with the information and that their role is to listen, take notes and be ready to reproduce the notes in the examination” (James, 2001, p. 47). Because of this privileging of the conventional learning/teaching style, students are likely to initially resist the introduction of other pedagogies. For example, in a class where I use a delivery system that involves small-group discussions on the selected topic to identify problems with the text before I do a presentation on the topic, students initially complain that they expect to be lectured before group exercises. Many of the students come to like the approach later when they realise that it makes lecture presentations more meaningful. Introducing pedagogy that validates or legitimises the neglected learning styles in the classroom will initially be resisted but will eventually flourish when the benefits of such diversity become evident. The bigger challenge, however, is how to successfully design and deliver curricula relevant to the multiplicity of learning styles represented in the classroom.

From the literature (Anderson, 2001; Clarke, 2001; Ginsburg, 2001), it is clear that the main areas that require diversification are course content, material, assessment criteria, delivery, and accessibility. Below are some details of how I practise the principle of diversity in these areas in my classroom.

Content

In my courses I ensure that content covers a diversity of dimensions in the subject area: methodologies, methods, perspectives, theories/models, concepts, empirical evidence, and practices/applications.

Material

Particular attention is paid to the sources of reading materials for my classes. Inclusiveness is imperative in this process. Materials are selected from scholarly books, refereed journals, the Internet, magazines and newspapers, videos, documents, and statistical data produced from academic and non-academic perspectives with diversity of affiliations. For example, my ‘Legal and Political History of First Nations—White Relations in Canada’ course uses texts written by Western academics, Aboriginal academics, and Aboriginal and Non-Aboriginal students.

Assessment Criteria

In the interest of diversity of learning styles, it is important that there are a variety of assessment components and options built into a course. My typical course has the following assessment criteria: individual critical reviews, small-group discussions of selected chapters of texts to generate questions for class discussions, small-group discussions of term paper/research essay, class discussions, student oral presentations, research essay/term paper, multiple-choice mid-term exam, and essay-type final exam. In my ‘Research Methods’ course, weekly laboratory sections are an additional component. Bi-weekly workshops are an integral feature of my ‘Workplace Diversity’ class. The grades are fairly distributed over the various assessment criteria. This minimises the risk of experimenting with new learning styles for students.

Delivery

Like the assessment criteria, my course delivery takes learning styles diversity into account. A combination of delivery modes is used in the same course. The instructor’s interactive presentation in which students are motivated to make comments, ask and answer questions at any point are combined with videos, skits, readings, labs, group/class discussions, and workshops. Transparencies, PowerPoint presentations, and the chalkboard are used as aids. All these delivery methods are well integrated into the main theme of the course.

Accessibility

A key principle of classroom diversity is flexibility of the teacher and the class organisation. Flexibility entails the teacher being accessible to all students by providing diversity of avenues for interaction and participation. I have practised this flexibility in a number of ways: sometimes I leave the last five minutes of class time to meet with students who are not available in my regular office hours because of the demands of their family situation, job situation and/or other classes. I hold regular office hours at various times of the day and days of the week, as well as make room for students to see me by appointment. Those students for whom none of the above options works can reach me through voice mail or email. With regard to accommodating students for participation, there have been instances where I have

allowed students to bring their pre-school children to class.

Guidelines and Boundaries

The growing representation of diversity in the classroom heightens the emotional dimension of learning/teaching. To validate these emotions and channel them to facilitate learning/teaching in the classroom, the teacher and students must work together to develop clear guidelines and boundaries at the start of the class. The highpoints of these guidelines and boundaries should be respect, safety, support, sensitivity, and zero tolerance of abuse.

From the above discussion on attempts to create and implement diversity pedagogy to reflect the variety of learning styles of students, it is clear that the process is complex and tedious. However, it is worthwhile pursuing it because it enhances student success by providing students from various backgrounds with voices in the classroom, encouraging student-teacher and student-student dialogue, and helping all students to identify with the learning process in the classroom. Not surprisingly, hardly do students fail or perform poorly in my courses in which diversity is conscientiously practised. An important thing that I have learned from the classroom diversity efforts is that to be successful, one has to possess both diversity competency (Cox & Beale, 1997) and human factor competency (Adu-Febiri, 2001), apart from motivation. Diversity competency is the ability to use awareness of differences, knowledge and understanding of differences, and facilitation skills to leverage differences to benefit people and organisations. Teachers need this competency in addition to the human factor competencies of commitment, dedication, loving-kindness, acceptance, persistence, responsibility and accountability to effectively facilitate productive diversity in the classroom. The school system should provide teachers with the adequate incentives and support to acquire and apply the necessary competencies to make classroom diversity work.

Conclusion

Diversity in learning styles exists in the classroom, and if not well facilitated frustrates both learners and teachers. Despite this situation most classrooms continue to experience monolithic approaches to learning. It takes a lot of work to facilitate productive diversity in the classroom, but it is doable and is worth the effort. Diversity works in the classroom, and it works well when teachers value full inclusion, are motivated, supported, and provided with the necessary competencies. The growing diversity in the classroom represents learning style differences, and provides opportunity for teachers to substantially contribute to developing productive labour force and citizens.

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Singapore Adolescents Also Got ‘Style’

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Introduction

Learning style is an individual’s typical and preferred way of perceiving, thinking, solving problems, drawing inferences, and remembering. It is based on a combination of environmental, emotional, sociological, physiological, and psychological traits that serve as relatively stable indicators of how learners perceive, interact, and respond to the learning environment (Dunn & Dunn, 1993). In recent years, the ‘Thinking School and Learning Nation’ concept in Singapore has revived and accelerated the interest in and application of learning style research. It is an important aspect of individuality crucial in determining the selection of appropriate teaching strategies and learning resources. This article presents a brief overview of studies on Singapore adolescents’ learning style in relation to their brain functioning in terms of hemisphericity or cerebral dominance—the tendency to use one side of the brain more than the other.

Brain Functioning

Brain functioning in relation to hemisphericity or cerebral dominance is one of the newest elements of the psychological domain of learning style research. Brain researchers yield evidence to support brain asymmetry—that the two sides of the brain are different and that our mental abilities are lateralised. The performance bias towards the left-brain functioning tasks (verbal, sequential, analytic, symbolic, abstract, temporal, digital, logical, and linear) or the right-brain functioning tasks (visual, spatial, holistic, intuitive, synthetic, and non-verbal) becomes a measure of hemisphericity (Lim, 2000).

Studies on Singapore Adolescents’ Learning Style

There are a number of studies on Singapore adolescents’ learning style. The findings are significant and show a core of learning style preferences and a certain trend in the cognitive profiles¹ that can distinguish the different achievement groups (Yeap, 1987; Lee & Yeap, 1998; Yeap, Chong & Low, 1998; Lim, 2000); the high and low mathematics achievers (Lee, 1998; Yeap, Chong & Low, 1998); and the types of achievers across the different disciplines (Yeo, 1992; Chan, 1994; Lee & Yeap, 1998; Lee, 1998; Ho, 1999; Tan, 1999; Tiey, 2001). The studies listed in this article are limited to those on brain hemisphericity and categorised according to the nature of instruments used for diagnosing hemispheric profiles. A distinction is made between the instruments used—preference inventories versus performance tests.

Preference inventories are simple opinion inventories based on an understanding of the basic functions of the right and left cerebral hemispheres, as revealed in research literature on brain specialisation. Performance tests are sub-tests on the specialised cognitive functions of the left or right cerebral hemisphere, validated by a consensus of research (Knolle, Gordon & Gwany, 1987).

The tables below present a summary of the studies on Singapore adolescents’ learning style related to brain hemisphericity:

1. **Cognitive Profiling:** Learners’ tendency towards left or right hemisphericity can be assessed using lateralisation tests. The cognitive profiling obtained from these tests gives a qualitative picture of an individual’s or group’s strengths and weaknesses.

Title of Study	Instrument (Preference Inventories)	Sample Profile	Learning Style Domains
Cognitive style preferences among adolescent mathematics achievers: Perception, processing and hemisphericity (Lee, 1998)	Hemispheric Mode Indicator (HMI), McCarthy, 1993 version	407 thirteen and fourteen-year-old secondary two students: high, average, and low mathematics achievers	Perception, processing, and hemisphericity
Cognitive patterns of engineering and nursing students: Perception, processing and hemisphericity (Tan, 1999)	Hemispheric Mode Indicator (HMI), McCarthy, 1998 version	138 engineering students and 123 nursing students: third and final-year polytechnic students	Perception, processing and hemisphericity
A cognitive profile of junior college students (Lim, 2000)	Hemispheric Mode Indicator (HMI), McCarthy, 1998 version	258 second-year junior college students	Perception, processing and hemisphericity

Title of Study	Instrument (Performance Tests)	Sample Profile	Learning Style Domains
Learning styles of Singapore secondary two students (Yeap, 1987)	The Cognitive Laterality Battery (CLB) (Gordon, 1986)	284 secondary two students: high, average, and low academic achievers	Environmental, emotional, sociological, physical and psychological
The learning of Shakespearean drama: The effects of visual-auditory and audio-and-print modalities (Yeo, 1992)	The Cognitive Laterality Battery (CLB) (Gordon, 1986)	67 fourteen-year-old adolescents	A quasi experiment on matching teaching and learning styles at the three levels of cognition: recall, interpretation and application
Cognitive diversity among Singapore adolescents: Brain functioning, perception, processing among academic achievers, mathematics achievers, and ethnic groups (Yeap, Chong & Low, 1998)	The Cognitive Laterality Battery (CLB) (Gordon, 1986)	1355 sixteen and seventeen-year-old adolescents: academic and mathematics achievers, ethnicity and gender	Brain functioning, perception and processing
Differential brain functioning profiles among adolescent mathematics achievers (Yeap, Chong, Chong & Low, 1998)	The Cognitive Laterality Battery (CLB) (Gordon, 1986)	1355 sixteen and seventeen-year-old adolescents: high, average, and low mathematics achievers	Brain functioning, perception and processing
Brain hemisphericity in art and non-art elective students (Express) and implications for curriculum (Lee, 1998)	The Cognitive Laterality Battery (CLB) (Gordon, 1986)	115 art elective and 115 non-art elective secondary three and four adolescents	Brain functioning

(N.B. Literature on most of the studies are available at the National Institute of Education library.)

Results of the Studies

The above studies reveal that individual and group adolescent students differ in their learning styles. In short, they think, learn, perceive, and process information differently. However, in the brain functioning domain, there is a certain trend in the students' cognitive profiles that will enable the researcher to predict their achievement level. Students with a tendency towards right brain functioning, favouring visual-spatial skills, is at greater risk for poor academic achievement. An integrated brain functioning profile with high performance scores in both the right- and left-brain functioning tasks is usually associated with high academic achievement.

Although the cognitive profiles of the adolescent students show their different cerebral dominance and preferred learning style, the above studies have also shown that all the adolescents have the capacity to engage in both left and right hemispheric processing. This dismisses the misconception that normal individuals process information with only one side of the brain. It also demonstrates that they have equal potent systems for thinking, and information processing.

Conclusion

The Prime Minister Mr Goh Chok Tong (September, 1996:3) described Singapore school leavers and graduates as having "good analytical abilities, and can reason logically. But they are not strong on creative and innovative thinking, and in dealing with problems that are not well defined". The Prime Minister's concern was for the future where growth will be driven by knowledge, innovation, and the ability of the work force to think creatively, generate, and apply ideas. This is a call for wholeness in the thinking process.

Despite the difficulty in identifying valid and reliable instruments for learning style diagnosis, the above studies have found that all learners have equal potent systems for thinking and information processing. Given that the two hemispheres of the brain specialise to interpret the same stimuli in completely different ways, therefore students learn differently and should be taught differently.

The construct of learning style provides teachers with a new look at another dimension of individualised or group instruction. In the studies related to hemisphericity, the findings can alert teachers to styles that may motivate or

inhibit students' learning. Modern technology places increasing value on the students' abilities to read and write well, to reason in numerals, to manipulate the computer keyboard, to think critically, to be creative, and to solve problems. Therefore, there is a need for students to develop flexible learning styles to cope with the multidimensional tasks. To those who teach, there is a need to recognise the fact that there are two equally valid methods of perceiving and processing information. There is a need to cultivate both hemispheric modes and to use them in a complementary fashion, towards whole brain functioning.

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The Centre for Development of Teaching and Learning (CDTL) engages in a wide range of activities to promote good teaching and learning at the National University of Singapore, including professional development, teaching and learning support, research on educational issues, and instructional design and development.

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