



Chapter 4

4. Empirical study

4.1 Introduction

The purpose of this study was to implement an educational model that enhances the quality of learning while accommodating the new paradigm of OBE. The Herrmann Whole Brain Model was selected and implemented in the study unit of Toothmorphology. During the study the following data was compiled and summarized:

- ◆ HBDI profile scores of the group of learners.
- ◆ Test scores by learners for the study unit of Toothmorphology.
- ◆ Mean M-Score of the group.
- ◆ Learners' feedback of learning via the Whole Brain Model.

The data was statistically analyzed and is described in this chapter.

4.2 Interpretation of HBDI scores

4.2.1 Thinking preferences of the group

As part of this study the learners and facilitator had to complete the HBDI survey. This was done before the commencement of the learning opportunities. The facilitator used the data from the profile score of the group as well as the individual scores to plan learning opportunities.

Table 10: Preferred modes of thinking of the group

Quadrant	Mean	Std. Dev.	Min. Score	Max. Score	Median
A	69.48	22.62	21	113	71.50
B	79.26	18.36	45	119	79.00
C	67.09	18.82	32	129	67.50
D	76.63	23.83	35	128	75.00

Table 10 (refer to p. 101) indicates that this is a heterogeneous group of learners having a strong or very strong preference (profile score equal or more than 67) for thinking in all four quadrants of the whole brain. This data strongly supports Herrmann's statement (Herrmann, 1996:150) that:

The only safe assumption is that every learning group represents a corporate whole brain.

The learning facilitator used the data to structure learning activities according to learners' thinking preferences. For the purpose of this study the facilitator planned his educational practice to accommodate and develop whole brain thinking in order to maximize the full potential of all learners and minimize learning avoidances during learning.

4.3 Comparison between the profile-score and M-Score

Traditionally, the School for Dentistry at the University of Pretoria uses the M-Score, which is based on learners' performances in grade twelve (Van Dyk, 1992), as an indicator to select learners to study dentistry. The higher the M-Score, the better chance a learner has to be selected to study dentistry. Currently there are only sixty selected learners in the first year of study for the BChD degree. For the purpose of this study it is concluded that the M-Score is used as an indication of a learner's ability, indicating the learners that are more intelligent and will be able to deliver the learning performances that are needed to be successful during their studies. Table 11 (refer to p. 103), which summarizes the M-Scores of this group of learners, indicates a minimum M-Score of 10 and a maximum M-Score of 30 for this group of learners. Pearson Correlation Coefficients were done between the group of learners' M-Scores and their preferred thinking styles.

Table 11: Summary of M-Scores

Mean score	Std. Dev.	Min. Score	Max. Score	Median
23.73	4.63	10	30	23

No statistically significant correlation was found between individual learner's M-Scores and their preferred modes of thinking. For this group of learners, the data indicates that the ability to perform well in school is not linked to a specific thinking style preference or HBDI pattern. It is suggested that human intelligence cannot be limited to only one, two or three of the brain dominant modes but to any combination (HBDI profile) of all four the modes. This coincides with the work of Gardner on multiple intelligences that was described previously in Chapter 2 (refer to p. 69).

4.4 Test scores for Toothmorphology

The learners wrote three lecturer-made tests during this study. The mean scores for the three tests are summarized in Table 12. The results from the three written tests in Table 12 show a significant high mean score for this group of learners. The minimum score for these tests by a learner was eighty percent and the highest score was one hundred percent with a mean score of ninety six percent for the group. Pearson Correlation Coefficients found no correlation between a learner's preferred modes of thinking and tests scores obtained during the study.

Table 12: Summary of test scores during this study

Test	Min.	Max.	Mean	Std Dev.	Median	Variation
1	86	100	97	1.737	98	3.019
2	82	100	95	1.949	96	3.802
3	80	100	95	2,636	96	6.951

Test performances of groups in previous years in the study unit of Toothmorphology delivered mean scores between sixty and seventy percent. It can be argued that the significant increase in the mean score of this group

measured against previous groups is due to the fact that the tests were too easy. This fact cannot be argued as valid since the questions in the previous tests were of the same kind. No test papers of previous years (1998 and 1999) were available to learners.

It could be argued that the learning facilitator who marked the tests was very lenient with marks. Since this study unit is about exact facts of anatomy the answers to all questions could be only right or wrong. The learners also had the first opportunity to mark their peers' tests. They could also contest the marks received from peer assessment. At the end the facilitator double-checked the allocation of marks.

The feedback from the questionnaires at the end of each week is described in section 4.5. The fact that this group of learners performed very well in this study unit seems to correspond with their positive experience of learning via the Whole Brain Model.

4.5 Evaluation of learning via the Whole Brain Teaching and Learning Model

The learners completed a questionnaire (Appendix B) after the first and again after a second set of four learning opportunities. Each learning session lasted for two hours and was presented to accommodate and develop the Whole Brain Concept. The questionnaire consisted of various kinds of questions about the learning experiences of the learners with the Whole Brain Model. The feedback received from the questionnaires was statistically analyzed.

Table 13: Summary of scores from learner feedback

Question	Mean	Min. Score	Max. Score	Std. Dev.
	Week1 / week2			Week1 – week2
1	4.04 / 4.17	3	5	.638 / .716
2	3.95 / 4.17	2	5	.638 / .936



3	4.04 / 3.91	2	5	.767 / .900
4	4.13 / 4.04	2	5	.868 / .824
5a	4.39 / 4.47	3	5	.891 / .790
b	4.34 / 4.26	3	5	.572 / .810
c	4.47 / 4.47	3	5	.665 / .730
d	3.78 / 3.95	2	5	.902 / .824
e	3.65 / 3.82	1	5	1.070 / .936
6a	4.13 / 4.04	3	5	.694 / .767
b	4.17 / 4.26	3	5	.834 / .810
c	4.47 / 4.43	3	5	.593 / .787
d	4.34 / 4.21	3	5	.647 / .735
7	3.69 / 3.91	2	5	.926 / .848
8	4.17 / 4.34	3	5	.716 / .647
9	4.34 / 4.39	3	5	.589 / .782
Mean	4.13 / 4.16			

Pearson Correlation Coefficients were done for the feedback received from the learners via the questionnaires for question one to nine. All the answers for the same question had a statistically significant high correlation (coefficients = -1 or 1). There was a statistically significant low correlation between all the different questions for both the two sets of answers from the different weeks.

The mean score for all questions for the first (4.13) and second (4.16) set of learning sessions indicates a better learning experience (equal or above a score of four) by the learners than what they had experienced previously in their studies. It is concluded that for this study learning via the Whole Brain Model caused more meaningful learning than what they had previously experienced.

The learners also had the opportunity to respond freely via the open questions (question ten and eleven) in the evaluation form. The feedback from all the

questions was very significant and positive. This feedback helped the learning facilitator with action research during the study.

4.6 Learner assignment

The learners had to produce, manufacture or construct something to illustrate the knowledge they had acquired in the study unit of Toothmorphology in a Whole Brain manner. The learners received this assignment after the first week of learning activities had been completed. They had to submit the finished assignment one week after the completion of the learning activities for the study unit.

The response from the learners exceeded all expectations. The learners responded by handing in products and artifacts that demonstrated knowledge of the content, order of content, working together or individually, creativity, artistic ability, diversity, excitement, commitment, as well as the willingness to dare and be different. The products ranged from different games, puzzles, magazines, traveller's journal, doctor's jacket, family album to a selection of four different flavours of pizzas in one model demonstrating the content of Toothmorphology in the four different modes of thinking.

4.7 Learners' experiences during learning

The different outcomes, data and feedback from this study indicate that the learners had a positive and meaningful learning experience. Learners' answers to the open questions, question ten and twelve, of the weekly questionnaire indicated the following as very positive aspects experienced during learning via the Whole Brain Model:

- ◆ Nineteen learners stated that they enjoyed the responsibility to research and discover information actively and solve problems on their own.
- ◆ Nineteen learners stated that learning via the Whole Brain Model was very enjoyable, exciting and they had fun while learning. These learners stated that they were looking forward to coming to a learning session.

- ◆ Twenty-two learners stated that they were learning faster, more easily and more effectively during these learning sessions than what they were used to in other lecturers' learning sessions. These learners also indicated that the Whole Brain Concept made new information more understandable and easier to learn and that they spent much less time at home to understand and get to know the work than in any other study unit previously experienced.
- ◆ Thirty-eight learners of the group indicated that co-operating in a group made the learning of the content much easier and more enjoyable. The learners enjoyed getting to know one another and having the opportunity of listening to and respect different opinions and views from different people. They also indicated that the Whole Brain Model helped them to know and understand themselves and others better.
- ◆ Nine learners indicated that they enjoyed the variety and various methods and activities during learning.

There was, however, a negative learning experience by one of the learners during the study.

- ◆ This learner indicated a negative and less meaningful learning experience for this study unit than in previous study units. This learner indicated frustration and a need for more lectures, concrete information and self-study (A-quadrant preferences) during learning.
- ◆ This learner's profile score (profile score=1222) indicated a strong to very strong preference for learning in the A-quadrant or left cerebral thinking mode. This is a less preferred thinking mode for the facilitator of learning as indicated by the facilitator's profile score (profile score=2112). The facilitator used this information to adapt learning activities to accommodate and develop this learner.
- ◆ After completion of the learning in the study unit of Toothmorphology this learner personally reported a positive and meaningful learning experience to the facilitator. This learner also performed above the group's mean score for this study unit.



Overall all learners reported a very positive and meaningful learning experience during this study. The facilitator also experienced the opportunity to be a part of the learning process via the Whole Brain Model as very enriching, stimulating, exciting and very positive.