Abstract: In this chapter we give an overview of what Whole Brain® learning is, and discuss in depth the Whole Brain® Model of Herrmann (1995) as a tool to understand the diverse thinking preferences that individuals have. We highlight what a single dominant HBDI® profile looks like in each of the quadrants.

Acknowledging that we have a diverse representation of thinking preferences in our classrooms, we emphasise that learning opportunities should be designed in such a way that they factor in the uniqueness of the individual student – this creates a challenge to all lecturers.

Keywords: Whole Brain® learning, facilitating of Whole Brain® learning, thinking preferences.

1.1 Introduction

Our knowledge of the functioning brain has not only increased more over the past 40 years than in all previous centuries together, but is also still evolving. It has long been recognised that people vary significantly in their styles of thinking and learning, and models have been created in an attempt to capture these differences. The construct ‘learning style’ is often used by Kolb (1984), Felder (1996) and other researchers in this field, but in this book we use the constructs ‘thinking style’ and ‘thinking preference’ throughout (Herrmann, 1995; 1996). These are some of the questions raised by researchers such as Coffield et al. (2004), who study styles of thinking and learning:

- How can student learning be facilitated if lecturers do not know how students learn?
How can the teaching practice of academic staff be optimised and transformed if they do not know how students learn?

What models of learning and facilitating of learning do lecturers use?

It is our intention to demonstrate and substantiate the value of acknowledging different thinking preferences that students and lecturers have. Furthermore, we propose a comprehensive, flexible Whole Brain® Model for learning and facilitating learning (see Figure 6.5) to be adopted by lecturers. This ‘inclusive’ model reflects a merging of aspects that come under scrutiny in different sections of the book. It embraces the original work by Herrmann (1995; 1996) and expands it by promoting Whole Brain® learning and a Whole Brain® Thinking approach to facilitating learning. The comprehensive Whole Brain® Model for learning and facilitating learning can provide a tool for lecturers to accommodate students’ diverse thinking preferences, and to develop areas of lesser preferred modes of learning, thus contributing to the development of students’ potential. According to Herrmann (1996) it is important to note that a preference for a particular thinking style becomes a motivational factor for the individual. Individuals who constantly have to operate in their least preferred modes become demotivated and their learning can be affected in a negative way because they lose interest.

Most lecturers take the traditional view that students are a homogeneous learning group, with similar interests and aptitudes for subjects. They therefore facilitate learning in a style where ‘one size fits all’, but the truth is that quality learning and understanding can only be accomplished if the learning group is assumed to be heterogeneous – highly dissimilar in interest and aptitude. The only safe assumption is that every learning group represents a composite of Whole Brain® Thinking (Herrmann, 1996).

1.2 Key contributors

Earlier brain research typified the left hemisphere as being logical, analytical, quantitative and rational, whereas the right hemisphere deals with conceptual, holistic, intuitive, imaginative and non-verbal aspects of thought. The split-brain research carried out by Nobel Prize winner Roger Sperry and his co-workers confirmed that different hemispheres are responsible for different learning tasks (Herrmann, 1995).

Ongoing research has reaffirmed that the two hemispheres control vastly different aspects of thought and action. Each half has its own specialisation, advantages and limitations (Gazzaniga, 1998). Research
Theoretical framework

shows that the left hemisphere breaks everything down into different elements, while the right hemisphere considers the whole and searches systematically for connections, analogies and similarities.

MacLean’s model, the Triune Brain Model (Herrmann, 1995), explains his research as an evolutionary model comprising a three-layered structure. Each layer represents a different evolutionary state. The deepest layer, known as the reptilian or R-layer, contains the cerebellum and brainstem and is important for survival. The next layer, the limbic system, consists of the amygdala, hippocampus and hypothalamus. It is responsible for emotions, and records memories of behaviours that produced pleasant and unpleasant experiences. The neocortex, the third layer, comprises the two hemispheres of the brain (cerebral cortex) and is involved with voluntary movement, processing sensory information, language, logical thinking, planning, imagination and consciousness. It is important to keep in mind that all three layers are interconnected and dependent on one another for survival through the corpus callosum (Herrmann, 1996).

1.3 Herrmann’s metaphoric Whole Brain® Model

Herrmann, acknowledged in literature as the father of brain dominance technology (Morris, 2006), focused his initial research not on brain dominance, but on understanding how the creativity of the human brain is unleashed. His valuable contribution to brain research during the 1990s involves his documentation of the fact that the human brain comprises four distinct learning modes and not only two hemispheres, where each of the modes has its own ways of processing information and functioning (Herrmann, 1995). His research proved that the brain functions as a whole, and there is a validated metaphoric Thinking Styles™ Model describing specialised clusters, or quadrants, of processing in the left, right, upper and lower modes, inspired by the physiological brain’s division into left and right hemispheres, embodying the left–right hemisphere brain theory of Sperry and his co-workers (based on research in the field of neuroscience during the 1980s), as well as the triune brain theory of MacLean (based on insights gained from anthropology during the 1970s). Herrmann further determined that each quadrant has very distinct clusters of cognitive functions within, called specialised modes of learning, and each quadrant has its own language, different ways to solve
problems, values and ways of knowing (Herrmann, 1995). Every person embodies a coalition of these specialised processes in various proportions. Because of the nature of the brain’s serial processing, when one part of the brain is activated or challenged to learn in a specific way, the other parts may be less involved. However, when solving a complex problem, more than one mode is required and thus the brain switches signals back and forth very rapidly between different specialised areas within and across the hemispheres, functioning as a whole system (Lumsdaine and Binks, 2003).

Figure 1.1 is a schematic representation of Herrmann’s metaphoric Whole Brain® Model (Herrmann, 1995).
Figure 1.1 shows the upper left mode, or A-quadrant, associated with logical, analytical, fact-based and quantitative thinking. The lower left mode is associated with organised, sequential, planned and detailed thinking. The lower right mode is associated with interpersonal, feeling-based, kinaesthetic, emotional thinking, and the upper right mode is associated with holistic, intuitive, integrating and synthesising thinking.

Although the four-quadrant model is inspired by a division within the physical brain, Herrmann’s Whole Brain® Model is metaphoric, as an individual’s degree of preference for each of the four modes can be determined by the relative attraction or aversion to each of the mode descriptors (Herrmann, 1996) and current research affirms that the brain functions as a whole system.

Herrmann’s research led to the development of a scientifically validated instrument that can quantify the degree of thinking preferences for specific modes within the Whole Brain® Model. The Herrmann Brain Dominance Instrument® (HBDI®) of 1981 is a questionnaire consisting of 120 items that quantifies mental (thinking) preferences. The results of the questionnaire are a visual plot of the thinking preferences of the individual (see Figures 1.2, 1.3, 1.4 and 1.5). Accompanied by a data summary sheet, the model gives a breakdown of what each individual selected and registers it according to the different quadrants (Tables 1.1, 1.2, 1.3 and 1.4). Finally these data are complemented by an explanation report that describes and highlights important aspects of the profile.

In order to understand the profile, it is important to explain quadrants and modes of thinking, the preference code, the adjective pair data, the profile score and the data summary.

### 1.3.1 Quadrants and modes of thinking

Thinking preferences are measured not only by the four quadrants (A, B, C or D), but also by four modes (upper left, lower left, upper right and lower right). The upper modes (right and left), combining quadrants A and D, are more cognitive and intellectual, preferring thinking in abstract, conceptual modes. The left modes, combining the A- and B-quadrants, prefer concise, efficient processes with realistic, disciplined and orderly approaches. The right modes, combining the C- and D-quadrants, include key mental processes such as intuitive and perceptive thinking, as well as idealistic, expressive and open approaches. The lower modes, combining the B- and C-quadrants, are grounded and emotional in nature. These modes often prefer visceral, ‘gut’ and concrete approaches (Herrmann International, 2009).
1.3.2 The preference code

The preference code is a categorisation of the profiles and is helpful in identifying generally similar profile configurations (see Section 1.3.4.1):

- A code 1 corresponds to a preference (a numerical value of 67–99). Visibility of a strong preference typically will be associated with a numerical value of 100 or more (Herrmann, 1996).
- A code 2 corresponds to an intermediate preference of generally being comfortable to use the thinking activities of the quadrant (a numerical value between 33 and 66).
- A code 3 indicates a low preference or even lack of interest for that specific quadrant’s thinking, and for some cases even avoidance (a numerical value of 33 or below) (Herrmann, 1996; Herrmann International, 2009).

1.3.3 The adjective pair data

This data derive from the forced choice pairing section in the HBDI® Survey and reveals the thinking style distribution that is most instinctive to the individual. The adjective pair data help indicate the individual’s ‘backup’ style of preferred thinking. There are 24 pairs, and therefore 24 points distributed between the four quadrants. The highest score (maximum 12) typically reveals the Thinking Styles™ favoured in ‘pressured’ or stressful situations, which may differ from the preferred style. The distribution of responses into A-, B-, C- and D-quadrants under pressure could therefore also indicate perhaps a less preferred quadrant becoming more dominant or a generally preferred one receding into the background (Herrmann International, 2009).

1.3.4 The profile score

The profile score, the total scores allocated to the four quadrants based on individuals’ responses to the HBDI® survey form, constitutes the basis of the profile. This visual profile (see Figures 1.2, 1.3, 1.4 and 1.5) is a graphic display of the diagonal axes (A and C; B and D). The scores within each quadrant have been plotted based on each individual’s responses to the HBDI® survey form. It is a visual representation that synthesises the responses into a global visual profile. At the top of the
profile are displayed the individual’s preference code, adjective pairs and profile scores for easy reference (Herrmann International, 2009).

Without going into the detail of all the possible combinations that emanate from the clusters within the quadrants and modes (Herrmann, 1995; Herrmann International, 2009), the purpose of the book is to highlight the main dominances.

1.3.4.1 Single dominant profiles

Of the more than three million profiles in Herrmann’s database, only 5 per cent of the profiles are for a single dominance. The single dominance can occur across all the four quadrants, with a preference code of 1222, 2122, 2212 or 2221. The advantage of having a single dominant profile is that the individual experiences relatively little internal conflict. Perceptions and decision-making processes tend to be harmonious, predictable, coherent and comfortable. The single dominant person tends to see the world through a consistent set of lenses. The downside to single dominance is that it can be quite a challenge getting along smoothly with others since those with multi-dominant preferences have the ability to see the world from different points of view.

1.3.4.2 Double dominant profiles

A majority of people (58 per cent of profiles in Herrmann’s database International, 2009) have a preference for two quadrants. Double dominance can occur between left 1122, right 2211, upper 1221 or lower 2112 with the advantage being that the two quadrants tend to reinforce each other. However, like single dominant profiles, a profile with two primaries in the same mode tends to access the other modes less frequently. Opposing double dominant profiles, left–right 1212 or 2121, experience some internal conflict between the two primary quadrants, but individuals with this profile will benefit from a greater appreciation of their own mental opposites and those of others, making it easier to cross the bridge between the different styles.

1.3.4.3 Triple dominant profiles

A high percentage of 34 per cent of the profiles in the database shows a triple dominance. Within this total, 2111, 1121 and 1112 are the most frequent profiles, representing 81 per cent of the triple dominant profiles (Herrmann, 1995; Herrmann International, 2009). These profiles have
only one quadrant that is not a primary. The advantage of such multi-dominance lies in the breadth of thinking of the triple dominant profile. It is more expanded than the double dominant profile and allows the individual to process and be able to access the associated language across three quadrants more easily. Interactions with others are thus often easier, as it is most likely that at least one preference will be shared with individuals with whom they interact. The downside of a triple dominant profile is that it can slow down the decision-making process because of the need to engage with all the alternatives available.

1.3.4.4 Quadruple dominant profiles

This profile makes up 3 per cent of the profiles present in Herrmann’s database. The 1111 profile is a true multi-dominant profile. The profile expresses primary levels for every one of the four quadrants and offers an enormous potential for highly integrated, varied thinking processes. This gives the profile a unique advantage through the ability to move seamlessly from quadrant to quadrant and mode to mode as the situation requires, as it is often able to understand all the thinking perspectives. Individuals with this profile have the ability to develop an extraordinarily balanced view of any given situation, but may find it a challenge to handle internal conflict within themselves because of the easy interaction between quadrants and a possible sense of indecisiveness or unclear focus that is associated with a multi-modal and multi-quadrant preference. The overall tilt (A+B+C+D) of their thinking preference will be influenced by their highest profile score in a specific quadrant or quadrants (Herrmann, 1995; Herrmann International, 2009), and their adjective pair data, which may serve as a tiebreaker, predisposing them to lean toward a certain quadrant or mode in pressured situations.

1.3.5 Data summary

Another way to look at individuals’ data are derived from the information captured on the data summary sheet. This indicates how each individual’s score for each quadrant is determined. The purpose is to remind those taking part of their responses to many of the questions on the HBDI® survey and to clarify which elements in each quadrant they prefer. It is a representation of a profile using a sequential, linear detailed and quantified mode format. The focus is on analysing the key descriptors and work elements on the data sheet (see Tables 1.1, 1.2, 1.3 and 1.4).
There are four columns in the data sheet sorting the individual’s responses into the four quadrants. The first column corresponds to the A-quadrant, the second to the B-quadrant, the third to the C-quadrant and the fourth to the D-quadrant. An ‘X’ appears next to individuals’ selection in the columns relating to the quadrant to which they belong, while the asterisk (*) denotes the most descriptive of the selected key descriptors chosen by the individual. On the HBDI® Survey, eight key descriptors must be selected from a total of 25 and the most descriptive one must be indicated with an asterisk (Herrmann International, 2009).

Selecting ‘Work elements’, the individual needs to rank the work elements from 1 (work that you do least well) to 5 (work that you do best). The rankings are sorted into the four quadrants. The work preferences are the indicators of thinking preferences™ that are most accessed in a work environment. The latter are influenced by training, preferences, opportunities and challenges that the working environment provides. In analysis of the data sheet it is also important to note that work elements and key descriptors indicated by the individual as high (5 or 4) or low (1 or 2) can perhaps reveal situational work preferences that have developed. These are perhaps somewhat different from the overall more general key descriptor preferences (Herrmann International, 2009).

From Herrmann’s own research and backed by studies and publications around the world, the aggregate total of all profiles results in a 1111 profile and is true of most groups if there are at least 100 individual profiles (see Figures 2.1 and 2.2). This implies that taken as a whole the world is a composite of ‘Whole Brain’® Thinking (Herrmann, 1996).

An HBDI® profile provides scientifically validated information to understand one’s own learning strengths and learning avoidances (Herrmann, 1995). However, it should be mentioned that the instrument does not measure competencies, but thinking preferences (and only that). To prefer something is to be drawn to it, while competency has to do with inter alia acquired knowledge, skills and professional experience. True mastery in a specific domain can only be achieved in the area that converges with one’s natural preferred mode.

In order to minimise confusion for the reader who is not familiar with interpreting an HBDI® profile, we discuss the single dominant quadrant’s preference in more detail, and show how a single dominant profile might relate to a preference for learning opportunities and methods of facilitating learning. The reader should keep in mind that only 5 per cent of the population actually has only one primary preference, most having two or more.
1.4 HBDI® profiles

In this section and consequent subsections real examples of single dominant profiles that are typical of the four quadrants are visually represented and explained. Each explanation and visual representation is rich with quantitative data. The wording, interpretation and visual representation on the other hand offer qualitative data that perfectly fits a mixed-methods approach towards studying the application of Whole Brain® principles in the context of learning and facilitating learning in higher education.

1.4.1 HBDI® single dominant profile example indicating a strong A-quadrant preference

In this section a sample profile with a preference code representing single dominance indicating a strong preference for thinking in the A-quadrant is discussed and visually displayed (Figure 1.2). This is followed by an explanation of the characteristics of the profile.

The preference code of this profile example is 1222 (single dominant), with the most preferred thinking preference being for the upper left A-quadrant with a numerical value of 126 (strong preference of 100+) (Herrmann, 1995). By quite a margin, the next most preferred is the B-quadrant, with a numerical value of 65; although this is a high secondary preference, the sample profile is still representative of singular dominance because the difference in scores between A and B is 59 points. Then follows the D-quadrant with a numerical value of 59, and the least preferred thinking preference is for the C-quadrant with a numerical value of 42.

The adjective pair distribution in this profile between the A-, B-, C- and D-quadrants is respectively 10-3-5-6. This implies 42 per cent of the adjective pair responses registered in the A-quadrant, 13 per cent in the B-quadrant, 20 per cent in the D-quadrant and 14 per cent in the C-quadrant. This is indicated on the profile grid by a broken line. The dotted line profile is also referred to as the individual’s stress profile. Although the stress profile is not perfectly aligned with the profile, it is not radically out of alignment either. When interpreting the profile and stress profile it is suggested that the individual under pressure shifts slightly towards the C-quadrant.

The data summary sheet (Table 1.1) highlights the key descriptors and work elements selected by the individual and registered in four columns:
Theoretical framework

Based on the qualitative data gathered, the key descriptors selected in the A column are **Factual, Quantitative, Critical, Mathematical** and **Logical**. **Analytical** was selected as being the most descriptive of the individual and marked with an asterisk (*). The work elements selected

![HBDI® single dominant sample profile indicating a strong preference for A-quadrant thinking](figure)

**Figure 1.2**

The four-quadrant graphic is a registered trademark of Herrmann Global and is reproduced under written contract for display in this text. © 2012. All rights reserved

the A-quadrant first, next the B-quadrant, third the C-quadrant and the last column representing the D-quadrant.

Based on the qualitative data gathered, the key descriptors selected in the A column are **Factual, Quantitative, Critical, Mathematical** and **Logical. Analytical** was selected as being the most descriptive of the individual and marked with an asterisk (*). The work elements selected
### Examples of key descriptors and work elements of a sample single dominant A-quadrant profile

<table>
<thead>
<tr>
<th>Key descriptors</th>
<th>A-quadrant</th>
<th>B-quadrant</th>
<th>C-quadrant</th>
<th>D-quadrant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factual</td>
<td>x</td>
<td>Conservative</td>
<td>Emotional</td>
<td>Imaginative</td>
</tr>
<tr>
<td>Quantitative</td>
<td>x</td>
<td>Controlled</td>
<td>Musical</td>
<td>Artistic</td>
</tr>
<tr>
<td>Critical</td>
<td>x</td>
<td>Sequential</td>
<td>Spiritual</td>
<td>Intuitive</td>
</tr>
<tr>
<td>Rational</td>
<td></td>
<td>Detailed</td>
<td>Symbolic</td>
<td>Holistic</td>
</tr>
<tr>
<td>Mathematical</td>
<td>x</td>
<td>Dominant</td>
<td>Intuitive</td>
<td>Synthesiser</td>
</tr>
<tr>
<td>Logical</td>
<td>x</td>
<td>Speaker</td>
<td>Talker</td>
<td>Simultaneous</td>
</tr>
<tr>
<td>Analytical</td>
<td>*</td>
<td>Reader</td>
<td>Reader</td>
<td>Spatial</td>
</tr>
<tr>
<td>Work elements</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Analytical</td>
<td>5</td>
<td>Organisation</td>
<td>3</td>
<td>Teaching</td>
</tr>
<tr>
<td>Technical</td>
<td>4</td>
<td>Planning</td>
<td>5</td>
<td>Writing</td>
</tr>
<tr>
<td>Problem solver</td>
<td>4</td>
<td>Administrative</td>
<td>1</td>
<td>Expressing</td>
</tr>
<tr>
<td>Financial</td>
<td>2</td>
<td>Implementation</td>
<td>4</td>
<td>Interpersonal</td>
</tr>
</tbody>
</table>

* Most descriptive
in column A are Analytical (5), Technical (4) and Problem solver (4). The next preferred thinking style is that of the B-quadrant. Speaker was selected as the key descriptor while work elements identified as work that the individual does well include Planning (5) and Implementation (4). The next preferred mode is for the D-quadrant, and Holistic was selected as the key descriptor while work elements identified as work the individual selected as done well include Integrating (5) and Conceptualising (5). The least preferred quadrant is that of the C-quadrant and the key descriptor selected is Talker. Looking at the data selected in the ‘Work element’ column, Interpersonal is ranked as a preferred work element (4).

Students with a single A-quadrant preference:

- prefer a cognitive and rational approach to executing tasks and approach problem-solving in a logical manner
- appreciate approaches that reduce the complex to the simple, the unclear to the clear, and the cumbersome to the efficient
- prefer logical, analytical and rational thinking, as well as engaging in feasibility studies, critical assessments and any task that requires focused quantitative research and rigorous discussions
- prefer financial, mathematical and technical matters.

Learning opportunities that students from the A-quadrant would appreciate, according to Herrmann’s research (1995) and confirmed by Lumsdaine and Binks (2003), include:

- formalised lectures
- data and information searching through reading textbooks, searching websites and doing library searches
- applying scientific methods in research projects and working through technical and financial case studies
- analysing and studying examples of problems and solutions and building case studies based on facts
- judging ideas based on facts, criteria and logical reasoning
- knowing how things work (the technical aspects) and the cost implications
- always seeking to answer the ‘what’ question
- challenging debates and robust discussion
- programmed learning.


**1.4.2 HBDI® single dominant profile example indicating a strong B-quadrant preference**

In this section a sample profile with a preference code representing single dominance in the B-quadrant is discussed and visually represented in Figure 1.3. This is followed by an explanation of the characteristics of the profile of the student with such a preference. The preference code is 2122, indicating a single dominant profile with the most preferred thinking for the lower left B-quadrant.

The profile score with a numerical value of 123 for the B-quadrant is an indication that this is the most preferred thinking preference and that it is characterised by *Controlled, Planned, Organised* and *Structured* modes of processing. There would be a tendency to pay close attention to detail and the implementation of activities. By quite a margin, the next most preferred is for the A-quadrant, with a numerical value of 65, followed by the D-quadrant with a numerical value of 63 and although these are both high secondary preferences, the sample profile is still representative of singular dominance because the difference in scores is 58 points and 60 points respectively. The least preferred preference is for C-quadrant thinking, indicated by a numerical value of 45.

The adjective pair distribution (into A-, B-, C- and D-quadrants) is 7-9-5-3 as indicated by the dotted line (or stress profile). An analysis of these results shows that 38 per cent of the adjective pair responses fall into the B-quadrant, 29 per cent in the A-quadrant, 21 per cent in the D-quadrant and 15 per cent in the C-quadrant. The stress profile is not perfectly aligned, nor radically out of alignment with the profile. Although the preference for the B-quadrant remains under pressure, there is a slight change in the person’s thinking style under pressure, towards the A- and C-quadrants. They become slightly more dominant, while the D-quadrant under pressure becomes the lesser thinking preference of all four.

According to the data summary sheet in Table 1.2, the key descriptors selected in the A-quadrant are *Mathematical* and *Logical*, while for the B-quadrant *Detailed* and *Reader* are registered. For the C-quadrant, *Spiritual*, and for the D-quadrant *Imaginative, Artistic* and *Simultaneous* were selected. *Reader* is selected as being most descriptive of the key descriptors and is registered in both the B- and C-quadrants. Although there were more key descriptors selected in the D-quadrant, the most descriptive was selected in the B-quadrant. Both A- and B-quadrants have the same number of selections – this can be explained because the profile is derived from a wide array of data across all 120 questions, which may
not all reflect a singular preference. The profile represents the overall trend tile of the profile data, which in this case indicate the most preferred overall is in the B-quadrant.

Work elements selected as work done well in the A-quadrant are *Analytical* (5) and *Problem solver* (4), while in the B-quadrant *Planning* (4), *Administrative* (5) and *Implementation* (4) were selected. These
### Table 1.2
Examples of key descriptors and work elements of a sample single dominant B-quadrant profile

<table>
<thead>
<tr>
<th>A-quadrant</th>
<th>B-quadrant</th>
<th>C-quadrant</th>
<th>D-quadrant</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Key descriptors</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Factual</td>
<td>Conservative</td>
<td>Emotional</td>
<td>Imaginative</td>
</tr>
<tr>
<td>Quantitative</td>
<td>Controlled</td>
<td>Musical</td>
<td>Artistic</td>
</tr>
<tr>
<td>Critical</td>
<td>Sequential</td>
<td>Spiritual</td>
<td>Intuitive</td>
</tr>
<tr>
<td>Rational</td>
<td>Detailed</td>
<td>Symbolic</td>
<td>Holistic</td>
</tr>
<tr>
<td>Mathematical</td>
<td>x</td>
<td>Dominant</td>
<td>Intuitive</td>
</tr>
<tr>
<td>Logical</td>
<td>x</td>
<td>Speaker</td>
<td>Simultaneous</td>
</tr>
<tr>
<td>Analytical</td>
<td>Reader</td>
<td>* Reader</td>
<td>* Spatial</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Work elements</strong></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Analytical</td>
<td>5</td>
<td>Organisation</td>
<td>2</td>
</tr>
<tr>
<td>Technical</td>
<td>1</td>
<td>Planning</td>
<td>4</td>
</tr>
<tr>
<td>Problem solver</td>
<td>4</td>
<td>Administrative</td>
<td>5</td>
</tr>
<tr>
<td>Financial</td>
<td>1</td>
<td>Implementation</td>
<td>4</td>
</tr>
</tbody>
</table>

* Most descriptive
reflect mental preferences preferred at work. In the D-quadrant, *Conceptualising* (4) was the strongest work element selected, while the least preferred quadrant was the C-quadrant. Notably none of the work elements was selected in the C-quadrant as work that the individual does well, although *Teaching* (3) and *Interpersonal* (3) were selected as work they are comfortable in doing.

Students with a single B-quadrant preference:

- commonly prefer structure and procedure; show a natural inclination towards organisation, efficiency, order, discipline and reliability
- have a strong tendency to prioritise tasks, approach them in a systematic and sequential manner and complete them within a given time frame
- are often mindful of logistical constraints, methodical in their approach to problems and attentive to detail.

Learning opportunities that B-quadrant students would appreciate, according to Herrmann’s research (1995) and confirmed by Lumsdaine and Binks (2003), include:

- carrying out detailed written work neatly, timely and conscientiously
- attending lectures that are structured and learning that is facilitated in a sequenced way
- undertaking experimental work to be carried out step-by-step and the acquisition of skills through repetition, drill and practice
- frequently asking the ‘how’ question
- planning projects and execution according to a set plan and dates
- assembling an object according to detailed instructions in a manual
- setting up an own filing system and using it regularly
- case studies focusing on organisational structures and administrative issues.

### 1.4.3 HBDI® single dominant profile example indicating a strong C-quadrant preference

In this section a sample profile with a preference code representing single dominance for thinking in the C-quadrant is discussed and visually represented in Figure 1.4.

The preference code for this profile is 2212. The profile score with the most preferred thinking preference is for C-quadrant thinking, with a
numerical value of 122 (Herrmann, 1995). This is followed by the D-quadrant with a numerical value of 66 followed by the B-quadrant with a numerical value of 62. Again, although both D- and B-quadrants are high secondary preferences, the sample profile is still representative of

<table>
<thead>
<tr>
<th>Quadrant:</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preference code:</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Adjective pairs:</td>
<td>3</td>
<td>5</td>
<td>12</td>
<td>4</td>
</tr>
<tr>
<td>Profile scores:</td>
<td>44</td>
<td>62</td>
<td>122</td>
<td>66</td>
</tr>
</tbody>
</table>

**Figure 1.4**  
HBDI® single dominant sample profile indicating a strong preference for C-quadrant thinking
singular dominance because the difference in scores is 56 points and 60 points respectively. The least preferred thinking preference is for the A-quadrant with a numerical value of 44.

The distribution of the adjective pair questions (into the A-, B-, C- and D-quadrants) is 3-5-12-4 and indicated by the dotted line (stress profile) with 50 per cent of the adjective pair responses registered in the C-quadrant, 17 per cent in the D-quadrant, 21 per cent in the B-quadrant and 13 per cent in the A-quadrant. When under pressure, the C-quadrant becomes even more dominant, with little shift in A and B and a slight decrease in the D-quadrant.

The following quantitative data are of significance: key descriptors selected for the A-quadrant are Critical and Logical. For the B-quadrant they are Speaker and Reader, and for the D-quadrant Holistic and Simultaneous. For the C-quadrant they are Spiritual, Talker and Reader, with Emotional the most descriptive of the key descriptors. In the column ‘Work elements’ in the A-quadrant Problem solver (4) was selected; in the B-quadrant, Organisation (4), Administrative (4) and Implementation (4) were selected and all the work elements in the C-quadrant were selected as work that the individual does well (Table 1.3).

Students with a single C-quadrant dominance:

- prefer to be in tune with and sensitive to others’ needs; are naturally attracted to people-related tasks and the ability to relate to others and express themselves easily; they are sensitive to moods, attitude, energy level and the atmosphere in a room where people are gathered

- may have good interpersonal skills, an awareness of the feelings of others and easy communication; they may give credence to sensory intuition in the form of gut feeling

- may display emotive thinking and be highly sensitive, while spiritual aspects play a key role in the lives of some C-quadrant students

- are often open to contributions from team members to attain a set goal; people focus constitutes the bottom line for C-quadrant students.

Learning opportunities that students with a strong C-quadrant profile would prefer, according to Herrmann’s research (1995) and confirmed by Lumsdaine and Binks (2003), include:
listening and sharing ideas during group interactions and discussions
- being emotionally involved and motivating self by asking the ‘who’ question
- learning through sensory input, movement, smelling and tasting
- hands-on learning by touch and using tools and objects
- keeping a personal journal to record feelings and values
- studying with background music
- making up a song or using music as a memory aid or to express feelings
- learning by means of facilitated learning at a more personal level
- using people-orientated case studies.

1.4.4 HBDI® single dominant profile example indicating a strong D-quadrant preference

This section sets out the quantitative and qualitative data using an example of a single dominant profile indicating a strong preference for the D-quadrant, which is visually represented in Figure 1.5.

This single dominant profile with a preference code of 2221 indicates the most preferred preference for the D-quadrant with a numerical value of 116. The characteristics associated with this quadrant include Creative, Imaginative, Holistic and Integrative processing. The three remaining quadrants are functional, yet secondary. The next preferred thinking preference is for the B-quadrant with a numerical value of 63, followed by the C-quadrant with a numerical value of 60 and the least preferred thinking style preference is for the A-quadrant with a numerical value of 53. Even though these three quadrants are high secondary preferences, the sample profile is still representative of singular dominance because the difference in scores is 53 points, 56 points and 43 points respectively.

The 1-4-8-11 adjective pair distribution (in the A-, B-, C- and D-quadrants) is indicated by the broken line (stress profile) and noticeably different from the profile in the percentage comparisons. The profile indicates a marked shift to D- and C-quadrant thinking when under pressure, and a lesser preference for A- and B-quadrant thinking. This suggests that there might be a quite different response when under pressure than at other times. Nearly half, 46 per cent, of the adjective pair responses fall into the D-quadrant, 17 per cent in the B-quadrant, 33 per cent in the C-quadrant and 4 per cent in the A-quadrant.
<table>
<thead>
<tr>
<th></th>
<th>A-quadrant</th>
<th>B-quadrant</th>
<th>C-quadrant</th>
<th>D-quadrant</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Key descriptors</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Factual</td>
<td>Factual</td>
<td>Conservative</td>
<td>Emotional</td>
<td>* Imaginative</td>
</tr>
<tr>
<td>Quantitative</td>
<td>Quantitative</td>
<td>Controlled</td>
<td>Musical</td>
<td>Artistic</td>
</tr>
<tr>
<td>Critical</td>
<td>Critical</td>
<td>Sequential</td>
<td>Spiritual</td>
<td>Intuitive</td>
</tr>
<tr>
<td>Rational</td>
<td>Rational</td>
<td>Detailed</td>
<td>Symbolic</td>
<td>Holistic</td>
</tr>
<tr>
<td>Mathematical</td>
<td>Mathematical</td>
<td>Dominant</td>
<td>Intuitive</td>
<td>Synthesiser</td>
</tr>
<tr>
<td>Logical</td>
<td>Logical</td>
<td>Speaker</td>
<td>Talker</td>
<td>Simultaneous</td>
</tr>
<tr>
<td>Analytical</td>
<td>Analytical</td>
<td>Reader</td>
<td>Reader</td>
<td>Spatial</td>
</tr>
<tr>
<td></td>
<td>Analytical</td>
<td>Organisation</td>
<td>Teaching</td>
<td>Integrating</td>
</tr>
<tr>
<td></td>
<td>Technical</td>
<td>Planning</td>
<td>Writing</td>
<td>Conceptualising</td>
</tr>
<tr>
<td></td>
<td>Problem solver</td>
<td>Administrative</td>
<td>Expressing</td>
<td>Creative</td>
</tr>
<tr>
<td></td>
<td>Financial</td>
<td>Implementation</td>
<td>Interpersonal</td>
<td>Innovating</td>
</tr>
</tbody>
</table>

* Most descriptive
Whole Brain® Learning in Higher Education

Based on the quantitative data gathered, the following is of significance. Key descriptors (Table 1.4) selected within the D-quadrant are Intuitive and Holistic, while the most descriptive selected is Imaginative. In the B-quadrant, Conservative and Sequential were selected, followed by the C-quadrant where Emotional and Intuitive were selected as descriptors. The least preferred quadrant is A, and Logical and Analytical were selected as key descriptors.

![Figure 1.5 HBDI® single dominant sample profile indicating a strong preference for D-quadrant thinking](image)

The four-quadrant graphic is a registered trademark of Herrmann Global and is reproduced under written contract for display in this text. © 2012. All rights reserved
### Table 1.4  Examples of key descriptors and work elements of sample single dominant D-quadrant profile

<table>
<thead>
<tr>
<th>A-quadrant</th>
<th>B-quadrant</th>
<th>C-quadrant</th>
<th>D-quadrant</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Key descriptors</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Factual</td>
<td>Conservative</td>
<td>x</td>
<td>Emotional</td>
</tr>
<tr>
<td>Quantitative</td>
<td>Controlled</td>
<td></td>
<td>Musical</td>
</tr>
<tr>
<td>Critical</td>
<td>Sequential</td>
<td>x</td>
<td>Spiritual</td>
</tr>
<tr>
<td>Rational</td>
<td>Detailed</td>
<td></td>
<td>Symbolic</td>
</tr>
<tr>
<td>Mathematical</td>
<td>Dominant</td>
<td></td>
<td>Intuitive</td>
</tr>
<tr>
<td>Logical</td>
<td>x</td>
<td>Speaker</td>
<td>Talker</td>
</tr>
<tr>
<td>Analytical</td>
<td>x</td>
<td>Reader</td>
<td>Reader</td>
</tr>
<tr>
<td>Work elements</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Analytical</td>
<td>4</td>
<td>Organisation</td>
<td>3</td>
</tr>
<tr>
<td>Technical</td>
<td>4</td>
<td>Planning</td>
<td>5</td>
</tr>
<tr>
<td>Problem solver</td>
<td>4</td>
<td>Administrative</td>
<td>2</td>
</tr>
<tr>
<td>Financial</td>
<td>1</td>
<td>Implementation</td>
<td>1</td>
</tr>
</tbody>
</table>

* Most descriptive
In analysing the data sheet and looking at work elements, Conceptualising (5), Creative (4) and Innovating (5) were selected as indications of work that the individual does well and that relate to the D-quadrant. The work element selected in the B-quadrant is Planning (5), and in the C-quadrant Interpersonal (5). Although the least preferred quadrant was the A-quadrant, work elements selected as work that the individual does well are Analytical (4), Technical (4) and Problem Solver (4).

Students with a single D-quadrant preference:

- are able to handle several mental inputs simultaneously, make rapid connections and work with abstract constructs
- think laterally in a way that inspires imagination; hence innovative and original ideas may stimulate this mode (the D-quadrant can be described as the catalyst for the creative process; strategic thinking and the fact that people with this profile welcome positive change and transformation create opportunities for taking risks and experimenting)
- have an initially holistic approach to problem-solving, as well as the assessment of various facets of a construct or situation and simultaneous execution of tasks
- reach conclusions in a spontaneous rather than a structured way, thus making this individual intuitive in an intellectual sense.

These are the learning opportunities that students with a D-quadrant dominant profile would prefer, according to Herrmann’s research (1995) and confirmed by Lumsdaine and Binks (2003):

- exploring hidden possibilities with a strong focus on self-discovery
- synthesising content and ideas to come up with something new
- asking the ‘why’ question and doing things simultaneously
- making use of visuals and mind maps; preferring pictures to words
- addressing open-ended problems and finding several solutions
- making use of experimental opportunities and playing with ideas
- conducting futuristic-orientated case studies and discussions
- trying different ways (not prescribed procedures) to do something, just for the fun of it
- making sketches to visualise a concept, problem or solution.
1.5 The construct Whole Brain® learning

The basic building blocks of our adult self are the DNA of our inherited genes and chromosomes, but aspects of socialisation, parenting, teaching, life experiences and cultural influences are considered to have a greater influence than genetic inheritance alone. Herrmann states unequivocally that his research into the brain has led him to firmly believe that:

we were designed to be whole; that the normal, ordinary everyday brain is specialised and interconnected in ways that position it to develop as a balanced, multi-dominant brain capable of accessing and using all of its mental options (1996, 35).

The construct ‘Whole Brain’® learning therefore includes genetic influence. This does not imply that we are the product of our genetics and nothing else. Herrmann in his research explicitly states that we are not on a genetically programmed path determined by our genes and chromosomes, but a product of both nature (genes) and nurture (development): ‘It’s not nature OR nurture. It’s nature AND nurture’ (1996, 34).

And it is the nurture aspect that has the major influence on who we are and who we become. Herrmann (1996) emphasises that if it was only genetic inheritance, the opportunity to develop into our own unique person would be limited and any learning during our maturing process would have no effect.

The physiological brain is designed to make connections that allow for direct interaction between the different specialised areas. Thus students have access to Whole Brain® learning, which means that any given aspect of designing for learning, such as a learning task and learning material, will have the potential to ‘reach’ them in some way, even if not in their preferred style. This implies that lecturers can effectively plan for a very diverse audience and look for blended options to provide different platforms for learning and for accommodating the diversity of their students.

Whole Brain® learning provides the basis for bridging the gap between the unique learning needs of the individual student and the appropriate methods of facilitating quality learning.

1.6 Challenges for lecturers

Most people choose occupations where they can exercise their preferred modes of thinking, and for this reason occupational categories have been
documented as *pro forma* profiles that contain typical profiles for certain kinds of jobs (Herrmann, 1995). Lecturers need to understand that for each group of students there is an array of thinking style preferences that represent a composite profile. Moreover:

There is also an equal distribution of learning avoidances distributed across the four quadrants. And learning avoidances are even more significant than learning preferences because they turn people off. A turned-off learner is a waste of educational time and effort as well as corporate time and effort (Herrmann, 1996, 152).

Herrmann goes on to make the reasonable assumption that ‘every classroom represents a complete spectrum of learning style preferences’ (1996, 152).

Our knowledge of the brain and its inherent uniqueness clearly indicates that a student has unique learning experiences, preferences and avoidances that will be different from those of other students. If we are serious about improving the quality of learning, we need to be aware of this. Each mode and quadrant of the brain is optimised when aligned with an appropriate task. However, as our school systems, and consequently our university systems, concentrate heavily on sequential and fact-based learning, creative abilities have become completely overshadowed and are often discouraged not only by teachers, but also by well-meaning parents, managers and lecturers. The following remark by Herrmann is apt in this regard:

Principals, superintendents, deans, or college presidents [armed with information on Whole Brain® learning] need to radically change the curriculum development and teaching processes in their institutions if they don’t currently deliver the learning product with equal effectiveness across the full learning spectrum (1996, 151).

Therefore learning opportunities must be designed in such a way that they somehow factor in the uniqueness of the individual student. An immediate implication for higher education in particular and education in general is that our assumptions about learning should take into account that our unique learning similarities and differences become part of the learning design and experience, and are thus made visible. As a result, learning is no longer one-dimensional but rather includes the notion of multiple intelligences (interests). This is demonstrated by Howard Gardner’s (1993) work, which advocates that the subject matter should be understood by all participants, not just by those whose learning is supported by the method
of facilitating learning used by the lecturer. In the context of our book and proposed learning theories, we would like to adapt this notion by promoting the idea of *inter alia* constructing meaning by employing the principles of self-regulated learning, opposed to mere understanding of subject matter.

The challenge is that if lecturers do not facilitate learning in line with students’ preferred thinking preferences, students often find themselves laden with study work that demands them to spend large blocks of time operating in tasks of lesser preferences or even avoidance (Herrmann, 1995). The advantage of applied Whole Brain® technology is that it can be learned and is therefore transferable (Herrmann, 1996). The application of this technology within the higher education arena will ensure a more learning-centred approach (Du Toit et al., 2011).

1.7 The advantage of understanding thinking preferences

Research has proved that students who know more about their own strengths and weaknesses will be more motivated to learn. If lecturers can respond to individual students’ strengths and weaknesses, then retention of the learning material and performance rates in formal programmes are likely to increase (Coffield et al., 2004). However, the argument in our book is that learning is not only about the retention of learning material, but also about establishing processes of deeper learning that allow students and lecturers to construct new meaning and to apply the principles of self-directed learning – as is discussed in the applicable sections below.

To develop the full potential of students, it is imperative for lecturers to be aware of their own thinking style preference and the implications it has for their preferred style of facilitating learning. Felder suggests:

> If professors teach exclusively in a manner that favors their students’ less preferred learning style modes, the students’ discomfort level may be great enough to interfere with their learning. On the other hand, if professors teach exclusively in their students’ preferred modes, the students may not develop the mental dexterity they need to reach their potential for achievement in school [university], and as professionals (1996, 18).

Educational activities that implement an approach using Whole Brain® Thinking will ensure that students’ preferred learning modes are
accommodated and that less preferred learning modes are developed. For the purposes of our book, we have adopted the four-quadrant model of learning preferences and avoidance, and through the lens of Herrmann’s Whole Brain® Model we have created a comprehensive Whole Brain® Model for learning and facilitating learning (Figure 6.5), which can assist lecturers to enhance the quality of their teaching practice.

Figure 1.6 summarises the expectations of students in the four quadrants and the struggles they encounter in the various quadrants if the lecturer’s facilitating of learning is not in accordance with an approach using Whole Brain® Thinking.

The planning and preparation of learning opportunities, as well as the applicable methods of facilitating learning as adapted from Herrmann (1995), are highlighted in Figure 1.7.

Noting all the data in this chapter, Figure 1.7 outlines the way ahead for facilitating of learning to accommodate all students in their preferred thinking modes using the Whole Brain® Thinking methodology.

1.8 Herrmann’s expanded Whole Brain® Model for Learning and Facilitating Learning

Herrmann’s original idea was to use the Whole Brain® Model for a teaching and learning Walk-Around™ process. This would imply that the key learning points needed to be presented to the students in all four quadrants. Acknowledging the breakthrough research that Herrmann (1995; 1996) left us with, we offer in our book a comprehensive model to not only facilitate Whole Brain® learning, but also incorporate designing of learning opportunities using Whole Brain® technology and Whole Brain® assessment opportunities that would promote deep and constructivist learning. It is a tool to assist lecturers to formulate key learning outcomes in as many ways as possible with a view to reflecting on the different quadrants. Using the comprehensive Whole Brain® Model for learning and facilitating learning, lecturers can learn how to use and integrate all four learning modes to accommodate the uniqueness of individual students and develop their areas of lesser preference.

Designing learning opportunities and learning material in this way must be done to not overwhelm students by providing a deluge of methods of facilitating learning. Instead, the Walk-Around™ Model creates a method that can be used to move back and forth on the Whole
Theoretical framework

**Students’ Expectation**

**A. Thinkers**
- Precise, to the point, information
- Theory and logical rationales
- Proof of validity
- Research references
- Textbook reading
- Quantifiable numbers, data sets, problems
- Opportunity to ask challenging questions
- Subject matter expertise

**Struggles with:**
- Expressing emotions
- Lack of Logic
- Vague, imprecise concepts or ideas

**B. Organizers**
- An organised consistent approach
- Staying on track, on time
- Complete subject chunks
- A beginning, middle and end
- Opportunity to practice and evaluate
- Practical applications
- Examples
- Clear instructions/expectations

**Struggles with:**
- Risk
- Ambiguity
- Unclear expectations/directions

**C. Humanitarians**
- Group discussion and involvement
- To share and express feelings/ideas
- Feeling-based
- Hands-on learning
- Personal connection with lecturer/group
- Emotional involvement
- A user-friendly learning ‘experience’
- Use of all the senses

**Struggles with:**
- Too much data and analysis
- Lack of personal feedback
- Pure lecture, lack of participation

**D. Innovators**
- Fun and spontaneity
- Playful, surprising approaches
- Pictures, metaphors, overviews
- Discovering of the content
- Freedom to explore
- Quick pace and variety in format
- Opportunity to experiment
- New ideas, concepts

**Struggles with:**
- Time management and deadlines
- Administration and details
- Lack of flexibility

---

**Figure 1.6** Students’ expectations in the four quadrants, and potential struggles

© 2012 Herrmann Global. All rights reserved
### Preparing and facilitating learning

<table>
<thead>
<tr>
<th>A</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Thinkers</strong>&lt;br&gt;Lecture: facts, details&lt;br&gt;Research findings&lt;br&gt;Higher order reasoning&lt;br&gt;Critical thinking&lt;br&gt;Textbooks, reading&lt;br&gt;Case studies&lt;br&gt;Use of experts&lt;br&gt;Apply logic&lt;br&gt;Metacognition&lt;br&gt;Theories&lt;br&gt;Thinking strategies</td>
<td><strong>Brainstorming</strong>&lt;br&gt;Mental pictures&lt;br&gt;Metaphors&lt;br&gt;Active imagination&lt;br&gt;Creativity&lt;br&gt;Illustrations/pictures&lt;br&gt;Pretending&lt;br&gt;Mind mapping, synthesis&lt;br&gt;Holistic exercises (big picture)&lt;br&gt;Painting/drawing&lt;br&gt;Paintings/designs</td>
</tr>
<tr>
<td><strong>Organisers</strong>&lt;br&gt;Outlining&lt;br&gt;Graphic organiser&lt;br&gt;Checklists, worksheets&lt;br&gt;Number sequences&lt;br&gt;Policies, procedures&lt;br&gt;Organisation, summaries&lt;br&gt;Who what why where when&lt;br&gt;Exercises with steps&lt;br&gt;Problem solving with steps</td>
<td><strong>Co-operative learning</strong>&lt;br&gt;Group discussions&lt;br&gt;Body language&lt;br&gt;Sharing personal experiences&lt;br&gt;Listening and sharing ideas&lt;br&gt;Musical and rhythmic&lt;br&gt;Interviews&lt;br&gt;Physical activities&lt;br&gt;Hands-on</td>
</tr>
<tr>
<td><strong>Humanitarians</strong></td>
<td><strong>Innovators</strong></td>
</tr>
</tbody>
</table>

#### Figure 1.7
Planning learning opportunities and methods of facilitating learning

© 2012 Herrmann Global. All rights reserved

Brain® Model by implementing learning activities in each of the four quadrants.

The expanded Whole Brain® Teaching and Learning Model (Figure 1.8) has the Whole Brain® Teaching and Learning Model as baseline and
Theoretical framework

centre. It also focuses on the culture in which the learning process is applied and highlights an array of aspects that have an influence such as Ethnic, Family, Social and Organisational. The expanded model also highlights the surrounding environment in which the culture exists namely the Physical, Geographical, Economic, Temporal and Motivational.

In Herrmann’s expanded Whole Brain® Teaching and Learning Model (Herrmann, 1995, 417) (see Figure 1.8), the environment in which learning takes place is important. In his model Herrmann highlighted the fact that the environment can also be incorporated into the four-quadrant model. Formal academic lecture halls or downloadable audio or video files of a lecture are often conducive to the learning of A-quadrant students, who are achievement-driven. They offer an environment where these students can listen efficiently to the academic specialist empowering them with skills to acquire new knowledge. The best environment for B-quadrant students is often more traditional, such as the conventional type of classroom setting. This is where they experience normalcy of ‘back to basics’ and can perform their tasks to the best of their abilities. An opposite type of environment is the learning stimulus of the C-quadrant student who prefers to learn in an environment resembling a student lounge, which allows students to get together and interact with one another on subject matter. D-quadrant students prefer an even more stimulating and yet relaxed learning environment. They have a preference for a ‘playground’ type of environment where ideas can be brainstormed and creativity is stimulated. These different environments are illustrated in Figure 1.8.

1.9 Learning style theories

Students have different thinking styles, which are characterised by strengths and preferences in the ways they process information and construct new meaning. Some students tend to focus on facts and data, while others are more comfortable with information from pictures and diagrams. Some gain more from written and spoken explanations, while others learn actively through interactive engagements with other individuals (Felder, 1996).

Apart from the HBDI® profile, Felder examines three other learning style models that have been used effectively in engineering education (his field of interest): the Myers-Briggs Type Indicator Model, Kolb’s Learning Style Model and the Felder-Silverman Learning Style Model.
1.9.1 The Myers-Briggs Type Indicator Model

This model classifies students according to their preferences on scales derived from psychologist Carl Jung’s theory of psychological types. The Myers-Briggs Type Indicator Model can combine 16 different learning style preferences. According to Felder (1996), students may be classified as:

- extraverts (who try things out, focus on the outer world of people) or introverts (who think things through, focus on the inner world of ideas)

- sensors (who are practical, detail-orientated, focus on facts and procedures) or intuitors (who are imaginative, concept-orientated, focus on meanings and possibilities)

- thinkers (who are sceptical, tend to make decisions based on logic and rules) or feelers (who are appreciative, tend to make decisions based on personal and humanistic considerations)
judgers (who set and follow agendas, seek closure even with incomplete data) or perceivers (who adapt to changing circumstances, resist closure to obtain more data).

1.9.2 Kolb’s Learning Style Model

Kolb is widely credited for launching the modern learning styles movement during 1984 with his scene-setting publication *Experimental Learning* (Kolb, 1984). It summarises 17 years of research, claiming that an appreciation of different learning styles can benefit teamwork, conflict solution, communication and the choice of a career (Coffield et al., 2004). Kolb postulates that ‘learning is the process whereby knowledge is created through the transformation of experience. Knowledge results from the combination of grasping experience and transforming it’ (1984, 41).

Figure 1.9 shows a simplified version of Kolb’s Learning Style Model.

Coffield et al. (2004) explain Kolb’s model as one that classifies students to have a preference for one of four different types of learning styles.

![Kolb's Learning Style Model](image-url)

**Figure 1.9 Kolb’s Learning Style Model**

Source: Coffield et al. (2004, 61)
1.9.2.1 Type 1: Converging style

The attributes of this style are abstract and active. Students falling in this category respond well to abstract conceptualisation and active experimentation. They prefer the ‘how’ question and opportunities to work actively on well-defined tasks, as well as learning by trial and error in an environment that allows them to fail in a safe way. Lecturers should function as mentors to students with a converging style.

1.9.2.2 Type 2: Diverging style

Students with this style of learning like concrete experience and reflective observation as part of their learning. They view concrete situations from many perspectives and adapt by observation rather than action. They are aware of meanings and values and have an interest in people, which tends to make them feeling-orientated.

1.9.2.3 Type 3: Assimilating style

This style was initially referred to in the literature as abstract reflective. Students respond well to abstract conceptualisation and reflective observation by focusing on the ‘what’ explanations. They like to reason inductively and create models and theories. They are more concerned with ideas and abstract concepts than with people. Lecturers should function as experts in order for students to be activated.

1.9.2.4 Type 4: Accommodating style

This learning style can be described as concrete active. Primarily, students with this style respond well to ‘what-if’ questions and welcome the opportunity to apply learning in new situations in order to solve problems. Lecturers should ‘stay out of their way’ but should create opportunities for them to maximise discovering.

1.9.3 The Felder-Silverman Learning Style Model

This model distinguishes between the following types of students:
sensing students (who are concrete, practical and orientated toward facts and procedures)

intuitive students (who are conceptual, innovative and orientated toward theories and meanings)

visual students (who prefer visual representations of presented material – pictures, diagrams, flow charts)

verbal students (who prefer written and spoken explanations)

inductive students (who proceed from the specific to the general)

deductive students (who go from the general to the specific)

active students (who learn by trying things out, working with others)

reflective students (who learn by thinking things through and working alone)

sequential students (who are linear, orderly and learn in small incremental steps)

global students (who are holistic, system thinkers; they learn in large leaps).

1.9.4 Summary of learning style models

Numerous learning style models have been used in education and training. Coffield and his research team (2004) contributed to the scientific validation of what we know about current learning style models when they were commissioned by the Learning and Skills Council in England to investigate the wide range of learning style instruments designed to make learning a more successful process for students.

After evaluating the main theories, they concluded that the field of learning styles is extensive and conceptually confusing. In order to make a contribution to the understanding of learning styles, they not only divided the field into three linked areas of activity, but also identified 71 models of learning styles that are available.

After reviewing and assessing the theoretical robustness of each model, they concluded that only 13 major models offer reliable and valid evidence and clear implications for practice based on empirical findings. They emphasised that it matters fundamentally which instrument one uses.

Of the 13 major models, only six were identified that met some of the set criteria. The rest of the models were disregarded as they failed to meet
these criteria and could not be considered for use (Coffield et al., 2004).

The Herrmann Brain Dominance Instrument® (HBDI®) was one of the six recommended models for education and training. The measures used in the HBDI® Survey are more closely related to those used in the Myers-Briggs Type Indicator, but less related to those in the learning style inventory of Kolb. Coffield and his team found that the HBDI® as an instrument is especially useful in further education because it throws light on group dynamics, and encourages awareness and understanding of the self and others (Coffield et al., 2004). They concluded that the instrument not only measures preferences of learning for specific quadrants, but actually highlights a low or even an avoidance preference for a specific learning mode. The latter is perhaps the most significant information for lecturer and students in the learning process, because the key to promoting quality learning and facilitating learning by means of appropriate strategies should be to address those low preferences, some of which may be essential to success in a particular subject or career (Coffield et al., 2004).

1.10 Learning theories for adults

A scholarly conversation position is taken in this section analogue to Haigh's (2006) work on academic staff development. It invites the reader to engage the aspects addressed and to reflect on them using self-conversation or 'intra-reflection' – typical of the C-quadrant of Whole Brain® learning. The learning theories discussed pertain to student learning and the professional learning of lecturers, and they include formal academic staff development, informal peer mentoring (see Section 3.4) and conversations about practice fitting the notion of community of practice referred to by Orlikowski (2002). Any community of higher education practice draws from applicable literature, which in turn is informed by practice. Literature and practice combined promote continuous meaning making. Meaning making includes the notion of unlearning traditional language that Harris (2004) alludes to. Unlearning contributes to working towards a radical transformation (Harris, 2004) based on experience and reflecting on it. Studying literature, gaining experience, having discussions with colleagues and the consequent constructing of meaning collectively form part of Huber and Morreale's (2002) scholarship of teaching and learning (see Section 3.3). Neave urges scholars of teaching and learning in higher education to
‘inspire others to join together to form a sustainable and mutually sustaining community of discourse, discovery and mutual learning’ (2008, 268).

One should change one’s conception of learning and construct new meaning about learning from the following three-dimensional point of view:

- the high quality of learning that lecturers expect of students
- what students expect of lecturers regarding high quality facilitating of learning
- what lecturers involved in staff development activities and peer mentoring expect of one another regarding professional learning.

Similar notions of expectations are highlighted by the comprehensive Whole Brain® Learning Model proposed at the end of our book. Expectations of the learning environment are an important aspect to consider. Regarding new meaning making in learning and facilitating learning, we propose in our book that Whole Brain® learning and the application of the principles become an integral part of our thinking.

The construct ‘adults as learners’ is preferred to ‘adult learning’. Learning is a life-long process; students need to develop their potential to become matured adults who learn. No attempt is made to differentiate between forms of learning for adults and for children.

The discussion of learning theories in the next sections demonstrates that no learning theory can be implemented in isolation. Moreover, we cannot include all existing theories in our book and can only work with examples. The idea is ultimately that one should construct one’s own meaning by applying the applicable principles in an integrated fashion.

### 1.10.1 Theories informing epistemology

Specific learning theories inform the epistemological and ontological grounding of the case studies discussed in our book. They may be considered by lecturers who research their teaching practice (see Section 3.2). The ‘way of knowing’ proposed stems from constructivist learning and Whole Brain® learning. The ontological stance emanates from combining the construct Whole Brain® Thinking, which forms the epicentre of our book, and the construct ‘living theory’ (McNiff and Whitehead, 2006), from which the construct ‘Whole Brain® living’ is coined. However, no learning theory can exist or be studied in isolation.
Collectively they should contribute to the realisation of the aims of higher education. One such aim is fostering a culture of authentic learning.

Authentic learning is described by Slabbert, De Kock and Hattingh as a learning process that needs ‘to be initiated by an incessant challenge to the learners’ [students’] living of real-life as a whole, so much so that uncertainty is provoked and anxiety not necessarily excluded’ (2009, 94).

To make authentic learning possible, students should be immersed in their own learning at a deep level with a view to ensuring the highest quality of learning. Constructivist learning contributes to such quality and is essential for academic learning. Constructivist learning is not prescriptive, and students as independents should take responsibility for their learning. Lecturers should design meaningful tasks and engage students by challenging them to construct new meaning while confronted with a real-life situation. O’Connor (2009, 49) maintains that individuals create or construct their own understanding or knowledge through the interaction of what they already know and believe with the ideas, events and activities with which they come in contact and with knowledgeable people.

According to Driscoll (2000), this is the essence of constructivist learning. Although she uses the construct ‘activity’, the construct ‘task’ (Slabbert, De Kock and Hattingh, 2009; Gravett, 2005) is preferred. Task means that students are challenged to get intrapersonally immersed in executing a task imbedded in a real-life context. This defuses the intrinsic–extrinsic motivation dichotomy, whereas activity simply means an activity arranged by someone else (external locus of control) that a student can or cannot take part in. However, executing a task that requires a constructivist and metalearning approach does not always involve an individual in isolation, but more often than not an individual in relationship with others as a social process (typical of the C-quadrant).

Constructivist learning is underscored by learning-centredness (Donche, 2005; Du Toit et al., 2012; Gravett, 2005) – an educational value that should be nurtured according to McNiff and Whitehead (2006). Another value is having respect for students’ point of view. Promoting constructivist learning is evidence of transformational teaching practice and learning. Learning and teaching becomes transformative when a shift is made in how one sees the self, others and the world around one, and when the revised perspective is actually acted on (Cranton, 2010) – therefore it becomes the practice of facilitating learning instead of teaching. One transforms one’s learning or teaching practice (externally) and the inner-self through self-formation (Strong-
Wilson, 2009). In the context of our book, facilitating learning is considered a practice that includes assessment of student learning. All types of assessment (being diagnostic, formative or summative) and methods of assessment (being self-assessment, peer assessment or assessment by the lecturer of written, oral or practical work) are an integral part of the process of facilitating learning. It implies assessment of learning and assessment for learning. Assessment should be authentic and aligned with real-life challenges that are considered authentic. When challenging students to engage in authentic learning and authentic problems (Slabbert, De Kock and Hattingh, 2009, 69) the process of learning about the self from the self has to be a continual process of feedback... a process of continually learning to learn in order to enhance the quality of learning, all with the aim of maximising human potential which is the responsibility of each individual human being.

This is a guiding principle for facilitating and assessing constructivist learning. Students should identify the problems that they would want to address and that are relevant. Proponents of authentic learning and assessment propose that students work with innovative ideas and data sets occurring in authentic settings, for example service learning (Ash and Clayton, 2004), other forms of community engagement, experiential education in the workplace (Phuthi, 2012) and ‘place-based and experiential initiatives’ (O’Connor, 2009, 54).

Characteristics of a holistic constructivist learning environment demonstrate the unlearning of the traditional (pedagogical) language that Harris (2004) alludes to. Lecturers should construct their own pedagogical language. When constructivist learning, action learning, service learning and other theories are merged, a multi-dimensional theory is created that complements the multi-dimensional nature of facilitating learning in higher education. Such a holistic pedagogical philosophy can be considered pedagogy using a Whole Brain® approach.

Pursuit of student questioning is highly valued and serves as another educational value (McNiff and Whitehead, 2006). Developing an inquiring mind is a value-adding attribute (Lee, 2004). Lecturers should be the ones asking facilitative questions as the role of the lecturer has shifted to that of facilitator or mediator of learning (cf. Wilkie, 2004). Questioning as an integral part of the learning process shifts from a one-way to a multi-way questioning approach. All students contribute to asking questions during contact or virtual sessions. They learn how to
formulate questions that would promote deep learning and construct new meaning. This underscores the argument for promoting scholarly discourse and conversation, as highlighted by Haigh (2006). Another construct used is ‘dialogue’, which entails engaging participants in a social relationship in a co-operative process of ‘reciprocal inquiry through questions, responses, comments, reflective observations, redirections and building statements that form a continuous and developmental sequence’ (Gravett, 2005, 41).

Students are considered more than critical thinkers with emerging theories about the world. Linked to the idea of developing inquiring minds, action learning creates opportunities to think constructively. From this stance new theory is constructed, based for example on what students have learned from studying literature, experience, scholarly discourse and feedback from others.

Scholarly discourse can be aligned with Haigh’s (2006) idea of everyday conversation that contributes to learning. Constructing meaning from such conversation and discourse becomes authentic learning, for example during a community-based project, as the community engagement setting is authentic. The notion of conversation as a means of learning is evident in co-operative learning (appreciated by students who prefer C-quadrant learning). Socio-constructivist learning opportunities as the ‘fulfilment of an important social function can also enable learning’ (Haigh, 2006, 11). Conversation forms an important part of reflective learning. Reflection as conversation can take the form of self-conversation (self-talk) or can be interpersonal – with others (also C-quadrant preferences).

Donald’s (2004) ideas of independent knowing are closely related to constructivist learning. The aspects she refers to, such as independent knowing and creating one’s own opportunities for experience, are the underpinning premises for constructing new meaning. Constructing new meaning is a holistic act that contributes to finding and constructing one’s own space in the formal learning environment and in the world. Complementing this idea, O’Connor refers to the importance of offering students the opportunity to become involved in ‘the process of learning about themselves and their place in the natural world’ (2009, 54). Donald (2004) points out that individual students construct their own understanding of larger public bodies of knowledge.

Action learning as process for student learning and action research as process for the professional development and learning of lecturers are closely related (see Section 3.2 for a discussion on action research as part of professional development).
Different constructs such as ‘self-regulated learning’, ‘self-directed learning’, ‘metalearning’ and ‘action learning’ are closely related. These constructs form part of the theoretical framework for the action research projects (reported in our book) that promote deep learning (see Chapter 4). The origin of these theories can be traced back to the original fruitful work of Kolb (1984).

The basic elements of the strategies applicable to all the theories mentioned revolve around the planning of learning and research actions to be taken, execution of the plan by taking action, and monitoring of the execution and learning and research process by different means. Critical reflection (C-quadrant) and assessing the outcome of the learning process and end product (A-quadrant) are important in this regard. Critical reflection is considered an intrapersonal act (Du Toit, 2009), which reflects the principal idea of the position students or lecturers take when taking care of their learning with a view to improving what they are doing. Although the construct ‘critical reflection’ is used in the literature, we support in our book Du Toit’s (2012) idea that ‘scholarly reflection’ should rather be used, especially in the case of research.

Action learning is the original idea of Revans (Teare and Prestoungrange, 2004) and closely related to action research. Action learning and research create an opportunity for students and lecturers to test accumulated knowledge (Marquardt, 2002).

The basic difference between action learning and action research is that action learning is usually executed by students, while action research is executed by lecturer or practitioner researchers. The same steps are taken during a spiral of learning that consists of different cycles, each consisting of different steps. Different ways of making the final outcome known are the most significant difference. The outcome is not made public for students who have to execute an action learning task. It is documented in the form of a portfolio (for example) and serves the purpose of *inter alia* final grading (see our case study focusing on professional portfolios in Section 3.2). With action research executed by a professional such as a lecturer, the outcome is made public by means of articles or conference papers. Should the lecturer be enrolled for a formal education qualification such as the Postgraduate Certificate in Higher Education (PGCHE) (see Section 4.2.1) and should formal assessment be carried out, writing a journal or conference paper is considered authentic assessment.

To the background of the theory on Whole Brain® learning specifically and multiple intelligences (Gardner, 1993), critical reflection in essence has to do with emotive thinking of the C-quadrant and intrapersonal intelligence. The different intelligences distinguished are dominantly
closely related to one or more of the different quadrants. In authentic learning no quadrant can operate in isolation, but it must function in a synchronous way with the other quadrants. In the same way, no intelligence can function in isolation but needs to be integrated with others. The following eight intelligences (Gardner, 1993) are listed as examples of multiple intelligences:

- intrapersonal intelligence (self-smart)
- interpersonal intelligence (people smart)
- musical intelligence (music smart)
- naturalistic intelligence (nature smart)
- linguistic intelligence (word smart)
- logical-mathematical intelligence (logic smart)
- bodily-kinesthetic intelligence (body smart)
- spatial intelligence (picture smart).

We acknowledge the fact that further research on multiple intelligences has brought to the fore additional intelligences such as intuitive intelligence and transcendental intelligence (Slabbert, De Kock and Hattingh, 2009).

Constructing meaning regarding the learning theories discussed below should be done against the backdrop of one’s understanding, experience and scholarly discussion of the four quadrants and multiple intelligences.

The term action learning is used to describe the initiative students take to execute a learning task at the highest quality of learning (Slabbert, De Kock and Hattingh, 2009), when they are proficiently matured and weaned from inquiry-guided learning as promoted by Lee et al. (2004). It implies moving from dependent learning to independent learning or self-inquiry. As an alternative, Boud (2006, 24) refers to self-directed learning as ‘negotiated learning’, while Straka (1997) describes self-directed learning as an initiative taken by the individual. Diagnostic self-assessment serves as a substantiated point of departure for deciding on the appropriate learning strategies and methods to apply in executing a specific task; this is aligned with Biggs’s (1999) idea of metalearning, which as a process starts with a presage phase. This phase consists of aspects pertaining to student attributes and the learning environment. Student attributes include personality, historicity, learning style, meta-cognitive knowledge and study background. The learning environment consists of the subject, the lecturer (personality, teaching style), time for or on task, task requirements, libraries, laboratories, and so on. This is followed by executing a task,
which involves a metalearning experience, action learning, deep learning, and so on. The end product or outcome reflects achievement. According to Biggs (1999), reflecting on the end product would include cognitive (A-quadrant) and affective (C-quadrant) aspects, but for the Whole Brain® Model the student should also reflect on the sequence (B-quadrant) to execute the task and adopt a holistic (D-quadrant) approach.

A significant attribute of action learners or researchers is the ability to become flexible. This is not acquired by osmosis, but should be nurtured. In the Whole Brain® Model it is the nurturing of becoming flexible that is nested in the D-quadrant. Students and lecturers who are willing to take risks and who observe the advantages of flexibility in others (students and peers) may be adaptable to such an extent that they influence the learning environment in a positive way. Flexible learning is considered a new way of learning that should be promoted in higher education (Garrick, 2000). Another dimension of flexible learning is divergent thinking. Authentic problems cannot be solved in the same way as others. Each problem has unique complexities and requires different approaches to solving it, as is evident from a Whole Brain® Thinking perspective. Such complex problems are to be found in authentic learning settings, for example in community engagement such as service learning.

Ash and Clayton (2004) consider engagement with the community as the context for inquiry learning. A deeper dimension to inquiry learning is evident when students enact solving the real-life problems they are faced with in collaboration with the community in question. Apart from the community offering the opportunity to students to deliver a service, learning from the community in a reciprocal fashion is yet a deeper dimension added to authentic service learning. As is typical of participatory action research (Zuber-Skerritt, 2000), which is common in service learning, ‘participatory action learning’ is an appropriate construct to use in the case of student learning where the outcome of the learning is not made public.

Positive influences may bring about free choices for students, peers and lecturers. Students decide to what extent they are willing to be controlled by others or other things – whether abstract such as learning culture, or tangible such as learning material. The same goes for peers. Lecturers have the free choice of promoting action learning, or staying in the rut of their old paradigm of lecturing and language.

All the learning and other theories pertaining to learning at university level (e.g. co-operative learning) inform curriculum development. Consequently, simple and practical guidelines for curriculum development are proposed. This is followed by a discussion of action research that is
used for assessing one’s application of the curriculum aspects, such as assessment, for which one is responsible as lecturer.

1.10.2 Curriculum development for Whole Brain® learning

We acknowledge that curriculum development per se is a specialised field with its own theoretical underpinning. However, it is included here with a view to indicating the position learning theories take in the curriculum. Learning theories inform curriculum development. In turn, curriculum development informs the application in practice of pertinent principles of learning theories as evident in different methods of facilitating learning. Moreover, the process of curriculum development per se reflects a constructivist approach.

Curriculum development takes different forms at different higher education institutions such as universities. Moreover, as higher education institutions differ vastly, they each would have their own curriculum development model that expects different actions when designing a curriculum, implementing it, evaluating it in a formative fashion, adapting it and eventually evaluating it summatively. It is a continuous iterative process and reminds one of the action research process discussed in Section 3.2. As curriculum development is a scholarly act, action research is promoted as a useful process to design, implement, monitor and evaluate the curriculum. The entire process of steps taken includes continuous scholarly reflection. The responsibility of participating in curriculum development activities is, inter alia, to be found in the roles stipulated by the Norms and Standards for Educators (Republic of South Africa, 2000), which include design and implementing of programmes, courses or modules, or interpreting curricula. The latter is specifically applicable where a curriculum is mainly prescribed by a professional body, such as a body for the professional development of chartered accountants, or a body for the professional development of medical practitioners. In our book, and contextualised for the South African higher education landscape, the construct ‘module’ is most often used. Another construct used is ‘learning programme’ or ‘programme’. Such a programme consists of several modules. For the purpose of discussions in our book, the construct ‘module’ is used. Readers should change this designation according to their own context, as we acknowledge that different higher education systems and different countries use different and context-specific constructs such as ‘course’.
The theoretical framework

The curriculum development model (the so-called cone model) that has been in use at the University of Pretoria (Kachelhoffer, Malan and Knoetze, 1990) for several years is currently revisited. It has since been adapted by a university of technology (Masebe, 2007) to suit its specific context. Three levels of curriculum development activities are distinguished: the macro-level, meso-level and micro-level. Instead of meso-level, we prefer to use the construct ‘mid-level’ or ‘middle level’. The contribution the lecturer makes occurs at the micro-level and is informed by curriculum development activities at mid-level. Mid-level curriculum development activities are informed by activities on the macro-level. At this level, curriculum development activities by a constituted curriculum development committee revolve around needs analyses executed by a faculty, such as Health Sciences, by looking into relevant policies of a Health Sciences Council. In the case of the professional development of medical practitioners, other similar health sciences programmes at local and international level can be studied. Applicable qualification frameworks and other policies should be adhered to. Facilities, human resources and cost implications should be kept in mind, as well as the duration of studies for a qualification.

At mid-level, the responsibility becomes that of the constituted curriculum development committee of a specific academic department or academic unit. The department is responsible for refining the needs analysis and for identifying and formulating overarching learning outcomes. This would inform the selection of modules. Decisions regarding an overarching schedule and approaches to be included, such as service learning, should be stipulated and made.

The micro-level curriculum development activities to be conducted by the individual lecturer include taking cognisance of the module expectations. Learning outcomes are refined and inform the division of the module into different study units, while complementing assessment opportunities are identified. Based on the intended assessment practice, appropriate learning opportunities are planned. These include practicals and co-operative learning that would not only foster deep and authentic learning, but would also complement the learning outcomes. All aspects are combined and documented as a study manual per module – to promote communication between the lecturer and student. For each module a purpose statement is communicated. In the case of modules that are integrated (which we advocate since the world of work is integrated and not compartmentalised), one might find that a study manual consists of guidelines for more than one module. Again, depending on the specific context of a higher education institution, other types of
learning material and documentation may be appropriate. Principles of Whole Brain® learning should be kept in mind, as well as the principles of other learning theories. The process starts with the formulation or reformulation of learning outcomes that should ensure the promotion of deep, authentic learning. This can be achieved by including challenging learning outcomes that would expect students to demonstrate that they have followed an appropriate action learning process by documenting it as part of an assignment. It is clear that the applicable learning theory in question here is action learning. When action learning is combined with constructivist learning, the formulation of the learning outcomes should reflect this. In some way students should be assessed on constructing new meaning while executing the action learning process, as the construction of new meaning builds on one’s experience.

The study guide serves as communication document to students about what is expected of them and as a contract between the lecturer and student. In brief, such a manual may include the following structure:

- an organisational component:
  - vision of module
  - motivational aspects, such as a welcoming letter
  - lecturer information
  - tutor and assistant lecturer information
  - schedule and programme
  - section on assessment opportunities and grading
  - section on philosophy of facilitating learning and approaches, approaches to learning, expectations of students
  - guidelines for plagiarism
  - grievance procedures
  - guidelines for online learning

- a study component:
  - overview of module (preferably in the form of a visual or mind map)
  - a purpose statement
  - introduction to Whole Brain® learning (all tasks to be executed accordingly)
  - each study unit documented as a subsection indicating:
    - learning outcomes
Theoretical framework

- self-study tasks
- collaborative tasks
- online tasks
- problems to be solved (problem-based learning)
- assignments
- assessment criteria
- rubrics
- list of references, and so on.

It is specifically when it comes to assessment that the learning theories alluded to in our book should be kept in mind. The overarching outcomes should reflect expectations for Whole Brain® learning, constructivist learning, metalearning and action learning, and so on. Biggs’ SOLO taxonomy comes in handy when the attributes of these theories need to be assessed (Biggs and Telfer, 1987).

These overarching outcomes should be refined as learning outcomes that each reflects the refining of learning for (constructed) knowledge (Whole Brain® Thinking) competencies, and so on. Learning tasks that would create opportunities for quality learning should be aligned with these learning outcomes. Arguments such as the one of Clayton and Kimbrell (2007) in favour of developing creative problem-solving skills inform curricula. Other so-called soft skills, such as communication skills, working as a member of a team, and leadership are pervasive skills that need to be included. This will contribute to designing a curriculum that will provide students the opportunity to develop in a holistic way.

When assessing one’s practice using action research, the study manual in use should also be assessed as part of one’s curriculum development responsibility. It might entail developing a new module or transforming an existing one. Against the background of the learning theories discussed, the assessment of one’s study manual and curriculum development skills should offer substantive evidence (McNiff and Whitehead, 2006). Such evidence should include the application of the principles of Whole Brain® learning, constructivist learning, and so on, which become the criteria for assessment of the manual.

1.11 Conclusion

From the aforementioned theories, it becomes clear that people think differently, with stronger and lesser preferences for certain styles of
thinking. This characteristic of the human brain therefore also has an impact on the thinking of individuals. It is therefore evident that lecturers need to know how to accommodate the various Thinking Styles™ of students while facilitating learning and assessing students with a view to enhancing quality learning. Moreover, lecturers need to know how to challenge students to learn how to think beyond their comfort zone or preferred way of thinking. As the world of work demands of every employee to be flexible when thinking, communicating and solving problems, every person should become more whole brained. The same goes for students as prospective employees, including lecturers. Apart from facilitating learning in a Whole Brain® fashion, lecturers as specialists in their field are responsible for ensuring that curricula, assessment opportunities and so on reflect accommodating and promoting the notion of Whole Brain® Thinking.

In the next chapters we endeavour to provide evidence of the practical application of the principles of Whole Brain® Thinking and other theories pertaining to higher education. It includes illustrations of how action research can be used as an applicable research design to investigate one’s own teaching practice, especially regarding the application of the principles of Whole Brain® Thinking. The exemplars, from an array of fields of specialisation such as medicine, engineering and information science, typically show how experimenting with novel ideas in one’s practice, such as Whole Brain® Thinking, and linking it to other learning theories for adults in an integrated way can bring satisfaction to lecturers and enhance the quality of every aspect of one’s teaching practice.